QUALITY ASSURANCE DOCUMENT
AFQA-0001
(REV 11-20)

SUPPLIER/SUBCONTRACTOR QUALITY REQUIREMENTS

FOR PURCHASE AGREEMENTS

Contents

INT01: INTRODUCTION

This document defines the quality assurance requirements for Suppliers of materials (raw materials, hardware, components, assemblies, and tools) and services to Northrop Grumman. THE SUPPLIER IS RESPONSIBLE FOR ASSURANCE, AND UPON REQUEST, TO PROVIDE OBJECTIVE EVIDENCE THAT ALL MATERIALS AND SERVICES PROVIDED ARE IN COMPLIANCE WITH THE PURCHASE AGREEMENT REQUIREMENTS WHETHER MATERIALS ARE MANUFACTURED OR SERVICES ARE RENDERED BY THE SUPPLIER DIRECTLY OR OBTAINED THROUGH PURCHASE AGREEMENTS WITH SUB-TIER SUPPLIERS.

Unless otherwise specified the Supplier may select all sub-tier suppliers. However, whether the selection was dictated by Northrop Grumman or of the Supplier's choice the Supplier must flow down the applicable Northrop Grumman purchase agreement requirements to the sub-tier supplier.

Only the paragraphs of this document that are referenced in the purchase agreement apply. Additional quality requirements may be stated directly in the purchase agreement to supplement the referenced paragraphs. In the event of conflict between the quality requirements and other purchase agreement requirements, the Supplier shall obtain clarification from Northrop Grumman.

All Northrop Grumman approvals and Supplier requests for approval referenced in this document shall be by and through the Northrop Grumman buyer in writing.

SUPPLIER EXCEPTIONS TO PURCHASE AGREEMENT REQUIREMENTS ARE NOT ALLOWED. An exception is defined as any attempt to certify material to a specification without meeting all requirements. Examples of exceptions are values that do not meet specification requirements, alternate test methods, or certification to revisions that are not called out in the purchase agreement.

QUALITY SYSTEMS

QQS1: QUALITY SYSTEM PER PURCHASE AGREEMENT

The Supplier shall provide and maintain a quality system that will ensure all products delivered conform to the drawings, specifications, and requirements specified in the purchase agreement. The Supplier must also ensure persons are aware of their contribution to product and services conformity, safety, and the importance of ethical behavior.

QQS2: MIL-Q-9858A

The Supplier shall provide and maintain a quality system that conforms to MIL-Q-9858A and is acceptable to Northrop Grumman.

QQS3: MIL-I-45208A

The Supplier shall provide and maintain an inspection system that conforms to MIL-I-45208A and is acceptable to Northrop Grumman.

QQS4: ISO 9001

The Supplier shall provide and maintain a quality system that conforms to ISO 9001 as currently amended and is acceptable to Northrop Grumman.

QQS5: ISO 9001 CERTIFICATION

The Supplier shall provide and maintain a quality system that conforms to ISO 9001 as documented by a third-party registrar. Northrop Grumman may request a copy of the registration certificate annually as evidence of continued compliance.

QQS6: AS9100

The Supplier shall provide and maintain a quality system that conforms to AS9100 and is acceptable to Northrop Grumman. Activities that support AS9100 compliance must include persons being aware of their contribution to product and services conformity, safety, and the importance of ethical behavior.

QQS7: AS9100 CERTIFICATION

The Supplier shall provide and maintain a quality system that conforms to AS9100 as documented by a third-party registrar. Northrop Grumman may request a copy of the Registration Certificate annually as evidence of continued compliance. Activities that support AS9100 compliance must include persons being aware of their contribution to product and services conformity, safety, and the importance of ethical behavior.

QQS8: AS9120

The Supplier shall provide and maintain a quality system that conforms to AS9120.

QQS9: AS9003

The Supplier shall provide and maintain an inspection and test quality system that conforms to AS9003.

QQS10: GE S-1000

The Supplier shall provide and maintain a quality system that conforms to General Electric (GE) Aviation specification S-1000 as well as all applicable and ancillary required specifications. All lab testing shall be performed in accordance with GE specifications S-400 and S-450 for labs. Special processes require GE approval or listing in the GE Yellow Pages.

QQS11: AC7004

The Supplier shall provide and maintain a quality system that conforms to NADCAP specification AC7004.

QQS12: ROLLS ROYCE SABRe

The Supplier shall provide and maintain a quality system that conforms to the Rolls-Royce Supplier Advanced Business Relationship (SABRe) documents. These SABRe requirements shall be flowed down to all applicable sub-tier supplier levels.

QQS13: QUALITY PLAN

A quality plan shall be maintained detailing how purchase agreement quality requirements will be satisfied.

QQS14: QUALITY PLAN APPROVAL

The quality plan shall be submitted to Northrop Grumman for approval within 30 days of purchase agreement award.

QQS15: QUALITY PLAN CHANGES

Any changes to the quality plan shall require Northrop Grumman approval before incorporation.

QQS16: QUALITY MANAGER

The Supplier shall designate a quality manager with responsibility for the effectiveness of the quality system. Any change to the designated quality manager shall be reported to Northrop Grumman within 30 days.

QQS17: QUALITY INVOLVEMENT IN DEVELOPMENT ACTIVITIES

The quality plan shall identify the extent of quality involvement in development activities.

QQS18: FASTENER MANUFACTURERS

Fastener manufacturers shall be “accredited laboratories” as specified in and compliance with the United States Fastener Quality Act, Public Law 101-592.

METROLOGY/CALIBRATION

QMT1: CALIBRATION

The Supplier and outsourced calibration services shall maintain a metrology system that conforms to ANSI/NCSL Z540, ANSI/ASQ/ISO Q9001-2008, AS9100, ISO/IEC 17025, ISO 10012, or an equivalent standard. The Supplier's signed certification must state:

1. Traceability to the National Institute of Standards and Technology (NIST).
2. Tool or gage number.
3. Purchase agreement number.

QMT2: AS9100

The Supplier and outsourced calibration services shall maintain a metrology system that conforms to AS9100.

QMT3: ISO 10012

The Supplier and outsourced calibration services shall maintain a metrology system that conforms to ISO 10012.

QMT4: ISO/IEC 17025

The Supplier and outsourced calibration services shall maintain a metrology system that conforms to ISO/IEC 17025.

QMT4A: ISO/IEC 17025: CALIBRATION- Electromagnetic – DC/Low Frequency

The Supplier and outsourced calibration services shall maintain a metrology system that conforms to ISO/IEC 17025- – DC/Low Frequency

QMT4B: ISO/IEC 17025: CALIBRATION- Electromagnetic – RF/Microwave

The Supplier and outsourced calibration services shall maintain a metrology system that conforms to ISO/IEC 17025- – RF/Microwave

QMT4C: ISO/IEC 17025: CALIBRATION- Time and Frequency

The Supplier and outsourced calibration services shall maintain a metrology system that conforms to ISO/IEC 17025-- Time and Frequency

QMT4D: ISO/IEC 17025: CALIBRATION- Thermodynamic

The Supplier and outsourced calibration services shall maintain a metrology system that conforms to ISO/IEC 17025- Thermodynamic

QMT4E: ISO/IEC 17025: CALIBRATION- Mechanical

The Supplier and outsourced calibration services shall maintain a metrology system that conforms to ISO/IEC 17025- Mechanical

QMT4F: ISO/IEC 17025: CALIBRATION- Dimensional

The Supplier and outsourced calibration services shall maintain a metrology system that conforms to ISO/IEC 17025- Dimensional

QMT4G: ISO/IEC 17025: TESTING SERVICES

The supplier and outsourced testing service suppliers shall maintain an ISO/IEC 17025 accredited system and scope for services procured.

QMT5: ANSI/NCSL Z540

The Supplier and outsourced calibration services shall maintain a metrology system that conforms to ANSI/NCSL Z540.

QMT5A: ANSI/NCSL Z540.1-1994

Calibration Laboratories and Measuring and Test Equipment-General requirements

QMT5B: ANSI/NCSL Z540.2-1997

US Guide to the Expression of Uncertainty in Measurement

QMT5C: ANSI/NCSL Z540.3-2006

Requirements for the Calibration of Measuring and Test Equip

QMT6: ANSI/ASQ/ISO Q9001

The Supplier and outsourced calibration services shall maintain a metrology system that conforms to ANSI/ASQ/ISO Q9001.

QMT7: MIL-STD-45662A

The Supplier and outsourced calibration services shall maintain a metrology system that conforms to MIL-STD-45662A.

QMT8: CALIBRATION SERVICES

The Supplier shall provide a test report/calibration certificate for each item calibrated. Each test report/calibration certificate shall contain as a minimum:

1. Description or identification of the item.
2. List of standards used for traceability.
3. Date of calibration.
4. Procedure used for calibration.
5. Test results/values.
6. Test report/calibration certificate number as applicable.

When an instrument has been adjusted or repaired, the calibration results before and after adjustment or repair shall be reported.

GENERAL QUALITY REQUIREMENTS

QQR1: RIGHT OF ACCESS

All work and material may be subject to inspection and test by Northrop Grumman and its customer and/or applicable government/regulatory authority representatives at any place and time. Northrop Grumman's access to processes considered proprietary by the Supplier shall be by mutual agreement. If applicable, the Supplier or sub-tier supplier shall provide the necessary facilities, equipment, and assistance for the safety and convenience of Northrop Grumman or its customer's personnel in the performance of selected inspections and tests.

QQR2: TRACEABILITY

Parts to be delivered must be identified by serial or lot numbers (as specified in the purchase agreement), part number, and revision (including change number as applicable). Parts shall be traceable to the lots of raw materials used. When two or more parts are joined in an assembly, manufacturing and inspection records shall identify each part by part number, revision, and if applicable, change number and serial or lot number. Materials to be delivered shall be identified by lot or batch number, specification, and revision (including change number as applicable). Materials shall be traceable to ingredients and manufacturing and inspection records. The Supplier may determine lot size unless otherwise specified in the purchase agreement or design document. Serial or lot numbers shall not be duplicated during the manufacture of the same part or material. If parts or material are scrapped or rejected, their serial or lot numbers shall not be reused. Unless otherwise specified in the purchase agreement the Supplier shall maintain traceability records on file and available for review by Northrop Grumman.

QQR3: NORTHROP GRUMMAN LOT TRACEABILITY

When the purchase agreement requires use of an Northrop Grumman-supplied lot number, one Supplier lot number shall be used for one Northrop Grumman supplied lot number. The Supplier may use one Supplier lot number for several different Northrop Grumman-supplied lot numbers, but no more than one Supplier lot number shall be used for one Northrop Grumman-supplied lot number.

Northrop Grumman-supplied lot numbers shall not be duplicated during the manufacture of the same part or material. Northrop Grumman-supplied lot numbers of scrapped or rejected parts or materials shall not be reused.

The Supplier shall provide advance notice to Northrop Grumman of any change to the established manufacturing process of a lot. Unless otherwise specified in the purchase agreement, the Supplier may determine the supplier lot size relative to unit of measure (e.g., each, kit, pounds) specified in the purchase agreement.

QQR4: CHANGE NOTIFICATION/CONTROL

The Supplier shall provide advance notice to Northrop Grumman of any changes to the Supplier or sub-tier supplier's name, address, tooling, facilities, materials, maintenance, processes, and acceptance methods. Examples of changes include, but are not limited to:

1. Changes to Northrop Grumman, Supplier, and sub-tier supplier-approved designs, including proprietary designs.
2. Changes to fabrication methods, test methods, processes, or tooling.
3. Changes to manufacturing location.
4. Management or ownership changes.
5. Prolonged labor disputes.
6. Prolonged shutdown of normal manufacturing operations.
7. Changes to sub-tier supplier locations.

If the purchase agreement is for material that has been previously purchased by Northrop Grumman it must be manufactured and accepted under the same conditions using the same processes and methods by the same manufacturer and acceptance agency as material previously supplied unless changes are approved by Northrop Grumman.

Changes submitted to Northrop Grumman must contain the following information:

1. A complete description of the change, including a statement of the "From" and "To" conditions of the change.
2. Justification for the change, including background information in sufficient detail to allow an adequate study of the proposed change.
3. The proposed effectivity of the change, stated either in terms of a calendar date or a part, lot, or serial number.

QQR5: BASELINED SUPPLIER CHANGES

The Supplier shall submit all proposed changes to Northrop Grumman as specified in STW7-13063 or TR017735. Baselined suppliers, including sub tier suppliers, shall submit a Supplier Operation Change Request (SOCR) to Northrop Grumman as specified in STW7-2631, STW7-2632, or STW7-13063 as required in the purchase agreement prior to implementing any change to tooling, facilities, materials, or methods that could affect the delivered items. Such changes include, but are not limited to, methods of fabrication, assembly, handling, inspection, acceptance, and testing.

QQR6: DOCUMENTATION CONTROL

The Supplier shall provide a system to ensure control of all documents including supplier and Northrop Grumman-furnished drawings, technical documents, manufacturing procedures, and inspection and test procedures and for the incorporation of changes thereto. Documents shall be distributed to the proper places (e.g., manufacturing and inspection stations, receiving inspection) at the appropriate times to ensure that changes are accomplished at the proper effectivity point, changed materials are appropriately marked, and all obsolete documents are removed from use.

QQR7: LEGIBILITY OF PAPERWORK

All inspection records, certifications, and supporting documentation shall be done using permanent, reproducible ink. The Supplier shall ensure legibility and reproducibility of all entries, stamps, imprints, and signatures. Errors may be voided by drawing a single line through the entry, recording the correct

entry above or adjacent to the voided entry, initialing, and dating. Entries shall not be erase, written over, or blanked out. The use of liquid paper (white-out) or correction tape is prohibited.

QQR8: RETENTION OF RECORDS

The supplier shall retain all books, documents, papers, and records pertaining to the purchase agreement for a period of ten (10) years after final payment on the purchase agreement during which time data shall be available at the Supplier's facility at no cost to Northrop Grumman. The Supplier may use electronic media storage in lieu of paper records if approved by Northrop Grumman. At the conclusion of this time period, the Supplier shall make written request to Northrop Grumman for permission to destroy the records, package and ship the records to Northrop Grumman, maintain the records at the Supplier's facilities; or any combination of the above. Copies of retained records shall be furnished to Northrop Grumman upon request.

QQR9: ALTERNATE RETENTION PERIOD

All books, documents, papers, and records pertaining to the purchase agreement shall be retained for the period specified in the purchase agreement during which time data shall be available at the Supplier's facility at no cost to Northrop Grumman. The Supplier may use electronic media storage in lieu of paper records if approved by Northrop Grumman. At the conclusion of this time period, the Supplier shall make written request to Northrop Grumman for permission to destroy the records, package and ship the records to Northrop Grumman, maintain the records at the Supplier's facilities; or any combination of the above. Copies of retained records shall be furnished to Northrop Grumman upon request.

QQR10: MANNED SPACEFLIGHT REQUIREMENTS

Items in this purchase agreement are for use in manned spaceflight. Materials, manufacturing, and workmanship of the highest quality standards are essential to astronaut safety. If the Supplier is able to supply the desired items with a quality that is higher than that of the items specified or proposed, the Supplier is requested to bring this fact to the immediate attention of the purchaser. This clause, including this sentence, shall be included in all subcontracts and purchase agreements for these items down to the lowest sub-tier supplier level.

QQR11: GIDEP

The Supplier shall participate in the Government-Industry Data Exchange Program (GIDEP). The Supplier shall notify Northrop Grumman prior to delivery of any GIDEP notices that affect items to be delivered and of the disposition which has been taken for the affected items.

QQR12: STAMP CONTROL

The Supplier shall establish and maintain a documented stamp control system in accordance with the following:

1. Items that have undergone fabrication, inspection, or test operations shall be identified.
2. Stamps shall be applied to records, planning, tags, cards, and labels to indicate the fabrication or inspection status of items.

3. Authorization from Northrop Grumman shall be required before stamps can be applied directly to items.
4. Records shall be maintained indicating verification methods and imprints associated with each person.
5. Stamps shall only be issued to qualified personnel.
6. Stamp imprints shall be legible.
7. A stamp may be in the form of a decal, seal, torque paint, signature, initial, electronic stamp, etc.
8. If any method other than stamps is used, the applicable preceding requirements shall be followed.
9. Stamps for fabrication and inspection personnel shall be distinctly different.
10. Inspection stamps shall be unique in design with a clear difference between acceptance and rejection stamps.
11. The Supplier's stamps shall be clearly distinguishable from Northrop Grumman stamps and shall not reference any governmental agency.

QQR13: PERSONNEL TRAINING

The Supplier shall ensure personnel whose work has an effect on the quality of the product are trained. Training shall include pertinent subjects relating to manufacturing, inspection, testing, packaging, and handling techniques and shall be documented.

QQR14: CONTROL OF COUNTERFEIT PARTS

The Supplier shall implement a system for controlling counterfeit parts. The system shall require that all applicable parts (e.g. electrical components and fasteners) are procured from the Original Equipment Manufacturer (OEM) or an OEM-franchised or authorized distributor. If purchase from the OEM or an OEM-franchised or authorized distributor is not possible or practical, the system shall provide a process for validating authenticity of the purchased parts including applicable certifications, test/inspection results, and all other documentation that provides identification and verification to design, traceability, and acceptable packaging and handling.

QQR15: ADDITIONAL COUNTERFEIT PART CONTROL

"Work" consists of those parts and materials delivered for the purchase agreement that are at the lowest level of separately identifiable items (e.g., articles, components, goods, assemblies). "Counterfeit Work" means work that is, or contains items that are, misrepresented as having been designed or produced under an approved system or other acceptance method. The term also includes approved work that has reached a design life limit, or has been damaged beyond possible repair, but is altered and misrepresented as being acceptable. The Supplier agrees and shall ensure that counterfeit work is not delivered to Northrop Grumman. The Supplier shall only purchase products to be delivered or incorporated as Work to Northrop Grumman that come directly from the Original Component Manufacturer (OCM)/Original Equipment Manufacturer (OEM), or through an OCM/OEM-authorized distributor chain. Work shall not be acquired from independent distributors or brokers unless approved in advance in writing by Northrop Grumman. The Supplier shall immediately notify Northrop Grumman with the pertinent facts if the Supplier becomes aware of or suspects that it has furnished counterfeit Work. When requested by Northrop Grumman, the Supplier shall provide OCM/OEM documentation that authenticates traceability

of affected items to the applicable OCM/OEM. In the event that Work delivered for the purchase agreement constitutes or includes counterfeit Work, the Supplier shall, at its expense, promptly replace the counterfeit Work with genuine Work conforming to the requirements of the purchase agreement. Notwithstanding any other provision in the purchase agreement, the Supplier shall be liable for all costs related to the removal and replacement of counterfeit Work including, but not limited to, Northrop Grumman's costs of removing counterfeit Work, of reinserting replacement Work, and of any testing necessitated by the reinstallation of Work after counterfeit Work has been exchanged. The remedies contained in this paragraph are in addition to any remedies Northrop Grumman may have at law, equity, or under other provisions of the purchase agreement.

QQR16: COUNTERFEIT PART CERTIFICATION

The Supplier shall certify in writing that parts are traceable to the Original Equipment Manufacturer (OEM) or OEM-franchised or authorized distributor. Should suspect/counterfeit parts be furnished under the purchase agreement, these items shall be impounded and destroyed by Northrop Grumman. The Supplier shall promptly replace such suspect/counterfeit parts with parts acceptable to Northrop Grumman and the Supplier shall be liable for all costs including, but not limited to, Northrop Grumman's internal and external costs.

QQR17: PROHIBITED MATERIALS

Prohibited materials will be identified in the purchase agreement. Any exceptions to the listed prohibited materials shall be approved in writing by Northrop Grumman.

QQR18: PROHIBITED MATERIALS DETAIL

The use of unalloyed tin, cadmium, or zinc is prohibited in the construction and surface finish of space hardware. Parts with tin alloys containing 97% tin or less by weight are acceptable. Parts containing cadmium or zinc alloys (e.g., brass) must be completely over-plated with an approved metal. Parts shall contain no corrosive solder flux. The use of cadmium or zinc is prohibited in the construction of space hardware. All cadmium or zinc alloys shall be completely over-plated with an approved metal. Any exceptions to these prohibitions must be approved in writing by Northrop Grumman.

QQR19: PROHIBITED MATERIAL CERTIFICATION

The Supplier's documentation shall include a specific certification that the listed prohibited materials have not been used.

QQR20: POM (Polyoxymethylene) RISK MITIGATION

Supplier shall ensure POM control in the performance of this purchase order.

- All personnel working Northrop Grumman material shall have POM identification, sensitivity, and avoidance training.
- Supplier, in conjunction with Northrop Grumman, will identify and baseline all sources of POM within production and packaging operations for materials delivered to Northrop Grumman.

Supplier shall implement a POM Control Plan:

- That identifies control mechanisms to prevent the introduction of POM into Northrop Grumman

products.
- That provides Northrop Grumman advance notification of any changes to the baselined plan.
- Potential POM items, not originally baselined, shall be additive and a risk mitigation plan established prior to the introduction of these elements in the production and/or packaging process of Northrop Grumman products.

Orbital Northrop Grumman shall approve the supplier POM Control Plan, including any revisions thereto. Northrop Grumman may, at any time, verify supplier's compliance to their approved POM Control Plan.

Should supplier become aware of, or suspect that their part includes POM, or has the possibility of introducing POM into any part destined for Northrop Grumman, they shall notify Northrop Grumman immediately.

QQR21: SPECIALTY METALS

Material certifications and associated test reports for designated domestic "specialty metals" per DFARS 252.225-7008 and DFARS 252.225-7009, should clearly state that all materials are melted in the United States or another qualifying country per DFARS 252.225-7002 (e.g. Australia, Belgium, Canada, Denmark, Egypt, Germany, France, Greece, Israel, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, United Kingdom, and Northern Ireland).

NOTE: Older purchase agreements may reference DFARS 252.225-7014, which was reserved in the DFARS in November 2009.

"Specialty metals" refers to:

1. Steel:
    a. With a maximum alloy content exceeding one or more of the following limits: 1.65% manganese; 0.60% silicon; or 0.60% copper.
    b. Containing more than 0.25% of any of the following elements: aluminum, chromium, cobalt, columbium, molybdenum, nickel, titanium, tungsten, or vanadium.
2. Metal alloys consisting of nickel, iron nickel, and cobalt base alloys containing a total of other alloying metals (except iron) in excess of 10%.
3. Titanium and titanium alloys.
4. Zirconium and zirconium base alloys.

QQR22: STATEMENT OF WORK

Items in the purchase agreement are subject to additional requirements per a statement of work, which shall be satisfied in order to achieve compliance to contract requirements. Northrop Grumman may not accept items if the Supplier fails to comply with the requirements of the statement of work.

QQR23: DIGITAL DESIGN MODEL AND PDD/LDD

Requirements for the purchase agreement are based on an Northrop Grumman Partially Defined Drawing/Limited Dimension Drawing (PDD/LDD) and its associated design model (CAD digital file) as defined in ASME Y14.41-2003. These are provided to the Supplier for use in planning and programming

digitally controlled machining and inspection equipment and the Supplier is responsible for meeting all requirements specified therein. Northrop Grumman will provide the design model with a file name structure that will include the part number and revision as a minimum (e.g., 3039K4802-1_D_3D.STP or Part No_Revision_3D.STP). The Northrop Grumman design model revision and PDD/LDD revision are always the same. All changes conveyed to the Supplier will be via ECO that describes the change.

1. Configuration: The Supplier shall have a documented control system to assure that the Northrop Grumman design model, PDD/LDD, and supplier-derived files are placed under supplier configuration control. Supplier-derived files shall be validated prior to use and maintained in a manner that prevents misuse or alteration of the file. All revisions shall be controlled. Supplier requests for changes to the design model or PDD/LDD shall be documented and submitted to Northrop Grumman.
2. Inspection: The Supplier shall provide an inspection report for each production lot that documents compliance with all requirements of the Northrop Grumman design model and PDD/LDD. The report shall map to the PDD/LDD requirements (the Supplier may annotate a copy of the PDD/LDD). A hard copy of inspection data used to validate the attributes shown on the PDD/LDD shall accompany the inspection report, and shall also map to the PDD/LDD requirements. The inspection data for the undimensioned default profile may be submitted in accordance with 2030F010 "PDD/LDD Quality Assurance Requirements" paragraph 4.2. Alignment points to the original model file origin must be included with the digital inspection data if realignment was necessary for machining and inspection purposes. Electronic data shall be reported in a 3D translation format such as .IGES, .STP, or CSV.

QQR24: DIGITAL DESIGN MODEL AND PDD: SUPPLIER APPROVAL

Suppliers shall be approved by Northrop Grumman prior to manufacturing to an Northrop Grumman Partially Defined Drawing (PDD). Requirements for PDDs are located in Northrop Grumman-FORM-293. Contact Northrop Grumman for direction.

NORTHROP GRUMMAN-FURNISHED MATERIAL

QCF1: NORTHROP GRUMMAN-FURNISHED MATERIAL

It is the Supplier's responsibility to inspect Northrop Grumman-furnished material upon receipt for identification, count, condition, and assurance of the presence of required documentation. Nonconforming material or material not fitting the Supplier's tooling shall be identified, segregated, and withheld from further processing and Northrop Grumman shall be notified.

The Supplier shall ensure that handling, preservation, and storage are such that material is protected at all times. Northrop Grumman furnished tooling and/or excess material shall be identified on Supplier packing lists and returned at the completion of the order.

When material is Northrop Grumman-furnished and the Vendor Inspection Plan (VIP) requires a certificate of analysis (C of A) or certificate of conformance (C of C), record the words "Northrop Grumman-Furnished" in the C of A or C of C along with the specification or part number and lot or serial number of the material. If acceptance data is supplied with the Northrop Grumman-furnished material, include the data in the inspection data package when required by the VIP.

QCF2: NORTHROP GRUMMAN–FURNISHED MATERIALS/COMPONENTS

When Northrop Grumman-furnished materials or components are used by the Supplier, Northrop Grumman specifications and accept tags take precedence over any other markings or manufacturer recommendations. The Supplier shall use materials in accordance with Northrop Grumman shelf life, usage life, and storage condition requirements.

QCF3: COMPLIANCE WITH DD250

The Supplier shall complete and submit Form DD250, "Material Receiving and Inspection Report." Preparation of the form shall be in accordance with DFARS 52.246-7000 Appendix F. Contact Northrop Grumman for copies of the form.

QCF4: GOVERNMENT AND NORTHROP GRUMMAN PROPERTY CONTROL

The Supplier shall be responsible for all property and associated documentation provided to the Supplier or its sub-tier suppliers by Northrop Grumman or the Government in accordance with the purchase agreement. The Supplier shall establish procedures to control and protect the integrity of all property.

TOOLING

QTC1: ACCEPTANCE TOOL CONTROL SYSTEM

The Supplier shall maintain a quality system which controls all acceptance tooling. The acceptance tool control system shall include as a minimum complete design controls, tool discrepancy control, and inspection controls (initial and periodic). An audit of the Supplier's acceptance tool control system shall be performed by Northrop Grumman and if approved, control of acceptance tools shall be through the Supplier's approved system.

QTC2: ACCEPTANCE TOOL CONTROL

Selection and control of tools and standard measuring instruments (SMI) is at the Supplier's discretion except as follows:

1. The Supplier shall control tools and SMI used for acceptance.
2. Tools and SMI used for acceptance shall be calibrated in accordance with QMT1 and/or any additional QMT subparagraphs imposed per the purchase agreement.
3. Prior to use, manufacturing tools used in lieu of gages (TULOGs) and specially designed acceptance gages require Northrop Grumman approval and, at Northrop Grumman's discretion, proofing.

4. Tools that receive Northrop Grumman approval to be used as TULOGs must comply with a Supplier-established periodic inspection program acceptable to Northrop Grumman. Use of the tools must be discontinued pending Northrop Grumman-approved reproofing if the tool is:
    a. Moved to a facility other than where proofed.
    b. Damaged.
    c. Removed from the Northrop Grumman inspection form.
    d. Found to produce a nonconforming item.
    e. Classified defective as a result of periodic tool inspection.
5. Departure from Northrop Grumman-specified inspection methods requires prior written approval by Northrop Grumman.
6. Tooling furnished by Northrop Grumman or its customer shall not be modified without prior written authorization.
7. Acceptance gage tolerance shall be no greater than ten (10) percent of the total tolerance of the attribute being inspected unless otherwise approved by Northrop Grumman.
8. The Supplier's tool control system shall define a significant out-of-tolerance condition as any condition beyond two (2) times the required accuracy of the tool. The Supplier's tool control system shall require notification of measurement and test equipment (M&TE) users and other appropriate Supplier elements of significant out-of-tolerance conditions so appropriate actions can be taken to correct possible nonconforming items.

QTC3: TOOL DESIGN CONTROL

The Supplier shall provide designs of all Supplier-designed acceptance tooling to Northrop Grumman prior to fabrication of the tool. Initial designs and changes to the design shall require review and written approval by Northrop Grumman before incorporation.

QTC4: TOOL DRAWING CONTROL

The Supplier shall establish a tool drawing and drawing change control system that includes, but is not limited to:

1. Complete configuration control.
2. Incorporation of the required changes at a previously designated effectivity point.
3. Characteristics and design criteria required for procurement, fabrication, inspection, and test.
4. Proper identification of new and changed tooling.
5. Distribution of drawings to proper points at proper times, and removal of all obsolete drawings from all points of issue and use.
6. Approval by the Supplier's quality assurance organization of all new tool designs and changes.

QTC5: TOOLING INSPECTION SYSTEM

The Supplier shall establish an initial and periodic inspection system for tooling based on tool drawing requirements. Periodic inspections shall be performed to ensure tool integrity. This system shall include, but is not be limited to:

1. Proofing of all new, replacement, or modified tooling.

a. A proofing plan and the proofing date shall be submitted to Northrop Grumman for review by Northrop Grumman Tool Quality Engineering. Northrop Grumman Tool Quality Engineering reserves the right to witness the proofing.

2. Inspection of new, reworked, repaired, modified, or replaced tooling. Actual measured values shall be recorded by qualified quality assurance personnel.
3. Written tool inspection planning.
4. Tooling identification indicating acceptability, configuration, and inspection due dates (tag or recall system).
5. A recall system to assure tools are not used when periodic inspections are required.
6. Inspections and tests conducted in a temperature controlled environment with all standards traceable to the National Institute of Standards and Technology (NIST).

QTC6: TOOLING DISCREPANCY CONTROL SYSTEM

The Supplier shall establish a discrepancy control system for tooling based on drawing requirements. The discrepancy control system shall include, but is not limited to:

1. The Supplier shall immediately discontinue the use of acceptance tooling that is out-of-tolerance.
2. Identification and control of discrepant, out-of-calibration, or out-of-tolerance tooling with instructions prohibiting their use.
3. Design departures and discrepancies shall be documented on a tool rejection form.
4. The dispositions of all nonconforming tooling shall require Northrop Grumman Tooling Quality Engineering approval.
5. Records of all rejections and rework traceable to specific tools and maintained on file subject to review by Northrop Grumman.

QTC7: DESIGN TOLERANCES FOR ACCEPTANCE TOOLING

Tooling used for product acceptance shall be designed so the total error in accuracy and precision is no greater than ten percent of the total tolerance for each characteristic being accepted by the tool. All exceptions to this requirement shall be approved in writing by Northrop Grumman Quality.

QTC8: DESIGN TOLERANCES FOR PRODUCTION TOOLING

Production tooling used for product acceptance shall be designed so the total error in accuracy and precision is no greater than 25 percent of the total tolerance for each characteristic being controlled by the tool. All exceptions to this requirement shall be approved in writing by Northrop Grumman Quality.

QTC9: OUT-OF-TOLERANCE CONDITIONS

The Supplier shall immediately notify Northrop Grumman of any out-of-tolerance conditions which may affect delivered items so that appropriate evaluation and corrective action may be taken. If the Supplier has Northrop Grumman Material Review Board (MRB) authority, the discrepancy shall be processed in accordance with established policies and procedures controlling MRB.

QTC10: ITEMS INSPECTED USING OUT-OF-TOLERANCE TOOLING

Any item accepted using tooling or equipment found to be out-of-tolerance since its most recent calibration or periodic inspection shall be identified and put on hold status. The item shall remain on hold status until reinspected and found acceptable. If the item has been included in a higher assembly, the assembly shall be put on hold status. If any of the items have been shipped to Northrop Grumman, the Supplier shall immediately notify Northrop Grumman.

QTC11: ACCEPTANCE TOOLING STORAGE

Tooling stored by the Supplier shall be preserved and protected in a manner that will prevent misuse, damage, or deterioration. Written handling and storage instructions shall exist for each tool.

NONCONFORMANCES

QNC1: NONCONFORMING ITEM REPLACEMENT

Unless otherwise directed by Northrop Grumman the Supplier shall replace nonconforming items with items that conform to engineering requirements. If the Supplier desires to use, rework, or repair any nonconforming items a request for Material Review Board (MRB) action shall be submitted to Northrop Grumman before any work is performed. Items with open nonconformances shall not be delivered unless approved in writing by Northrop Grumman.

QNC2: MRB DELEGATION

Material Review Board (MRB) authority is not delegated to the Supplier. Nonconforming material shall not be delivered to Northrop Grumman without written approval by Northrop Grumman. The Supplier shall notify Northrop Grumman of all nonconformances in writing. Approval for use may be granted by MRB, and delivery may be authorized with this written approval. Approval to ship nonconforming items must be requested for each specific occurrence.

QNC3: SUBMITTAL OF DISPOSITIONED NONCONFORMING ITEMS

Documentation accompanying submitted items which required nonconformance disposition by Northrop Grumman shall reference the Northrop Grumman nonconformance numbers. A copy of the dispositioned Northrop Grumman nonconformance documents along with objective evidence of compliance with the disposition shall accompany the submitted items. Supplier records shall be maintained and made available upon request to provide the relevant history of submitted nonconforming items up to and including submittal.

QNC4: SUPPLIER NONCONFORMANCE RECORDS

Supplier nonconformance records shall be maintained and made available to Northrop Grumman upon request. Nonconformance records shall include:

1. A uniquely identifiable and traceable report number.
2. A detailed description of the nonconformance including photographic evidence to the greatest extent possible.
3. The nonconforming item name and part number, serial number, manufacturer, lot number, as well as the next higher assembly name and part number, serial number, manufacturer, and lot number as applicable.
4. The circumstances surrounding the discovery of the nonconformance, including who discovered the nonconformance, how it was discovered, where it was discovered, when it was discovered and the general condition of the item upon discovery of the nonconformance.
5. The identity of the initiator of the nonconformance record.
6. Disposition instructions along with clear indication of disposition approval by authorized personnel.
7. Objective evidence of compliance with the disposition instructions.
8. Clear identification of record closure following compliance with disposition instructions.

QNC5: FAILURE ANALYSIS/CAUSE AND CORRECTIVE ACTION

The Supplier shall perform a failure analysis on all nonconforming items in the purchase agreement and as a minimum shall provide Northrop Grumman:

1. Date of report.
2. Purchase agreement number.
3. Supplier's name and address.
4. Part name, part number, revision level, and serial/lot number.
5. Northrop Grumman nonconformance or corrective action number, if applicable.
6. Specific and contributory causes of failure, including documentation of all investigation activities.
7. Corrective action taken to preclude recurrence.
8. Effectivity of corrective action, date or serial number.
9. Signature, title and date or stamp and date of Northrop Grumman quality representative approving the analysis report. A typed name on a submitted document is an acceptable substitute for a signature.
10. The effectiveness of corrective actions shall be verified by objective evidence.

QNC6 - SUSPENSION OF PRODUCTION/PROCESSING

In the event of an unexpected non-conformance or anomaly, the supplier shall notify Northrop Grumman of the situation, then identify, segregate and suspend all processing on all parts, assemblies, or materials related to the non-conformance. Discretion shall be used to identify an appropriate stopping point in the process to reduce any additional or adverse impact to parts or material. Notification shall be made no more than 24 hours from the discovery of the situation. The supplier shall document the non-conformance and forward as much information as is known about the circumstances to Northrop Grumman. The supplier shall not resume processing of the suspect parts or material until direction from Northrop Grumman, either in the form of a disposition or authorization to continue to process, has been received.

PROCUREMENT

QPR1: FLOWDOWN REQUIREMENTS

Quality requirements imposed in the purchase agreement must be flowed to sub-tier suppliers. The Supplier shall determine the quality requirements that are applicable to the sub-tier suppliers.

QPR2: SUB-TIER SUPPLIER CONTROL

The Supplier shall assure the adequacy and quality of all items and services purchased from sub-tier suppliers. Technical assistance and training shall be provided to sub-tier suppliers as necessary to achieve the required quality levels.

QPR3: QUALITY PARTICIPATION IN SUB-TIER SELECTION

The Supplier's quality organization shall participate in the selection of sub-tier suppliers. The quality organization shall verify sub-tier suppliers have an acceptable quality record for supplying a similar item.

QPR4: PRE-AWARD SURVEYS OF SUB-TIER SUPPLIERS

The Supplier shall perform pre-award surveys of their sub-tier suppliers. Pre-award surveys shall be documented and made available to Northrop Grumman upon request.

QPR5: NORTHROP GRUMMAN DISAPPROVAL OF SUB-TIER SUPPLIERS

Northrop Grumman shall have the authority to disapprove the use of any sub-tier supplier.

QPR6: RAW MATERIAL PURCHASE AGREEMENTS

The Supplier's purchase agreements with sub-tier suppliers for raw materials that will form part of the delivered item shall include, where applicable, the requirements for chemical and/or mechanical test results traceable to the manufacturer.

QPR7: OFF-THE-SHELF/CATALOG ITEM PURCHASE AGREEMENTS

The Supplier's purchase agreements with sub-tier suppliers for off-the-shelf or catalog items (e.g., bearings, springs, screws, washers) that will form part of the delivered item shall include, where applicable, chemical and/or mechanical test results traceable to the manufacturer.

QPR8: NORTHROP GRUMMAN SPECIFICATIONS USED FOR PROCUREMENT

Materials procured for and/or used to manufacture items in the purchase agreement shall be certified to the material specifications and revisions identified in the purchase agreement. Suppliers purchasing these materials shall flow the exact material specification and revision as identified in the purchase agreement to their sub-tier suppliers.

QPR9: RECEIVING INSPECTION SYSTEM

The Supplier shall maintain a receiving inspection system that ensures procured items conform to purchase agreement requirements. All items and their records shall be clearly marked to indicate the acceptance status when released from receiving inspection. Receiving inspection records shall include as a minimum:

1. Date of receipt.
2. Results of inspections or tests.
3. Applicable procedures for the inspections or tests.
4. Disposition of the inspected or tested items.
5. Sub-tier supplier documentation received with items.
6. Evidence of government, Northrop Grumman, or Supplier source inspection when applicable.
7.

QPR10: PROCUREMENT DOCUMENTS

Before release, Supplier procurement documents shall be reviewed by the Supplier's quality personnel for approved sources, document revisions, quality requirements, and Government, Northrop Grumman, and Supplier source inspection requirements. A quality assurance approval signature, stamp, initial, etc. shall be required.

QPR11: GOVERNMENT AND INDUSTRY STANDARDS

Unless otherwise specified on the purchase order, the Supplier is to use the latest released revision of Government/Industry standards and specifications for certification purposes.

PROCESS CONTROL

QPC1: WORK INSTRUCTIONS

The Supplier shall have written work instructions that ensure consistent manufacturing operations. All materials, process steps, and process control tooling shall be identified in the work instructions. Special tooling shall be noted by its identifying number in the operational sequence in which it is used. Direction to record all materials and processes used for manufacture shall be provided in the work instructions. Fabrication or processing of materials shall not begin prior to implementation and proofing of work instructions or changes thereto. Processing documents shall be approved by the Supplier's quality assurance personnel.

QPC2: NORTHROP GRUMMAN-APPROVED WORK INSTRUCTIONS

Prior to initiation of production, the Supplier shall notify Northrop Grumman and submit documentation outlining the manufacturing process for approval by Northrop Grumman. This documentation shall include at a minimum but is not limited to:

1. Method or type of processing used.
2. Manufacturing location, including any satellite locations.
3. Materials used, including processing aids such as gloves, brushes, orange sticks, etc.
4. Process work instructions.
5. Process drawings.
6. Inspection plans.
7. Packaging methods and materials.
8. Handling and transportation instructions.

Once the manufacturing process has been approved by Northrop Grumman, any change to the manufacturing process requires Northrop Grumman approval prior to implementation per paragraph QQR4. A copy of the revised document, excluding proprietary information, shall be submitted with change information. Clarifications and corrections of typographical errors, formatting errors, or misspellings are not considered a process modification or change.

QPC3: PROCESS CONTROLS FOR RAW MATERIALS

The Supplier shall prepare procedures to implement the applicable processing requirements for raw materials. The Supplier shall include detailed performance and control provisions describing the preparation of materials and equipment, conditions to be maintained during each phase of processing, environmental controls, and the required inspection and test documentation.

QPC4: PROCESS CONTROLS FOR FABRICATION PROCESSES

The Supplier shall prepare procedures to control fabrication processes (e.g., metal joining, bonding, plating and coating, chemical or surface treatment, pressure testing) wherein inspection cannot ensure uniform quality. When samples or visual aids are necessary to define acceptable workmanship they shall be selected by the Supplier and approved by Northrop Grumman Quality. **NOTE:** If available, existing Northrop Grumman samples, standards, inspection aids, or photographs shall be made available to the Supplier upon request.

QPC5: WORKMANSHIP

The Supplier shall maintain documented workmanship standards. Workmanship standards shall comply with Northrop Grumman specifications and industry best practices.

QPC6: STATISTICAL PROCESS CONTROL

The Supplier shall use Statistical Process Control (SPC) for controlling the manufacturing process. Northrop Grumman shall approve the SPC plan prior to the start of manufacture. The use of SPC does not supersede the requirements for change control notification.

QPC7: SPC FOR KEY CHARACTERISTICS

Statistical Process Control (SPC) techniques must be used on key characteristics of this item. Specific requirements shall be included in the purchase agreement line item detail notes.

QPC8: ELECTROSTATIC DISCHARGE PREVENTION

The Supplier shall create and maintain an electrostatic discharge plan in accordance with the requirements of ANSI/ESD S20.20. The plan shall be submitted to Northrop Grumman for approval. Changes to the approved electrostatic discharge plan shall be documented and submitted to Northrop Grumman for approval.

QPC9: DYE PENETRANT INSPECTION

The Supplier shall ensure that manufacturing processes do not create surface indications which, when inspected per Northrop Grumman Procedure 90-000086, "Fluorescent Penetrant Inspection Procedure-Fracture Critical Components", are basis for rejection. Northrop Grumman reserves the right to reject and return to the Supplier any material or parts in the event of replacement. If the Supplier determines material or parts can be reworked to drawing requirements, prior approval must be obtained in writing from Northrop Grumman Engineering and Quality.

SPECIAL PROCESSES

QSP1: SPECIAL PROCESSES

Special processes are segregated into fabrication special processes and Nondestructive Evaluation (NDE) special processes. Examples of special processes are firing, pyrolysis, autoclave cure, flame/metal spraying, welding, heat treatment, plating and coating, etching and priming, nondestructive testing (e.g. ultrasonic, magnetic particle, dye penetrant, and X-ray inspections), environmental and laboratory testing, de-scaling, bronzing, and environmental testing such as vibration, acoustic, shock, and thermal cycle.

Personnel performing special processes shall be certified in accordance with applicable special process specifications. Personnel performing NDE special processes shall be certified to NAS410 or as specified in the purchase agreement. Personnel performing NDE special processes may be certified to ASNT-TC-1A if allowed by customer or contract. The Supplier shall have records of its personnel certifications and sub-tier supplier special process approvals on file and available for review by Northrop Grumman.

The Supplier and any sub-tier supplier shall either have special processes approval by Northrop Grumman or the Supplier's system to control its sub-tier supplier special processes shall have been approved by Northrop Grumman. Approval of special process sub-tier suppliers does not relieve the Supplier of the responsibility for exercising those control measures necessary to ensure work performed by sub-tier suppliers is in accordance with specification requirements.

For each part or weldment requiring NDE special processes, the Supplier or sub-tier supplier shall complete a technique chart and submit it to Northrop Grumman for approval. The chart may be in the Supplier's or sub-tier supplier's format and shall be the document used for the actual inspection.

Northrop Grumman shall not be held responsible for defects in workmanship, loss of parts, or damages resulting from performance of Northrop Grumman-approved special processes.

Note 1: Northrop Grumman shall approve the technique chart and any change thereto prior to NDE for item acceptance unless otherwise specified in the purchase agreement.

Note 2: Technique charts approved for the same item on previous procurements need not be resubmitted if the inspection technique is unchanged.

Note 3: The technique chart number and revision shall be recorded on the test reports submitted by the Supplier to Northrop Grumman.

QSP2: CRITICAL AND/OR SPECIAL PROCESSES

For processes designated as "Critical" or "Special", a special process certification shall be provided with each shipment. The Supplier shall submit documentation showing qualification and/or certification.

QSP3: NADCAP CERTIFICATION FOR SPECIAL PROCESSES

The Supplier shall be accredited to the applicable NADCAP requirements for the special processes they perform as part of the purchase agreement.

QSP4: SPECIAL PROCESS QUALIFICATION

The Supplier shall demonstrate it is qualified to perform special processes in accordance with applicable process specifications in the purchase agreement. Applicable qualification test results shall be submitted to Northrop Grumman for approval prior to performing the same process on the deliverable item. The process shall be requalified if there is a change in material and/or methodology, or if the Supplier has not performed the process for more than 18 months. Process parameters and acceptance criteria shall conform to the applicable process specifications.

QSP5: SPECIAL PROCESSES: CUSTOMER-SPECIFIC SUPPLIERS

Special process suppliers must be approved by Northrop Grumman's customer at the time of processing. If Northrop Grumman's customer information is not provided in the purchase agreement, contact Northrop Grumman to obtain the information.

QSP6: SPECIAL PROCESSES: BOEING APPROVED SUPPLIERS

Supplier and sub-tier suppliers who perform special processes shall be approved per Boeing D1-4426. Certification shall be per and list the Boeing Process Code and the Supplier Processor Code number. Contact Northrop Grumman if assistance is needed locating an approved supplier.

QSP7: SPECIAL PROCESSES: SUPPLIER DELEGATED

The Supplier is responsible for audits of sub-tier suppliers who perform special processes or tests. The Supplier shall assure the sub-tier supplier quality system and technical process controls are adequate to meet all requirements.

QSP8: INSPECTION REPORT (NDE SPECIAL PROCESSES)

The Supplier shall include an inspection report listing the specification number and revision used, statement for acceptance criteria used, and a statement that magnetic particle, liquid penetrant, ultrasonic, eddy current or x-ray/n-ray inspection has been performed on items being supplied in accordance with applicable specifications. An authorized acceptance stamp or signature shall be affixed to the report. A typed name submitted by the supplier is a legally acceptable substitute.

QSP9: INSPECTION REPORT DETAIL (ALL SPECIAL PROCESSES)

Supplier or sub-tier supplier certifications and/or test reports identifying the specifications and revision to which items conform shall be included with shipment. Certification shall include, but is not limited to:

1. Name and location of the process facility.
2. Date of service.
3. Northrop Grumman part number, revision, serial number, and description.
4. Purchase agreement number.
5. Quantity.
6. Identification of the lot, batch, and serial number if applicable.
7. Materials used and processes performed.
8. All required processing specifications and revisions as specified. Specific requirements shall be included in the purchase agreement line item detail notes.
9. Supporting test data, oven charts, time/temperature charts, point maps, data files, NDE reports, etc. as applicable.
10. A statement of conformance indicating that all requirements have been met.
11. The signature and title of the certified/authorized representative.
12. Evidence of current approval by Northrop Grumman's customer when required.

QSP10: REPORT FOR SUB-TIER SHIPMENTS

When items are shipped to a sub-tier party, inspection reports shall be sent to Northrop Grumman at the time of shipment.

QSP11: RADIOGRAPHIC FILM/REPORT

The Supplier shall submit X-ray/N-ray film and reports with each shipment.

QSP12: X-RAY CONTROL DOCUMENT

The Supplier shall submit an X-ray control document to Northrop Grumman identifying areas to be X-rayed, image views, and orientation to allow precise film interpretation. When welding is a requirement, identify each weld by number, direction, and the number of views required per weld.

QSP13: HEAT TREAT CERTIFICATION

The Supplier shall include a heat treat certification listing the heat lot, actual chemical, physical, and, mechanical properties, specification used (including class, type, etc. as applicable), and indication that the method used was in compliance with the specification for all items shipped. An authorized acceptance stamp or signature shall be affixed. A typed name submitted by the Supplier is a legally acceptable substitute.

QSP14: HEAT TREAT TEST SAMPLES

Two (2) test bars shall be heat treated with each lot of heat treated material and submitted with the shipment of the parts. Documentation shall accompany the test bars identifying which parts they accompanied through the heat-treat process.

QSP15: WELDING

The Supplier shall maintain certified status of all welding personnel, welding facilities, and visual weld inspectors employed in fulfillment of the purchase agreement in accordance with AWS D17.1 or other applicable codes and specifications. The Supplier shall also maintain Welding Procedure Specifications (WPSs) for submittal and approval by Northrop Grumman. **Note 1:** AWS D17.1: 2010 allows use of other standards/codes for non-flight hardware (Table 9.1). **Note 2:** Compliance with AWS D17.1 and NASA-SPEC-5004 is required for welded materials used in NASA Ground Support Equipment (GSE) and Transportation Support Equipment (TSE). **Note 3:** Compliance with AWS D17.1 and NASA-STD-5006 is required for welded materials used in NASA flight hardware.

QSP16: WELDING CERTIFICATION

The Supplier shall include in a certificate of conformance (C of C) a statement that welding has been performed on welded items being supplied in accordance with applicable codes and specifications. An authorized acceptance stamp or signature shall be affixed. A typed name submitted by the Supplier is a legally acceptable substitute.

QSP17: CRITICAL/SEMI-CRITICAL WELD DOCUMENTATION

Critical/semi-critical welds are defined as:

1. Welds identified as Class A or B per AWS D17.1.
2. Welds identified as Class C per AWS D17.1 in non-typical materials.
3. Welds on tooling or equipment used in an energetic environment.
4. Welds and brazed joints on pressure vessels and pressure systems per ASME BPVC and ASME B31.
5. Welds identified as Class A, B, and C per NASA-STD-5006.
6. Welds identified as Class A, B, and C per NASA-SPEC-5004.
7. Structural Brazed joints per AWS-C3.3-C3.7.

Typical materials are defined as:

1. Low/mild carbon steels: ASTM A36, A53, A105, A234, A500, A516, A517, A569, AISI 1010-1028.
2. Aluminum: 6061, 6063 (except when Post-Weld Heat Treatment (PWHT) is required).
3. Austenitic stainless steel: 304, 304L, 316, 316L (except when used in a corrosive environment).

QSP18: WELD DOCUMENTS REQUIRED PRIOR TO FABRICATION (1)

For critical/semi-critical welds, prior to fabrication of welded items, the Supplier shall submit the applicable information identified in Part II of Northrop Grumman form FQA-0171 to Northrop Grumman for review and approval.

1. This form is provided with each purchase agreement with specific welding requirements identified and shall be completed by the Supplier and submitted to Northrop Grumman for approval along with the required information.

2. Northrop Grumman Welding Engineering shall review and approve the Supplier-provided information by returning the signed form to the Supplier. The Northrop Grumman signature shall authorize the Supplier to proceed with fabrication.

QSP19: WELD DOCUMENTS REQUIRED PRIOR TO FABRICATION (2)

For critical/semi-critical welds, prior to fabrication of welded items, the Supplier shall submit applicable weld procedures, welder or weld operator qualification records/reports, and the process to be used, in accordance with AWS D17.1: 2010, Section 5., to Northrop Grumman for review and approval.

QSP20: WELD DOCUMENTS REQUIRED WITH SHIPMENT (1)

For critical/semi-critical welds, after the completion of production welding, fabrication and inspection, the Supplier shall submit the applicable information identified in Part III of Northrop Grumman form FQA-0171 to Northrop Grumman along with a copy of the approved form.

QSP21: WELD DOCUMENTS REQUIRED WITH SHIPMENT (2)

For critical/semi-critical welds, with shipment of the welded product, the Supplier shall submit:

1. Names of welder, welder signatures, and processes used on a certificate of conformance (C of C) in accordance with AWS D17.1: 2010, Section 9.2.3.10.
2. A copy of the Supplier Welding Approval sheet that has been approved by Northrop Grumman.
3. An inspection report by an AWS Certified Weld Inspector(CWI) or qualified visual weld inspector approved by Northrop Grumman. Include a copy of AWS certification if an AWS CWI is used as certification of compliance to AWS D17.1: 2010, Section 7.1.2 and 7.2.

QSP22: NON-CRITICAL WELD DOCUMENTATION

Non-critical welds are defined as welds identified as Class C per AWS D17.1 in typical materials. Typical materials are defined as:

1. Low/mild carbon steels: ASTM A36, A53, A105, A234, A500, A516, A517, A569, AISI 1010-1028.
2. Aluminum: 6061, 6063 (except when Post-Weld Heat Treatment (PWHT) is required).
3. Austenitic stainless steel: 304, 304L, 316, 316L (except when used in a corrosive environment).

Prior to fabrication of welded items, the Supplier shall ensure the following are available upon request:

1. Welding Procedure Specification (WPS) for each welded material.
2. Qualification records for each welder or weld operator in accordance with AWS D17.1
3. Qualification records for each inspector indicating qualification as either an AWS Certified Weld Inspector (CWI)or an Northrop Grumman approved equivalent.

The Supplier shall submit the following to Northrop Grumman after production welding, fabrication, and inspection is complete:

1. Visual weld inspection reports signed by a welding inspector (AWS CAWI, CWI, SCWI or Northrop Grumman approved equivalent) as certification of compliance with AWS D17.1: 2010, Section 7. Inspection reports shall include:
    a. Verification that all welding operations were performed only by qualified welders or welding operators.
    b. Verification that all welding was performed in accordance with approved Welding Procedure Specifications (WPSs).
    c. Verification that the size, length, and location of all welds conforms to applicable requirements.
    d. Verification that the final welds meet acceptance criteria.

QSP23: VISUAL WELD INSPECTION REPORT

After production welding, fabrication, and inspection are complete the Supplier shall submit a visual weld inspection report to Northrop Grumman. The report shall be signed by the certified welding inspector (AWS CAWI, CWI, SCWI, or Northrop Grumman approved equivalent) as certificate of compliance to AWS D17.1: 2010, Section 7. The visual weld inspection report shall include:

1. Verification that all welding operations are performed only by qualified welders or welding operators.
2. Verification that all welding is performed in accordance with approved Welding Procedure Specifications (WPSs).
3. Verification that the size, length, and location of all welds conform to the requirements of the purchase agreement documents.
4. Verification that the final welds meet acceptance criteria.

QSP24: TEFLON COATING

Teflon® coating shall be performed per Northrop Grumman document SP-V-GF-3.1.1. Teflon® application shall be performed by an Northrop Grumman-approved Teflon® supplier. The Supplier shall provide processing documentation as required per SP-V-GF-3.1.1. An authorized acceptance stamp or signature shall be affixed. A typed name submitted by the Supplier is a legally acceptable substitute.

QSP25: BLACK TEFLON COATING

Black Teflon® coating shall be performed in accordance with Northrop Grumman document GPI000036. Teflon® application shall be performed by an Northrop Grumman-approved Teflon® supplier. The Supplier shall provide processing documentation as required per GPI000036. An authorized acceptance stamp or signature shall be affixed. A typed name submitted by the Supplier is a legally acceptable substitute.

QSP26: BLACK OR GREEN TEFLON COATING

Teflon® coating shall be performed in accordance with Northrop Grumman document S-0004. Teflon® application shall be performed by an Northrop Grumman-approved Teflon® supplier. The Supplier shall provide the following processing documentation at a minimum:

1. Certification of conformance to drawing requirements and to S-0004.
2. Temperature recorder charts for all bake-out and Teflon fusing operations.
3. Relative humidity recorder charts.
4. Material certification for Teflon-S and Teflon FEP.
5. Teflon-S and Teflon FEP thickness recording measurements.

An authorized acceptance stamp or signature shall be affixed. A typed name submitted by the Supplier is a legally acceptable substitute.

QSP27: SOLDERING

Soldering shall be performed in accordance with NASA-STD-8739.3 or J-STD-001DS. The Supplier shall provide certification that soldering was performed in accordance with one of these standards.

QSP28: CRIMPING

Crimping shall be performed in accordance with NASA-STD-8739.4. The Supplier shall provide certification that crimping was performed in accordance with this standard.

QSP29: CABLE AND WIRE HARNESS ASSEMBLIES

Cable and wire harness assemblies shall be accepted per the requirements in specification ICP WHMA-A-620 or NASA-STD-8739.4. The Supplier shall provide certification of acceptance per the requirements in this specification.

INSPECTION AND ACCEPTANCE

QIN1: ACCEPTANCE TEST PROCEDURES

The Supplier shall prepare test procedures detailing all tests required for acceptance. Each item that requires acceptance testing shall have an acceptance test procedure. Test procedures require Northrop Grumman approval prior to delivery of the first article. All subsequent changes to acceptance test procedures are subject to Northrop Grumman approval. When tests are performed using equipment controlled by computer software or firmware, the software or firmware associated with or affecting those tests shall be approved by Northrop Grumman.

QIN2: ACCEPTANCE TEST PROCEDURES DETAIL

Detailed procedures shall be available to inspection and test personnel and shall include:

1. Nomenclature and identification of the test item or material.
2. Detailed sequential steps and operations including verification requirements at each step.
3. Instructions for operation of special data recording or automated test equipment.
4. Environmental conditions to be maintained.
5. Training requirements for testing certification.
6. Details of any inspection sampling plan to be used.

QIN3: TEST/INSPECTION ENVIRONMENT

The supplier shall ensure items fabricated or processed in a temperature controlled environment are inspected or tested under similar conditions to prevent quality degradation.

QIN4: INSPECTION/TEST VALUE ROUNDING

All limits in Northrop Grumman specifications and drawings are absolute unless stated otherwise in the specification or drawing. The Supplier shall not round attribute values into conformance with engineering limits.

QIN5: REPORTING, ROUNDING, AND RECORDING OF DATA

Measurement instruments shall be selected for use based on theaccuracy, stability, range, and resolution required for their intended use. Accuracy ratios may be used to determine adequacy but shall not exceed a 4:1 ratio unless otherwise approved by Northrop Grumman. Recorded values must indicate the unit of measurement. **Note:** Measurement instruments used to verify drawing and specification dimensional requirements shall be calibrated in accordance with paragraph QMT1 and any associated subparagraphs imposed. Recorded values shall reflect at a minimum the same resolution (number of decimal places) as the tolerance even if the final digits are zeros. Example: The dimensional requirement is 9.015 ± .020. The recorded value must show a minimum of three decimal places (i.e. 9.010, not 9.01 or 9.0100). Interpretation of limits shall be as stated in ASME Y14.5M: "All limits are absolute; hence all tolerance limits of a dimension are absolute with an infinite number of zeros beyond the last stated digit." In accordance with ASME Y14.5.1, internal diameters (ID) shall be determined by the inscribed circle method and outside diameters (OD) shall be determined by the circumscribed circle method. Under no circumstances shall least-mean-square or root-mean-square be used to calculate ID or OD size without written authorization from Northrop Grumman. For purposes of determining conformance with drawings and specifications, an observed value or a calculated value shall be rounded to the nearest unit in the last right-hand significant digit used in expressing the limiting value in accordance with the rounding method of ASTM E29. Under no circumstances shall values be rounded into tolerance. Since limits are absolute, "rounding in" is not correct or proper in increasing or decreasing the value of a reported dimension to fall within the tolerance.

QIN6: INCREASED ACCURACY RATIO REQUIREMENT

Accuracy ratios may be used to determine adequacy but shall not exceed a 10:1 ratio unless otherwise approved by Northrop Grumman.

QIN7: CRITICAL ITEM AND KEY CHARACTERISTIC CONTROL

The Supplier shall establish, implement, and maintain appropriate methods to control critical items, including process controls and/or inspections, for which key characteristics have been identified in Northrop Grumman engineering documentation. The Supplier shall perform 100% inspection of critical characteristics identified in the Northrop Grumman engineering document. Key characteristic verification methods require Northrop Grumman approval prior to use. The Supplier shall submit a certificate of conformance with each shipment attesting that all critical items and key characteristics have been verified to meet the requirements of the engineering documents. The certification shall

contain, at a minimum, a listing of the critical items and key characteristics verified, verification methods used for each key characteristic, the Supplier name, the part numbers, purchase agreement number, serial numbers (if applicable), and quantity shipped. An authorized representative of the Supplier shall date and validate the certificate either by signature and title or inspection stamp.

QIN8: AS9103 VARIATION MANAGEMENT OF KEY CHARACTERISTICS

The Supplier shall meet the requirements of AS9103.

QIN9: SAMPLING NOT PERMITTED WITHOUT NORTHROP GRUMMAN APPROVAL

The Supplier shall prepare and maintain an inspection record validating 100% compliance with each engineering requirement of the deliverable item. When authorized by Northrop Grumman the Supplier shall perform acceptance inspection using a sampling procedure approved by Northrop Grumman. Sampling plans shall not be used to accept design parameters of serialized hardware unless specifically authorized by Northrop Grumman inspection documents, an Northrop Grumman-approved supplier inspection plan, or the purchase agreement. Unless otherwise specified in the material specification, an Northrop Grumman-approved supplier inspection plan, or the purchase agreement, sampling of lotted material shall be in accordance with standard sampling plans (e.g. MIL-STD-105, MIL-STD-414, MIL-STD-1916, ANSI/ASQ Z1.4, ANSI/ASQ Z1.9) only, with prior Northrop Grumman approval of the inspection level. The sampling plan shall preclude the acceptance of lots whose samples have known nonconformities. Should the Supplier wish to implement a different sampling plan, Northrop Grumman approval shall be obtained prior to use.

QIN10: SAMPLING PERMITTED

The Supplier is authorized to perform sample inspection in accordance with ANSI/ASQ Z1.4. Critical characteristics, when defined by the drawing, specification, or purchase agreement, are to be inspected 100%. Other dimensions and features may be inspected to an AQL of 1.0. The Supplier shall supply test/inspection data with actual results.

QIN11: SPECIFIC SAMPLING

The lot sampling plan shall meet the requirements of ANSI/ASQ Z1.4, General Inspection Level II, Single, Normal, and AQL 1.0.

QIN12: PYROTECHNIC SAMPLING

For pyrotechnic device inspection, the use of sample inspection and sample plans shall be approved by Northrop Grumman. When used, sample inspection shall be in accordance with ANSI/ASQ Z1.4, with the following exception: Whenever sample inspection reveals one or more nonconforming items and the sampling plan does not require rejection of the lot, all items in the lot shall be inspected for the identified nonconforming characteristic.

QIN13: MATERIAL RETENTION

The Supplier shall retain sufficient material of the same lot of each shipment to perform two (2) sets of certifiable tests as required by specifications and/or drawings pursuant to the purchase agreement for a period of at least 12 months from the date of shipment.

FOD/CONTAMINATION CONTROL

QFC1: FOD PREVENTION

Deliverable items shall be free of Foreign Object Debris (FOD) that can be detected by a visual inspection. The Supplier shall document and investigate all FOD incidents assuring elimination of the root cause. Northrop Grumman shall have the right to perform inspections and/or audits as a method of verification that the Supplier's FOD control procedures are functional, documented and effective.

QFC2: FOD PREVENTION PROGRAM

The Supplier shall maintain a Foreign Object Debris (FOD) control program assuring work is accomplished in a manner preventing foreign objects or material from entering and remaining in deliverable items or contaminating deliverable items. The following items constitute the minimum requirements under this clause:

1. The Supplier shall establish and implement a FOD program procedure.
2. The Supplier shall identify a single FOD control person responsible for implementing the FOD prevention program.
3. Employees shall be trained in FOD recognition and response.
4. Establishment and maintenance of a training program for the FOD program.
5. The Supplier shall document and investigate all FOD incidents assuring elimination of the root cause.
6. Housekeeping of the work area shall preclude the risk of FOD incidents.
7. Control of tools, parts, and material shall preclude the risk of FOD incidents.
8. Tooling, jigs, fixtures, test equipment, and handling devices shall be maintained in a state of cleanliness and repair to prevent foreign object damage.
9. Assessment of proposed process changes to determine potential FOD issues.
10. Procedures relating to closing inaccessible or obscured areas or compartments during assembly and packaging shall provide for inspection for foreign objects/materials.
11. Northrop Grumman shall have the right to perform inspections and/or audits as a method of verification that the Supplier's FOD control program is functional, documented, and effective. The Supplier is strongly encouraged to expand and tailor the FOD program for their product lines.

QFC3: FOD PREVENTION PROGRAM NAS412

The Supplier shall comply with National Aerospace Standard NAS412 or request approval from Northrop Grumman to use an equivalent FOD program.

QFC4: FOD CERTIFICATION

The Supplier shall submit a statement of certification that deliverable items are free of any foreign materials specified in the purchase agreement that could cause damage to the item or to the components or systems of which the item is a part or to which the item is attached.

QFC5: FOD INSPECTION

Prior to closing inaccessible or obscured areas or compartments during assembly the Supplier shall inspect for foreign objects and materials. Tooling, jigs, fixtures, test equipment, and handling devices shall be maintained in a state of cleanliness and repair to prevent foreign object damage.

QFC6: NORTHROP GRUMMAN-APPROVED CLEANING

The Supplier shall clean items ordered in the purchase agreement per Northrop Grumman contamination control specifications. Cleaning and/or testing of the items shall be performed in facilities with Northrop Grumman-approved procedures and equipment. Each item shall be identified with a tag certifying its cleaning status and identification. The tag shall not be in contact with significant surfaces of the item.

QFC7: SOLVENTS

All solvents shall be supplied only in a new container that has not been used before to prevent contamination by residual material.

QFC8: CONTAMINATION CONTROL PLAN APPROVAL

Detailed controls shall be documented in an Northrop Grumman-approved contamination control plan that describes the goals, methods, and cleanliness levels that will be applied to hardware, materials, facilities, equipment and personnel at the Supplier's facility.

QFC9: RED PLAGUE CONTROL PLAN (RPCP)

Subcontractor and sub-tier suppliers shall have a documented process to control the potential for Cuprous or Cupric Oxide Corrosion, known in the industry as Red Plague, for Silver-coated Copper wire, cables and harness assemblies. Reference NASA/Johnson Space Center document JSC 64647 Red Plague Control Plan.

The following requirements apply to this Purchase Order.

1. Silver-coated copper wire, cable and harness assemblies shall not show evidence of red plague. Wire/Cable showing indications of red plague shall be cause for rejection of unit.
2. Subcontractor's hardware containing wire/cable in its construction shall have wire traceability documented. Evidence of traceability and Date of Manufacture (DOM) shall be included in the Certificate of Conformance.
3. Where required, the wire shall be procured from the approved supplier listed on the Qualified Manufacturers List (QML).
4. Full certified test reports for wire shall be available for review upon request.

5. During storage and shipment, wire ends shall be capped with heat shrinkable end-caps conforming to SAE-AMS-DTL-23053/4 or protected from exposure in some agreed to manner.
6. Hardware with silver-copper wire/cable shall be stored in a dry protective package to prevent the development of cuprous/cupric oxidize corrosion.
7. Aqueous solvents and cleaning systems shall not be used on assemblies with silver-coated copper wire.

MATERIAL CONTROL

QMC1: MATERIAL CONTROL

The Supplier shall establish and maintain a documented system for control of materials sensitive to environmental and/or age degradation. The Supplier shall ensure all time, cycle, age, or environmentally sensitive items are marked to indicate the expiration date, cycle, or conditions for use. Material that degrades with age shall be marked to indicate the date when the useful life expires as defined by the applicable specification, drawing or contract.

The Supplier shall identify the material and the material certification documentation with the date of expiration, including (if applicable) out-time requirements. The compounding dates, curing completion dates, manufacturing dates, and assembly dates (date of assembly completion by the Supplier) and any environmentally sensitive information (i.e. either state "not environmentally sensitive" or state recommended storage temperature and allowable excursion time and temperature allowances), as required by the applicable specification, drawing or purchase agreement, shall be included in the inspection data package. The Supplier shall include the shipping date of the product in required documentation. Date of shipment is determined by the Supplier unless defined in a specification or the Supplier's baseline.

QMC2: CURE DATE FOR O-RINGS AND RUBBER GOODS

Rubber goods delivered under this contract shall conform to MIL-STD-1523. If applicable, non-installed o-rings shall be individually packaged in a preservative wrapping in accordance with MIL-P-116, marked with the cure date, and shall be delivered to Northrop Grumman within six months of the cure date.

QMC3: REMAINING SHELF LIFE

All limited-life items shall have remaining shelf life upon delivery as specified in the purchase agreement.

QMC4: NORTHROP GRUMMAN PROVIDED MATERIALS/COMPONENTS

When Northrop Grumman provided materials or components are used by the Supplier, Northrop Grumman specifications and accept tags take precedence over any other marking or manufacturer recommendations. The Supplier shall use materials in accordance with Northrop Grumman shelf life, usage life, and storage condition requirements.

QMC5: ENVIRONMENTAL CONTROLS

The Supplier shall establish and maintain a documented system for control of materials sensitive to environmental degradation. Materials that may degrade in shipment or during storage shall be shipped or stored as specified by the applicable drawing, specification, or purchase agreement. Off-the-shelf materials shall be stored per manufacturer warranty information until shipment to the using facility.

QMC6: ENVIRONMENTAL PACKAGING

Limited-life materials shall be packaged to assure required storage temperatures and limited-life requirements are not adversely affected by the transport and/or interim storage prior to delivery. When required by specification, temperature recorders shall be included. The outer shipping box **MUST** be marked to indicate "Time and Temperature Sensitive Material," and the temperature storage range in degrees.

QMC7: SHELF LIFE AND STORAGE: NASA PROGRAMS

When included in Northrop Grumman drawings or specifications, shelf life and storage requirements shall apply as stated therein. In the event the requirements conflict with Supplier shelf life and storage requirements, Northrop Grumman requirements take precedence, and the Supplier shall notify Northrop Grumman of the disparity. When shelf life and storage requirements are applicable, the Supplier shall include the recommended requirements. The requirements shall designate as applicable:

1. When the shelf life begins (e.g., date of manufacture, date of shipment, date of receipt).
2. Any Environmental sensitivity information (either state "Not Environmentally Sensitive" or state the recommended storage temperature, allowable excursion time, and temperature allowances).

NORTHROP GRUMMAN OVERSIGHT

QCO1: SUPPLIER MANUFACTURING READINESS REVIEW

The Supplier shall present a detailed process plan to Northrop Grumman for approval prior to commencing manufacturing operations. This process plan shall include, but is not limited to:

1. Schedule of key milestones with planned completion dates.
2. Material procurement, quality, and process requirements flowed to sub-tier suppliers.
3. Detailed manufacturing plan for achieving specific product design/specification requirements.
4. Visual flow sheet for manufacturing plan steps.
5. Approach to process change controls and methods by which Northrop Grumman approval is requested.
6. Process proofing methods.
7. Statistical process and quality control (SPC/SQC) evaluation plan, if applicable.
8. List of required materials and quantities or Manufacturing Bill of Materials (MBOM).
9. Inspection methods for validating specific product design/specification requirements.
10. First Article Inspection (FAI) methods and delta FAI approaches.
11. Manpower/training evaluation.

QCO2: NORTHROP GRUMMAN AUDITS

Northrop Grumman may schedule and conduct an on-site audit of the Supplier's operations to assure compliance with purchase agreement requirements. Audit coverage will include examination of product quality program elements, operations, material, and documents and review of Supplier audit reports of sub-tier suppliers. The Supplier's quality system is subject to audit by Northrop Grumman during the period of performance of the purchase agreement. This requirement applies to supplier and sub-tier supplier facilities where Northrop Grumman products and services are processed. The Supplier shall schedule and conduct an on-site audit of the Supplier's sub-tier supplier with the participation of Northrop Grumman's personnel if requested by Northrop Grumman. **Note:** Northrop Grumman's customer may accompany the auditor to observe the audit.

QCO3: SUPPLIER PERFORMANCE OF AUDITS

The Supplier shall periodically audit its quality system and manufacturing processes to ensure compliance with purchase agreement requirements. Audits shall be conducted throughout the period of performance of the purchase agreement and shall be performed by personnel not having responsibilities in the area being audited. Audits shall review all program elements for adequacy of and compliance to policies and procedures. Audits shall also review operations in manufacturing, test, and inspection areas for adequacy of and compliance with process controls and inspection and test methods. The scope of these audits shall include sub-tier material and service suppliers. Audit results shall be communicated to appropriate management. Action to correct deficiencies and follow-up to verify effectiveness shall be performed. Audit results shall be made available to Northrop Grumman upon request.

QCO4: SUPPLIER AUDITS OF SUB-TIER SUPPLIERS

The Supplier shall periodically audit the personnel, procedures, and operations of its sub-tier suppliers to verify compliance with purchase agreement requirements if any of the following conditions are satisfied:

1. Conformance to purchase agreement requirements cannot be verified by the Supplier by receiving inspection of items procured from the sub tier supplier.
2. Performance variations or quality problems are attributed to the sub tier supplier.
3. The Supplier is notified in writing by Northrop Grumman that such audits are required.

QCO5: NORTHROP GRUMMAN PARTICIPATION IN SUPPLIER AUDITS

Northrop Grumman and its customers may elect to participate in or observe audits performed by the Supplier, particularly at sub-tier supplier facilities. Such activities shall be coordinated in advance between Northrop Grumman and the Supplier. Sufficient notice shall be given by the Supplier of upcoming audits.

QCO6: SUPPLIER AUDIT SCHEDULE

A schedule of audits to be performed by the Supplier during the purchase agreement period shall be submitted to Northrop Grumman. Changes to the schedule shall be submitted to Northrop Grumman.

QCO7: SOURCE SURVEILLANCE

Northrop Grumman shall perform surveillance at the Supplier's facility. Inspection or testing performed by the Supplier may be subject to Northrop Grumman surveillance. The Supplier shall contact Northrop Grumman prior to the start of processing to coordinate surveillance.

QCO8: NORTHROP GRUMMAN IN-PROCESS SOURCE INSPECTION

In-process verification at the Supplier's facility by an Northrop Grumman quality representatives shall be required. Specific requirements shall be included in the purchase agreement line item details. The Supplier shall provide five (5) days advance notice of activities to Northrop Grumman to permit scheduling of in-process source inspection. Evidence of in-process verification by an Northrop Grumman quality representative shall accompany each shipment. Source inspection by Northrop Grumman does not absolve the Supplier of the responsibility to provide acceptable products.

QCO9: NORTHROP GRUMMAN SOURCE INSPECTION

Approval by an Northrop Grumman quality assurance representative shall be required prior to shipment of the material. Approval shall require prior completion of inspection records, test data, shipping documents, and review of hardware or material. The Supplier shall notify Northrop Grumman at least five (5) working days prior to presentation of material for source inspection. Evidence of source inspection shall accompany each shipment. Notwithstanding the provisions of this clause, all items may be subject to inspection and acceptance by Northrop Grumman and/or a government/regulatory agency representative at Northrop Grumman. Northrop Grumman, by giving 24 hours notice, shall be granted access to the Suppliers' facility in order to accomplish source inspection and to inspect tooling, materials, certification documents, and scheduling information. Source inspection by Northrop Grumman does not absolve the Supplier of the responsibility to provide acceptable products.

QCO10: GSI

Government Source Inspection (GSI) is required prior to shipment from the Supplier's facility. Upon receipt of this purchase agreement, the Supplier shall promptly notify and furnish one copy of the agreement to the government inspection agency. If a government representative does not service the Supplier's facility, the Supplier shall contact the nearest Air Force, Army or Navy inspection office. If the government agency cannot be located, the Supplier shall immediately notify Northrop Grumman. The Supplier shall notify the cognizant government office in advance when an item is ready for processing, testing, and/or inspection. In the event the government representative cannot be located, the Supplier shall contact Northrop Grumman for instructions. A copy of the documentation bearing the GSI verification shall accompany each shipment. Pertinent data and equipment required for GSI shall be made available at the Supplier's facility and shall be furnished to the government representative upon request. The Supplier shall also furnish the government representative with copies of discrepancy notifications and Northrop Grumman replies. The government representative shall also be notified 48 hours in advance of the time articles or materials are ready for processing, inspection or test. (NOTE: Notification times can vary, check with the government representative for specific time.)Source inspection by the Government does not absolve the Supplier of the responsibility to provide acceptable products.

QCO10A: GSI Potential GSI Requirement

Government oversight of manufacturing processes, testing and/or inspection may be required during fulfillment of this contract per the discretion of the Government Quality Assurance Representative (QAR) for Northrop Grumman. Contact Northrop Grumman Purchasing prior to start of processing for confirmation of this requirement. In the event GSI is required, the requirements in clause QC010 GSI would be enforced.

QCO11: GSI: NASA CONTRACTS

Government Source Inspection (GSI) is required. All work on this order is subject to inspection and test by the Government at any time and place. The government quality representative who has been delegated the NASA quality assurance function on this procurement shall be notified immediately upon receipt of this order. The government representative shall also be notified 48 hours in advance of the time articles or materials are ready for inspection or test. Shipment may not be made until inspected by or documented authorization to ship is received from the government representative.

QCO12: NASA GSI STATEMENT

The Supplier shall incorporate the following statement in its entirety into sub-tier supplier purchase agreements for procured items requiring Government Source Inspection (GSI): ALL WORK ON THIS ORDER IS SUBJECT TO INSPECTION AND TEST BY THE GOVERNMENT AT ANY TIME AND PLACE. THE GOVERNMENT QUALITY REPRESENTATIVE WHO HAS BEEN DELEGATED THE NASA QUALITY ASSURANCE FUNCTION ON THIS PROCUREMENT SHALL BE NOTIFIED IMMEDIATELY UPON RECEIPT OF THIS ORDER. THE GOVERNMENT REPRESENTATIVE SHALL ALSO BE NOTIFIED 48 HOURS IN ADVANCE OF THE TIME ARTICLES OR MATERIALS ARE READY FOR INSPECTION OR TEST.

The Supplier shall incorporate the following statement in its entirety into sub-tier supplier purchase agreements for all other items: THE GOVERNMENT HAS THE RIGHT TO INSPECT ANY OR ALL OF THE WORK INCLUDED IN THIS ORDER AT THE SUPPLIER'S PLANT.

QCO13: FAA SOURCE INSPECTION

The Federal Aviation Administration (FAA) may at any time perform a source inspection of the Supplier's manufacturing facility. The scope of the inspection may include the inspection system and/or manufacturing system used by the Supplier as well as the materials used in manufacture and the final product.

QCO14: FIRST ARTICLE INSPECTION OR PROCESS PROOFING

Northrop Grumman shall perform a First Article Inspection (FAI) or process proofing of items produced at the Supplier's facility. The first article may be for proofing a tool or software prior to approving the tool for product acceptance, or to verify material compliance to the design. Northrop Grumman shall coordinate with the Supplier and establish the requirements for the inspection or proofing. The Supplier shall contact Northrop Grumman prior to the start of fabrication so that mandatory in-process inspection/test points can be agreed upon.

QCO15: FIRST ARTICLE INSPECTION PER AS9102

First Article Inspection (FAI) shall be performed by the Supplier in accordance with AS9102. The sample shall have been fabricated using the same parts, materials, processes, and locations proposed for full production. A report of acceptable first article inspection shall accompany the first part delivered to Northrop Grumman and shall include all dimensional measurements and results of all electrical, mechanical, and non-destructive inspections and tests. The report shall show the item meets all requirements. When FAI is imposed, approval of the first article is required before proceeding with full production.

PACKAGING AND HANDLING

QPH1: PACKAGING AND HANDLING

The Supplier shall maintain a system that assures adequate control of packaging and shipping. The use of commercial packaging practices does not relieve the Supplier of the responsibility for controlling the packaging and shipping function in a manner which will prevent damage in transit. Special instructions for packaging and shipment may be specified in the material specification or purchase agreement.

QPH2: SPECIFIC PACKAGING INSTRUCTIONS

Unless otherwise specified in the purchase agreement , drawings, or specifications, all items shall be enclosed with wrappings, bags, cartons, boxes, or other containers as necessary to provide protection from hazards of static electricity, contamination, and physical damage encountered in general handling, shipping, and storage. Indirect contact of items with metal surfaces shall not cause or promote corrosion. Packaging material used shall be non-abrasive, chemically neutral (pH 6.5 to 7.5) and have a water-soluble acidity of not more than .02% equivalent sulfur trioxide.

QPH3: CRITICAL HARDWARE PACKAGING

The Supplier shall submit a documented critical hardware handling and packaging plan to Northrop Grumman indicating special precautions to be taken to meet QPH2**.**

QPH4: ESD

Items shall be manufactured, handled, received, stored, and shipped in a manner to preclude damage from Electrostatic Discharge (ESD) in accordance with ANSI/ESD-S20.20 or NASA-STD-8739.7. Items shall be properly packaged and identified as required by ANSI/ESD-S20.20. Containers shall be appropriately identified to show electrostatic protection.

QPH5: CONTAINER IDENTIFICATION

The Supplier shall identify each unit and multiple over pack container with the part number, purchase agreement number, traceability number, recommended storage conditions, and hazardous warnings as applicable. Unless otherwise specified in the purchase agreement, all items shall be protectively packaged to prevent contamination and damage during handling, shipping, and storage.

QPH6: DATE CODE MARKING

Each part shall be marked with the manufacturer's date code, traceable to its production lot records. If it is not practical to mark the part, the lowest order of packaging shall be marked with the date code.

ITEMS SUBMITTED TO NORTHROP GRUMMAN

QSB1: SAMPLES PROVIDED PRIOR TO PRODUCTION

The Supplier shall submit samples for Northrop Grumman review per the purchase agreement requirements. Written approval from Northrop Grumman is required prior to proceeding with production runs. Samples shall be properly identified when shipped to Northrop Grumman and copies of the relevant actual test and inspection results (including radiographs and physical and chemical analyses, where applicable) shall accompany the shipment.

QSB2: RAW CASTINGS AND FORGINGS

Two samples of all raw castings and forgings shall be submitted from new or reworked dies or molds and shall be approved by Northrop Grumman prior to manufacture of production parts. The samples shall be provided to Northrop Grumman along with the actual results of layout inspections, radiographs, and chemical and/or physical tests.

The Supplier shall be responsible for obtaining Northrop Grumman approval of any change in processes, raw materials, or tooling before implementation.

QSB3: SAMPLES PROVIDED WITH SHIPMENT

The Supplier shall submit test samples of each batch of material sufficient to conduct tests in accordance with specification or purchase agreement requirements. The test samples shall accompany the shipped material. Each test sample shall be clearly and permanently marked with the following: batch or lot number; date manufactured; specification or material control information number; Supplier's designation; and the purchase agreement number.

QSB4: TENSILE TESTING

Two (2) separately-cast test bars, coupons, or appendages as defined by the applicable specification or drawing shall be submitted with each material lot delivered.

QSB5: LAP SHEAR TESTING

The Supplier shall process lap shear coupons in accordance with drawing and specification requirements. Traceability to purchased parts must be maintained on coupons. Northrop Grumman receiving inspection or designee shall initiate a lab request and forward the lap shear coupons and the lab request to the lab. Parts shall be inspected to the quality requirements and held pending lab results.

QSB6: T-PEEL TESTING

The Supplier shall process T-peel coupon in accordance with drawing and specification requirements. Traceability to purchased parts must be maintained on coupons. Northrop Grumman receiving

inspection or designee shall initiate a lab request and forward the T-peel coupons and the lab request to the lab. Parts shall be inspected to the quality requirements and held pending lab results.

QSB7: SUPPLIER INSPECTION FORMS

The Supplier shall perform inspection of all items. The Supplier's inspection of each requirement shall include all dimensions and tests in accordance with applicable specifications and drawings unless otherwise stated in the purchase agreement. Data shall be recorded in the Supplier's own format. The Supplier's inspection plan shall be submitted for Northrop Grumman approval. A copy of the inspection data shall accompany each shipment, marked to the attention of Northrop Grumman receiving quality control. Sample inspection is not authorized unless specifically stated in the purchase agreement.

NOTE: If an inspection plan is used, the Supplier shall legibly affix a stamp to or initial each item of the inspection plan. This certifies that the required data is supplied and each requirement is acceptable. Electronically generated stamps or signatures are acceptable.

QSB8: DETAILED SUPPLIER INSPECTION REPORT

The Supplier shall submit an inspection report in the Supplier's format that documents the acceptability of each drawing requirement in accordance with the following:

1. The person performing the inspection, the inspection equipment, and the actual values of the measurements shall be recorded. Check marks are not acceptable.
2. The range of measurements on a lot of parts may be recorded showing minimum and maximum values for each characteristic.
3. Any discrepancies must be identified and reported, and approval obtained in writing from Northrop Grumman prior to shipment. If employed, lot sampling shall be per ANSI/ASQ Z1.4, General Inspection Level II, Single, Normal, AQL 1.0.
4. All critical dimensions shall be measured and recorded on 100% of the parts. A critical dimension is defined as one with a linear tolerance less than 0.001 or an angular tolerance less than 0.1 degrees, or any dimension or attribute defined by the program quality engineer as critical. The requirement for measuring the critical linear dimension is superseded by the requirements found in drawings that have incorporated the use of the black diamond in the title block to indicate critical dimensions.
5. The instruments used for inspection must be listed on the inspection report and traceable to the data recorded for each drawing requirement and must be calibrated and have sufficient accuracy, stability, range, and resolution required for the intended measurements.
6. The inspections must be accomplished with the parts unrestrained in a temperature-controlled environment to comply with drawing requirements.

QSB9: INSPECTION DATA

With each shipment, the Supplier shall include an inspection data package with the required inspection data and all approved nonconformances. The data shall include the sampling plan (if applicable), actual dimensions, and quantities inspected, accepted, and rejected. The Supplier shall submit inspection data for each serialized part or each lot and for tests accomplished in accordance with the purchase

agreement along with a statement of conformance and an authorized acceptance stamp or signature, unless otherwise specified. A typed name submitted by the Supplier is a legally acceptable substitute.

QSB10: VENDOR INSPECTION PLAN

A completed Vendor Inspection Plan (VIP) shall accompany each shipment. Northrop Grumman shall supply the VIP to the Supplier. The copy returned to Northrop Grumman must be legible and reproducible. Each item of the VIP shall be dated and verified by the Supplier and/or Northrop Grumman quality assurance representative as applicable, including Government Source Inspection (GSI) buyoffs. The VIP shall not be used to replace the Supplier's inspection planning or inspection records.

QSB11: TECHNICAL USE REQUIREMENT INSPECTION PLANS

Vendor inspection plans titled "Technical Use Requirements" contain special requirements associated with the use of Tools Used In Lieu of Gages (TULOGs), gages, and special SMI methods. These inspection plans shall be submitted with items produced.

QSB12: METAL RAW MATERIAL DATA PACKAGES

Northrop Grumman shall review and approve material data packages prior to any processing. Raw material forms include, but are not limited to: plate, rod, bar, forgings, extrusions, and castings. Data packages shall include certifications, test reports, and physical analyses at a minimum. Resubmittal of a material data package is required if heat treatment operations are performed following the initial Northrop Grumman review.

QSB13: METAL RAW MATERIAL SPECIAL REQUIREMENTS

The Supplier shall provide a cut chart showing the location of each serialized forging traceable to bar and bar to ingot.

The Supplier shall certify ultrasonic acceptance per SAE-AMS-STD-2154, Type 1, Class AA quality level acceptance criteria after rough machining. Northrop Grumman shall perform the ultrasonic inspection. In the event forgings fail ultrasonic examination, the Supplier shall be held liable for the cost of machining time, up to and including the time of rejection, as well as attributable testing charges.

QSB14: METAL RAW MATERIAL ELEMENTAL COMPOSITION

A test report shall accompany each shipment. The report shall indicate the actual percentage of each element that makes up the chemical composition of the raw material. The report shall specifically identify the material by indication of the number of the melt, batch, lot, or other designators, as well as the applicable specification and revision.

QSB15: CERTIFICATION OF MATERIAL CONFORMANCE

Each shipment must be accompanied by a legible and reproducible copy of a certification stating that the items were produced:

1. From materials furnished by Northrop Grumman and utilized for manufacture and test.
2. From materials for which the Supplier has specific data or other objective evidence of conformance to applicable specifications available for examination.

The certificate must contain the signature and title of an authorized representative of the Supplier.

The following documentation shall be included:

1. Certification of raw materials and/or processes. All certifications shall include traceability to the Northrop Grumman part number, purchase agreement number, and purchase agreement line item (e.g. job number, lot number, heat treat number).
2. Supplier's shipper/receiver for raw materials and /or processes referencing the Northrop Grumman purchase agreement number.
3. Origin of raw materials, traceable to the Northrop Grumman purchase agreement number, part number, and lot number.
4. Lot/date code, heat and batch number traceable to the Northrop Grumman purchase agreement number, part number, and lot number.
5. Process certifications and test reports traceable to the Northrop Grumman purchase agreement number, part number, and lot number.

QSB16: FUNCTIONAL TEST REPORTS

Functional test reports shall be submitted. All functional test reports shall reference the purchase agreement number, the Supplier's name and address, and the independent laboratory's name and address, if applicable. The part number, serial or lot number, date and run time (if applicable), and a summary of the test results shall accompany each shipment. An authorized Supplier representative, either by a dated inspection stamp or signature, date, and title shall validate all test reports. A typed name submitted by the Supplier is a legally acceptable substitute. **NOTE:** Functional tests include, but are not limited to: static, vibration, acoustic, thermal cycle, electronic, and hydraulic.

QSB17: DIMENSIONAL INSPECTION REPORT

The Supplier shall submit dimensional inspection acceptance data, identifiable to the item supplied, with each shipment. The data shall include the sampling plan (if applicable), actual dimensions, and quantities inspected, accepted, and rejected. Unless otherwise specified, 100% inspection of all materials, notes, and features is required on all items. The sampling plan, if approved by Northrop Grumman, shall be specified in the purchase order line item detail notes.

QSB18: CHEMICAL, PHYSICAL, AND/OR MECHANICAL TEST REPORTS

One copy of test reports indicating chemical composition, physical, and/or mechanical properties including actual test data/results identifiable to each lot, batch, or heat treat lot shall accompany each shipment of material. Test data shall include actual values obtained from testing of the submitted material (lot). Test methods used shall agree with the methods stated in the specification or drawing. An authorized Supplier representative (including sub-tier supplier representatives), either by a dated inspection stamp or signature, date, and title, shall validate all test reports. A typed name submitted by the Supplier is a legally acceptable substitute. For electrical or RF wire and cable, the report shall include electrical inspections and tests in accordance with the applicable specifications. The manufacturer name and lot number of materials must be identified on each document.

QSB19: MATERIAL CERTIFICATIONS

The Supplier shall submit a certificate of conformance (C of C) for all raw materials purchased from a sub-tier supplier and used in items delivered to Northrop Grumman. Specific requirements shall be included in the purchase agreement line item detail notes.

QSB20: WEIGHT REPORT

The Supplier shall submit a weight report for each item. Traceability shall be maintained to all part numbers, serial or lot numbers, materials designations, and any other specified data or information.

QSB21: MANUFACTURING LOCATION

The Supplier shall include the location of the item manufacturer in the acceptance documentation.

QSB22: MANUFACTURER CAGE CODE

The Supplier shall include the Commercial and Government Entity (CAGE) code of the item manufacturer in the acceptance documentation.

QSB23: AUTHORIZATION TO SHIP/PRE-SHIPMENT REVIEW

Items delivered under this purchase agreement are subject to Northrop Grumman pre-shipment review. The Supplier shall submit a copy (by fax or mail) of the complete inspection planning, material, welder, and special process (e.g., heat-treat, welding, x-ray, magnetic particle, ultrasonic, plating,) certifications as specified in this purchase agreement to Northrop Grumman for review and approval in advance of the proposed shipping date. Northrop Grumman approval is required prior to shipment. Upon approval, Northrop Grumman will return a stamped or signed Authorization to Ship (ATS) form signifying approval for shipment. Items requiring pre-shipment review will only be received by Northrop Grumman when an approved ATS accompanies the packing slip. An approved ATS does not constitute automatic acceptance of items by Northrop Grumman.

QSB24: CERTIFICATION

The Supplier shall submit a certificate that will, along with other required documentation, accompany the product upon delivery to Northrop Grumman. To facilitate that all applicable certification requirements are documented, the Supplier may submit an Northrop Grumman certificate of conformance form in lieu of their own certificate. At a minimum, the certificate shall include the following information:

1. Northrop Grumman purchase agreement number.
2. Northrop Grumman part number, stock number, or purchase agreement item number.
3. Northrop Grumman serial or lot number, if preassigned in the purchase agreement.
4. Drawing number or specification, revision, and change notice to which the item was manufactured as specified in the purchase agreement.
5. Manufacturer name and address.
6. Manufacturer part number.
7. Manufacturer serial, lot , or batch number.
8. Nonconformance numbers, if applicable.

9. A statement that the items provided meet purchase agreement requirements, including any drawings or specifications, revisions, and change notices listed in the purchase agreement.
10. An accept stamp, electronic authorization, or signature of the authorized individual representing the Supplier or other legally binding approval.

QSB25: HEAT NUMBER

Material certification shall include the material heat number.

QSB26: CURE DATE

Material certification shall include the cure date.

QSB27: DATE OF SHIPMENT

Material certification shall include the date of shipment as described in the purchase agreement.

QSB28: DATE OF MANUFACTURE

Material certification shall include the date of manufacture.

QSB29: DATE OF PACKAGING

Material certification shall include the date of packaging.

QSB30: DATE OF ACCEPTANCE TESTING

Material certification shall include the date of acceptance testing.

QSB31: CERTIFICATION DATES

Material certification shall include any other dates required in the purchase agreement (e.g., compounding date, mix date, melt date,).

QSB32: ACCEPTANCE DATA PACKAGE

The Supplier shall submit an Acceptance Data Package (ADP) for items that shall contain all applicable sections of the following according to the purchase agreement:

1. Item description, including item name, part number, serial or lot number or both, hardware type, purchase agreement number, name of providing organization, Commercial and Government Entity (CAGE) code, and unique software identification number.
2. For age-sensitive/time-action items, the ADP shall include running/operating time and cycle for each time and cycle critical item of the Configuration Item (CI). These logs shall identify the items by nomenclature, part number, and serial number and shall state the total authorized life and the life expended.
3. Test history log, including post-manufacturing checkout and final verification tests of the CI, with the following data:
    a. Actual measurements identified to specified tests. References to applicable test reports are satisfactory provided that copies of the reports are provided.
    b. Brief test summary.

c. List of unaccomplished tasks and estimated man-hours to complete.
d. List of actual and recommended retest.
e. Special test instructions, investigations, warnings, and problems encountered during test.
f. Failure and corrective actions data for all failures during testing.

4. Inspection records for all inspections.
5. Weight and balance logs covering total weight and horizontal, vertical, and lateral centers of gravity.
6. Transfer records providing a history of all CI and critical component movements.
7. Alignment data for all CIs and critical items.
8. Component log books, including Government-furnished items.
9. Acceptance certification.
10. Quality certification.
11. Nonstandard calibration/checkout.
12. Repair limitations.
13. Non-flight hardware/temporary installations.
14. Certification of flight readiness (pre-endorsement form).
15. Material review actions in accordance with STW7-13108.
16. As-designed/as-built configuration including refurbishment history.
17. Pyrotechnic certification.
18. Shortages.
19. Unplanned/deferred work.
20. Preplanned/assigned work.
21. Battery data.
22. Pressure vessel data.
23. Configuration records including:
    a. Parts and drawing lists identifying all parts.
    b. Software configuration records defining the verified and validated software, version description documents, software certification, and the validated software program.
    c. List of approved and pending deviations and waivers.
    d. Complete list of hardware and software/firmware items shipped loose or separately.
    e. Copy of proposed form DD250.
24. Equipment log book shall document activities and operations performed on deliverable hardware containing the information identified in MSFC Form 3473 or equivalent with MSFC approval.

QSB33: CERTIFICATE OF CALIBRATION

The Supplier shall include in the inspection data package a legible and reproducible copy of a certificate of calibration. Along with other required documentation, the certificate of calibration shall accompany the product upon delivery to Northrop Grumman. The certificate of calibration shall contain traceability to the item supplied and the following data/information:

1. Test data that show compliance to the requirements of the applicable drawing or specification.
2. Test data showing actual values obtained from testing of the submitted item.

3. Name and address of the testing facility that performed the tests, if different from the manufacturing facility.

SOFTWARE

QSW1: SOFTWARE CONTROL

When computer software or firmware is used as medium of acceptance, either singly or in conjunction with tooling, the Supplier shall develop and implement a plan for control of software or firmware. Configuration and change control, method for design review, verification and proofing, storage of master control software and firmware shall be included in the plan. Northrop Grumman shall approve the plan before the software or firmware is used to accept items. This does not apply to software used in the operation of commercial off-the-shelf inspection devices.

QSW2: SOFTWARE CONTROL: ISO 9001/90003 OR CMMI LEVEL 2

The Supplier's software quality system shall be acceptable to Northrop Grumman. The software quality system shall be consistent with ISO 9001-2008, ISO 90003, or CMMI Level 2 or higher. Northrop Grumman reserves the right to perform surveys and audits as necessary to assure conformance to the software quality system requirements.

QSW3: SOFTWARE CONTROL CERTIFICATION

The software quality system shall be certified to ISO 9001-2008 in accordance with ISO 90003 or CMMI Level 2 or higher. The Supplier shall submit a copy of registration/certification annually.

QSW4: SOFTWARE ASSURANCE PLAN

A software assurance plan shall be maintained detailing how software quality requirements will be satisfied. This plan shall be submitted to Northrop Grumman for approval. Any changes to the plan shall be approved by Northrop Grumman before incorporation.

QSW5: IEEE STD 730-2002 SOFTWARE ASSURANCE PLAN

The software assurance plan shall conform to IEEE STD 730-2002.

QSW6: QUALITY PARTICIPATION IN SOFTWARE DESIGN

Supplier quality assurance personnel shall participate in the review process during development of software and provide input on requirements, development, and design.

QSW7: SOFTWARE DESIGN APPROVAL

Supplier quality assurance personnel shall approve all requirements and specifications to ensure design criteria are adequately addressed. Supplier quality assurance personnel shall also approve all software logic to verify logic adequately traces to the requirements of the specifications and design.

QSW8: SOFTWARE TESTING

Supplier quality assurance personnel shall assure tests are conducted using approved test policies, procedures, and appropriate test tools, and that test anomalies are identified, documented, addressed, and tracked to closure.

QSW9: SOFTWARE TEST PLAN APPROVAL

Supplier quality assurance personnel shall approve all test plans and procedures to verify the plans and procedures adequately test all software requirements relative to the specifications and criteria for acceptance.

QSW10: SOFTWARE TEST REQUIREMENTS

Supplier quality assurance personnel shall create inspection requirements to verify the software checkout and tests.

QSW11: SOFTWARE TEST RESULTS

Supplier quality assurance personnel shall ensure test results and inspections are accurate and produce the necessary information to ensure specification and design requirements have been satisfactorily implemented.

QSW12: SOFTWARE DOCUMENTATION

The Supplier shall maintain documentation of the requirements, development, verification and validation, and identification of deliverable software.

QSW13: SOFTWARE DOCUMENTATION CONTROL

Unless otherwise specified by Northrop Grumman, software documentation shall be controlled by the Supplier's Northrop Grumman-approved policies and procedures for controlled documents. Modifications to these policies and procedures must follow the change control requirements imposed in the purchase agreement.

QSW14: SOFTWARE ACCEPTANCE

Software will be accepted by Northrop Grumman after the following minimum criteria are met:

1. Acceptance testing, rework, and regression testing have been successfully completed.
2. All discrepancies, open work, and deviations and waivers are properly documented and approved by Northrop Grumman.
3. The final software description document has been reviewed and approved by Northrop Grumman.
4. Acceptance documentation, including signed certifications, is complete and approved by Northrop Grumman.
5. Lessons learned are recorded and submitted to Northrop Grumman.

QSW15: SOFTWARE PROCESS AUDITS

Northrop Grumman shall perform audits of the Supplier's software development processes and activities at various points in the software development lifecycle. The time and location of audits will be

coordinated with the Supplier by Northrop Grumman. Elements audited may include, but are not limited to:

1. Software development process documentation.
2. Process tools (e.g. tools for requirements management, software development, project management, configuration management).
3. Defect tracking and risk management systems.
4. Software development activities.
5. CMMI compliance documentation.

QSW16: SOFTWARE, TESTING, SURVEILLANCE, AND AUDITS

Northrop Grumman shall perform surveillance and audits of the Supplier's software testing processes and activities at various points in the software development lifecycle. Surveillance and audits shall be conducted at the Supplier's testing facilities and shall include examination of documentation and visual observation of testing processes. Elements observed may include, but are not limited to:

1. Test documentation.
2. Defect tracking system.
3. Automated software testing tools.
4. Code reviews.
5. Unit testing.
6. Integration testing.
7. System testing.
8. Testing to requirements traceability.

QSW17: FIRMWARE TESTING AUDIT

During firmware development, Northrop Grumman shall audit the Supplier's testing plans, processes, and tools. Beginning at the initial baseline of the code (the point at which the code is handed over to independent testing), the Supplier shall provide Northrop Grumman with defect data via test reports.

QSW18: SOFTWARE CONFIGURATION AUDITS

Northrop Grumman shall perform functional configuration audits and physical configuration audits of the Supplier's software baselines and configuration management system. Configuration audits shall include examination of configuration management documentation and visual observation of the Supplier's software configuration management and change control system, requirements management system, change request and problem reporting procedures, and the software baseline configuration/inventory.

QSW19: SOFTWARE REVIEWS

Northrop Grumman shall conduct formal and informal reviews of the Supplier's software deliverables. Reviews may include formal reviews, peer reviews, inspections, technical reviews, and milestone reviews. The Supplier shall support these activities by providing access to materials and processes under review.

QSW20: SOFTWARE QUALITY ASSURANCE STATUS REPORTS

The Supplier shall submit monthly quality assurance (QA) status reports to Northrop Grumman software quality assurance. QA status reports shall contain at a minimum:

1. QA reviews and audits performed during the reporting period.
2. Outstanding QA issues and resolution strategies.
3. Current schedule of QA activities.
4. Status of software changes.
5. Exceptions and waivers to software process and deliverables.

QSW21: SOFTWARE METRICS

The Supplier shall report to Northrop Grumman, at a minimum, the following quality assurance (QA) metrics:

1. Number of QA assessments.
2. Number of QA assessment findings or non-compliances.
3. Number of software assurance observations.
4. Number of risks identified during QA assessments.
5. Risk levels of risks identified during QA assessments.
6. Completed QA tasks.

QSW22: CMMI CERTIFICATION

The Supplier software development organization shall be CMMI ®-SE/SW certified to the level defined in NPR-7150.2A and shall use CMMI-recommended processes to conduct software development and quality assurance activities. Northrop Grumman shall verify compliance to this requirement during software development process audits. CMMI documentation shall be made available to Northrop Grumman upon request.

QSW23: SOFTWARE QUALITY ASSURANCE TRAINING

Supplier personnel shall have fundamental knowledge through prior experience, training, or certification of software quality assurance methodologies, processes, and standards.

FASTENERS

QFS1: CRITICAL FASTENERS

For a part number identified as a "critical fastener" in the purchase agreement, the Supplier shall randomly select three (3) fasteners from each lot for verification of ultimate tensile strength through mechanical testing of tensile load and hardness. Testing shall be in accordance with NASM1312 or ASTM F606 and shall be performed by an agency different than the agency that performed the testing for acceptance. Fasteners with verification test results that do not comply with the applicable product specification shall not be delivered or incorporated into assemblies to be delivered. The three (3) fasteners subjected to verification tests are in addition to the quantity ordered. Verification test results

shall be included in the acceptance data package. **Note:** Fasteners and rivets too short for tensile testing as defined by the above standards will undergo hardness testing only. Suppliers who are responsible for design of the delivered item shall perform the fastener criticality analysis as specified in the purchase agreement, identify the critical fasteners, and comply with the verification testing as stated above.

QFS2: FASTENERS PER NASA-STD-5008

Compliance with NASA-STD-5008 is required for fasteners used in NASA flight hardware.

QFS3: FASTENERS PER NASA/GSFC 541-PG-8072.1.2 OPTION 1

Fasteners will be screened by Northrop Grumman to the fastener integrity requirements of NASA/GSFC Directive 541-PG-8072.1.2. The Supplier shall provide lot traceability and material test reports as defined therein.

QFS4: FASTENERS PER NASA/GSFC 541-PG-8072.1.2 OPTION 2

Fasteners used in flight hardware or critical ground support equipment applications, the Supplier shall provide lot traceability and material test reports as defined therein. The Supplier shall maintain compliance records and provide Northrop Grumman a Certificate of Conformance (C of C) documenting compliance with the applicable requirements therein.

QFS5: FASTENERS FOR SPECIAL TOOLING/FACILITIES

Fasteners for use on special tooling, test equipment, or facilities shall meet requirements in the applicable drawing/specification and comply with TER-01001.

ELECTRICAL PARTS/RIGID PRINTED BOARD

QEB1: ELECTRICAL PARTS AND ASSEMBLIES AGE CONTROL

All Electrical, Electronic, or Electromechanical (EEE) parts procured from the Supplier shall have been manufactured within two (2) years from the delivery date. This shall include all sub-assemblies of the article being procured. Any deviation from this requirement shall be approved in writing by Northrop Grumman. A copy of the authorization shall be included with each shipment.

QEB2: RIGID PRINTED BOARD REQUIREMENTS: NASA

Rigid printed board suppliers shall meet the requirements of the Master Drawing, IPC 6011, and IPC 6012 and the additional construction, inspection, and product assurance requirements of NASA/GSFC S312-P-003, “Procurement, Rigid Printed Boards for Space Applications”. The Supplier is responsible to read all drawing notes and comply with all specifications on the drawings, in the customer files and data, and in the fabrication notes.

1. A manufacturer’s certificate of compliance is required that includes the date code, lot code, and specifications that apply to the manufacture of the circuit boards.
2. Required coupons shall be supplied with the circuit boards.

3. Bare printed circuit boards and their coupons shall be evaluated by GSFC materials group prior to acceptance.

QEB3: RIGID PRINTED BOARD REQUIREMENTS

Rigid printed board suppliers shall meet the requirements of the Master Drawing and shall be certified to meet the requirements of IPC 6011 and IPC 6012. The Supplier shall comply with all specifications on the drawings, in the customer files and data, and in the fabrication notes.

1. A manufacturer's certificate of compliance is required that includes the date code, lot code, and specifications that apply to the manufacture of the circuit boards.
2. Required coupons shall be supplied with the circuit boards.
3. Northrop Grumman or an Northrop Grumman approved Supplier may evaluate the bare printed circuit boards and/or coupons prior to acceptance.

QEB4: NASA STD REQUIREMENTS

The Supplier shall comply with the requirements of the following as applicable : NASA-STD-8739.1, NASA-STD-8739.1, NASA-STD-8739.3, NASA-STD-8739.2, NASA-STD-8739.5.

QEB5: QPL

The Supplier shall certify that the parts provided were manufactured by a source on the NASA GSFC Qualified Parts List (QPL) for the part specification imposed in the purchase agreement.

QEB6: PRINTED BOARD PACKAGING

Each printed wiring board/flex shall be packaged individually in silver saver bags that conform to MIL-B-131H, Type I, Class I or II; MIL-B-81705B, Type I; or MIL-D-117E, Type III, Class E, Style 1. A desiccant and humidity indicator shall be placed inside each bag and the bags shall be heat-sealed. There shall be adequate space between the heat seal and the board to allow opening and resealing the bag a minimum of three times. At a minimum the part number, date code, and panel location designator or serial number shall appear on each bag.

QEB7: SINGLE DATE CODE

All items shall be from a single manufacturing date code. Mixed lot date codes will not be accepted unless specifically approved in writing by Northrop Grumman. The approval for shipment of mixed lots shall be included with the shipping documentation.

QEB8: MULTIPLE DATE CODE

Items from multiple manufacturing lots (i.e. with multiple date codes) may be accepted, provided the individual lots are separately packaged and identified.

SUBCONTRACTOR REQUIREMENTS

QSC1: DESIGN REVIEW CHECKLIST

The Subcontractor quality assurance organization shall participate in design reviews. Participation in reviews shall be documented to provide a historical record through the completion and storage of design review checklist. Quality assurance approval shall be required on these documents.

QSC2: DESIGN REVIEW CHECKLIST REQUIREMENTS

At a minimum, design review checklists shall assure the design documentation includes:

1. Identification and data retrieval.
2. Document Hazard Analyses (HAs) and Failure Mode and Effects Analyses (FMEAs).
3. Identification of critical hardware and hardware characteristics necessary for procurement and fabrication, including assembly, integration, inspection, and test operations.
4. Inspection and test criteria, including Nondestructive Evaluation (NDE) methods, test equipment, environmental conditions, and sample size.
5. Performance and/or tolerance limits.
6. Contamination control.
7. Process specifications, standards, and procedures.
8. Limited-life items.
9. Acceptance/rejection criteria.

QSC3: KEY CHARACTERISTICS

A system shall be implemented that identifies key characteristics and assures they are inspected to verify conformance. Once a key characteristic has been identified, variation management activities should be performed until the process or processes that influence that characteristic are in control. Appropriate monitoring methodology is then implemented to assure continued performance.

Note: A key characteristic should be identified only after determining a significant benefit exists from controlling the characteristic to assure the feature is at or very close to the specified dimension.

QSC4: CRITICAL CHARACTERISTICS

A system shall be implemented that identifies critical characteristics and assures the critical characteristics are inspected to verify conformance.

QSC5: GENERAL CHARACTERISTICS

Verification of general characteristics shall be adequately controlled through upfront inspections, error-proof manufacturing techniques (e.g., process controls), operational in-process inspections, final system checks, etc. to reliably demonstrate a high level of confidence that the component meets the intent of all requirements.

Note: Single point failure, inspection/verification opportunity, interface with adjoining components/assemblies, risk of attribute failure, Critical Items List (CIL) , hazards, SPC data, and other similar points of logic shall be used when identifying critical characteristics.

QSC6: SUBCONTRACTOR MRB AUTHORITY

The Subcontractor's Material Review Board (MRB) system and the scope of its authority shall be approved in writing by Northrop Grumman. Subcontractor personnel with MRB authority shall be approved in writing by Northrop Grumman and a list of all approved personnel shall be maintained and made available to Northrop Grumman upon request. All nonconformances shall be processed in accordance with the approved MRB system. Nonconformances outside the scope of the Subcontractor's approved MRB system shall be submitted to Northrop Grumman.

QSC7: SUPPLIER MRB ACTIVITY

Additional testing outside the scope of the normal or baseline production process in support of nonconformance investigations must be authorized by the Supplier's Material Review Board (MRB) within the approved scope of its MRB authority. Nonconformance dispositions made by the Supplier's MRB shall include the following information as applicable:

1. Relevant engineering evaluation of the nonconformance effects on or related to:
    a. Form, fit, and function including interfaces, key dimensions, and finish conditions.
    b. Loads and capabilities.
    c. Factors of safety.
    d. Failure modes.
    e. Self-limiting or fail-safe conditions.
    f. Likelihood of recurrence.
    g. Increase in severity of potential outcomes.
    h. Contract End Item (CEI) requirements.
    i. Process controls.
    j. Production or flight history.
2. Other issues or concerns.
3. Documentation of all activities performed in the course of investigations.

QSC8: SENIOR MRB ACTIVITY

Significant nonconformances that meet the Subcontractor's criteria for Senior Material Review Board (SMRB) shall be referred for Northrop Grumman SMRB approval prior to final disposition approval. The reason for elevation, either from the criteria listed below or from the criteria in the Subcontractor's procedures, shall be given.

4. Nonconformances which could result in loss of life or vehicle or cause an increase in risk.
5. Nonconformances which reduce the margin of safety or factor of safety and are below NASA Space Flight Programs Senior Board experience.
6. Nonconformances which result in an initial "limited use" disposition or which change the "limited use" status. Exceptions for which "limited use" status does not require SMRB review are in cases where:
    a. The "limited use" status removes the component from flight, static test, or qualification test usage.

b. The "limited use" disposition requires a select fit to a mating component such that the mating requirements assure that all engineering requirements of the mated assembly are met.
c. All other SMRB criteria (such as previous experience and new analytical techniques) still apply. Non-SMRB concurrence with the customer Safety & Mission Assurance (S&MA) representative is required and shall be referenced on the nonconformance document.

QSC9: NONCONFORMANCES COORDINATED WITH NORTHROP GRUMMAN

The following dispositions and nonconformances shall be coordinate with Northrop Grumman regardless of the Supplier's Material Review Board (MRB) authority:

1. Nonconformances that have first-of-a-kind repair and for which the nonconformance causes an increase in risk.
2. Dispositions which authorize repairs that negate previous inspection/tests which cannot be re-inspected/retested or the repair verified to the original inspection criteria.
3. Nonconformances which, in the opinion of any MRB member or Northrop Grumman, are considered to be of reasonable risk.
4. Dispositions or nonconformances which must be approved by a waiver.
5. Dispositions for items that have a nonconformance which falls outside the Northrop Grumman Senior Material Review Board (SMRB) experience.
6. Nonconformances for pyrotechnic devices that fail to meet the performance requirements as established in destructive and/or nondestructive lot acceptance testing or which fail to conform to critical requirements(Critical requirements include those dimensions or characteristics that would cause unsatisfactory performance or affect installation in the next level assemblies).
7. Dispositions that allow or direct a change in the engineering configuration of an assembly by replacement of a required part number with another part number.
8. Dispositions which are Northrop Grumman Fracture Control Board (FCB) concerns not covered by other SMRB criteria and which have been determined to be significant by an Northrop Grumman FCB technical subcommittee member or dispositions addressing weld cracks and weld anomalies (e.g. linear indications, lack of fusion, porosity, voids, inclusions, lack of penetration).
9. Nonconformances that violate Operations Maintenance Requirements Specifications Documents (OMRSD) requirements and that exceed the Northrop Grumman experience for that type of nonconformance.
10. Nonconformances that require analytical techniques, allowable material properties, or material characterization properties not previously approved by Northrop Grumman.
11. Use-as-is or repair dispositions involving interfaces with other vehicle elements.
12. Changes to a previously-approved SMRB disposition.
13. Dispositions of downgraded hardware being returned to flight status.
14. Dispositions that are the result of unexplained anomalies on accepted flight hardware.
15. Dispositions of nonconformances which reduce the design life of flight hardware.
16. Dispositions that result in cost or schedule impacts beyond the MRB-established limits.
17. Unanimous agreement cannot be achieved at the MRB level.

QSC10: TRANSFER OF ITEMS BETWEEN NORTHROP GRUMMAN PROGRAMS

The Subcontractor shall maintain a system to reassess all nonconformances and dispositions for items prior to their transfer between Northrop Grumman programs. This system shall require review of transfers by Supplier design and quality engineering and shall assess nonconformances and dispositions with respect to the requirements of the program to which items are being transferred. If the assessment determines that the nonconformances or dispositions are not in accordance with the requirements of the receiving program, the nonconformances must be reprocessed in accordance with the receiving program requirements.

QSC11: STANDARD REPAIR

The Subcontractor shall process all "repair" dispositions through the approved Material Review Board (MRB) system. No standard repair type activities for nonconformances are allowed outside of MRB unless prior approval is given by Northrop Grumman.

QSC12: SUBCONTRACTOR CHANGE CONTROL

The Subcontractor shall implement a change control system in accordance with TR017735.

QSC13: DIMINISHING MANUFACTURING SOURCES

The supplier shall notify the Buyer of any Diminishing Manufacturing Sources (DMS) issues related to components, materials, assemblies, subassemblies, and software items that arises affecting the current procurement, future availability, or logistics support of the current and prior configurations of deliverable equipment. All DMS issues shall be reported to the Buyer. Notification of a potential DMS issue shall be provided to the Buyer within seven (7) working days of its identification. A DMS issue that requires action in less than two (2) weeks shall be reported within one (1) business day.

APPENDIX A: TERMS AND DEFINITIONS

Limited Dimension Drawing - A drawing that has been simplified in that it does not contain a complete set of dimensions. For complete product definition the dimensional information is queried from the model geometry contained in the CAD digital file.

Lot or Batch - Unless otherwise defined by engineering, a collection of material compounded at one time or during one continuous, uninterrupted process, bearing identification and treated as a unique entity.

NOTE: Lot designation shall capture any change in special processes (e.g., heat treat, chemical processing, plating, welding, etc.) when a separate lot number has been assigned to document the process. (Example: A single lot of raw metal that is split into two heat treat lots, the Supplier shall identify them uniquely and not combine them into a single lot number.

Off the Shelf Material - A material or item typically made to-stock, for general sale throughout the industry, and thereafter sold to multiple customers under the Supplier's internal designation or multiple

customer specifications. This shall include cases where an entire manufacturing run is allocated to Northrop Grumman order, if the material is typically made to-stock. This shall not include materials made on a per-order basis, even if multiple customer orders and/or specifications are combined in a single manufacturing run.

Partially Defined Drawing (PDD) - A drawing that has been simplified in that it does not contain a complete set of dimensions. For complete product definition the dimensional information is queried from the model geometry contained in the CAD digital file.

APPENDIX B: APPLICABLE DOCUMENTS

GOVERNMENT DOCUMENTS

The following documents of the issue in effect on date of invitation for bids or request for proposal form a part of this specification to the extent specified.

STANDARDS

National Aeronautics and Space Administration (NASA) standards.

NASA-SPEC-5004, Welding of Aerospace GSE and Related Nonconventional Facilities
NASA-STD-5006, Fusion Welding for Aerospace Materials used in Flight Hardware
MIL-STD-1916, Test Method Standard, DOD preferred methods of acceptance of Product
(Copies of specifications, standards, drawings and publications required by Suppliers in connection with specific procurement functions should be obtained from the contracting agency or as directed by the contracting officer.)

NON-GOVERNMENT DOCUMENTS

The following documents, of the latest approved issues unless otherwise specified, form a part of this document to extent specified herein.

SPECIFICATIONS

American Welding Society (AWS)

AWS D17.1	Fusion Welding for Aerospace Applications, Specification for
AWS B2.1	Welding Procedure and Performance Qualification, Specification for
AWS B2.2	Brazing Procedure and Performance Qualification, Specification for
AWS C3.3	Design, Manufacture, and Examination of Critical Brazed Components, Recommended Practices for
AWS C3.4	Torch Brazing, Specification for
AWS C3.5	Induction Brazing, Specification for
AWS C3.6	Furnace Brazing, Specification for
AWS C3.7	Aluminum Brazing, Specification for

(Application for copies should be addressed to American Welding Society, 550 N.W. LeJeune Road, Miami, Florida 33126.)

STANDARDS

Aerospace Industries Association of America Inc. (AIA/NAS)

AIA/NAS 410 NAS Certification & Qualification of Nondestructive Test Personnel
NAS412 Foreign Object Damage/Foreign Object Debris (FOD) Prevention
(Application for copies should be addressed to Aerospace Industries Association of America Inc., 1000 Wilson Blvd Suite 1700, Arlington VA, 22209.)

American National Standards Institute (ANSI)/American Society for Quality (ASQ)

ANSI/ASQ Z1.4 Sampling Procedures and Tables for Inspection by Attributes

ANSI/ASQ Z1.9 Sampling Procedures and Tables for Inspection by Variables for Percent Non-Conforming

(Application for copies should be addressed to American National Standards Institute, 11 West 42nd Street, New York, NY 10036.)

American Society of Mechanical Engineer (ASME)

ASME Section I - X Boiler and Pressure Vessel Code

(Application for copies should be to Global Engineering Documents (800-854-7179)

American Society for Nondestructive Testing (ASNT)

ASNT-TC-1A Qualification of Nondestructive Testing Personnel, Recommended Practice

(Application for copies should be to Global Engineering Documents (800-854-7179)

American Society for Quality (ASQ)

ANSI/ISO/ASQ Q9001-2008 Quality Management Systems- Requirements

(Application for copies should be addressed to the American Society for Quality, P.O. Box 3005, Milwaukee, WI 53201-3005.)

International Organization for Standardization (ISO)

ISO 10012 Measurement Management Systems - Requirements for Measurement Processes and Measuring Equipment

ISO 90003 Software Quality Management Standard

(Application for copies should be addressed to International Organization for Standardization)

National Conference of Standards Laboratories (NCSL)

NCSL Z540.1 HDBK Handbook for the Interpretation and Application

NCSL Z540.3 Calibration of Measuring and Test Equipment – Requirements for

(Application for copies should be addressed to the National Conference of Standards Laboratories, 1800 30th Street, Suite 305B, Boulder, CO 80301.)

Society of Automotive Engineers (SAE) International

AS9100 Quality Management Systems - Aerospace Requirements

AS9120 Quality Management Systems - Requirements for Aviation, Space and Defense Distributors

AS9003 Inspection and Test Quality System

AS9103 Variation Management of Key Characteristics

(Application for copies should be addressed to SAE International Headquarters, 400 Commonwealth Drive, Warrendale, PA 15096-0001.)

Capability Maturity Model Integration (CMMI) Institute

CMMI Capability Maturity Model Integration

(Application for copies should be addressed to CMMI Institute, 11 Stanwix Street, Suite 1150, Pittsburgh, PA 15222).

OTHER PUBLICATIONS

Northrop Grumman Aerospace Systems

GPI000036	Black Teflon Application
SP-V-GF-3.1.1	Teflon Application
S-0004	Black & Green Teflon Application
TER-01001	Manufacture of Special Tooling and Equipment, Workmanship and Shop Practice Standard for

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APPENDIX C: DOCUMENT CHANGES

Document Changes*

Revision	Changes
04-2013	Document initial release
08-2014	1. New: QQR20: POM (Polyoxymethylene) RISK MITIGATION 2. Change: Renumbered paragraphs from QQR20 – QQR23 to QQR21 – QQR24
04-2015	1. Change: All references from "ATK" changed to "Orbital ATK" to reflect the merger 2. Change: QQR8: RETENTION OF RECORDS 3. New: QNC6: SUSPENSION OF PRODUCTION/PROCESSING 4. Change: QSP1: SPECIAL PROCESSES 5. Change: QSP15: WELDING 6. Change: QSP17: CRITICAL/SEMI-CRITICAL WELD DOCUMENTATINON 7. Change: QSP19: WELD DOCUMENTS REQUIRED PRIOR TO FABRICATION (2) 8. Change: QSP21: WELD DOCUMENTS REQURIED WITH SHIPMENT (2) 9. Change: QSP22: NON-CRITICAL WELD DOCUMENTION 10. Change: QSP23: VISUAL WELD INSPECTION REPORT 11. Change: QSB15: CERTIFICATION OF MATERIAL CONFORMANCE 12. Added Appendix C: Document Changes
01-2016	1. Change:QEB1: QEB1: ELECTRICAL PARTS AND ASSEMBLIES AGE CONTROL 2. Added: QFC9: RED PLAGUE CONTROL PLAN (RPCP)
02-2017	1. Change: QQS1: QUALITY SYSTEM PER PURCHASE AGREEMENT 2. Change: QQS6: AS9100 3. Change: QQS7: AS9100 CERTIFICATION 4. Change: QMT1: CALIBRATION 5. Added: QMT4A: ISO/IEC 17025: CALIBRATION- Electromagnetic – DC/Low Frequency 6. Added: QMT4B: ISO/IEC 17025: CALIBRATION- Electromagnetic – RF/Microwave 7. Added: QMT4C: ISO/IEC 17025: CALIBRATION- Time and Frequency 8. Added: QMT4D: ISO/IEC 17025: CALIBRATION- Thermodynamic 9. Added: QMT4E: ISO/IEC 17025: CALIBRATION- Mechanical 10. Added: QMT4F: ISO/IEC 17025: CALIBRATION- Dimensional 11. Added: QMT5A: ANSI/NCSL Z540.1-1994 12. Added: QMT5B: ANSI/NCSL Z540.2-1997 13. Added: QMT5C: ANSI/NCSL Z540.3-2006 14. Added: QPR11: GOVERNMENT AND INDUSTRY STANDARDS 15. Changed: QSP8: INSPECTION REPORT (NDE SPECIAL PROCESSES) 16. Changed: QSP9: INSPECTION REPORT DETAIL (ALL SPECIAL PROCESSES) 17. Changed: QSP19: WELD DOCUMENTS REQUIRED PRIOR TO FABRICATION (2) 18. Changed: QSP29: CABLE AND WIRE HARNESS ASSEMBLIES 19. Changed: QIN9: SAMPLING NOT PERMITTED WITHOUT ORBITAL ATK APPROVAL 20. Changed: QCO10: GSI 21. Changed: QFS3: FASTENERS PER NASA/GSFC 541-PG-8072.1.2 OPTION 1 22. Changed: QFS4: FASTENERS PER NASA/GSFC 541-PG-8072.1.2 OPTION 2
03-2018	1. Added: QCO10A: GSI POTENTIAL GSI REQUIREMENT

*Note: Current revision changes are highlighted in blue, within the body of the text.