QUALITY ASSURANCE PROVISIONS FOR PURCHASE ORDERS WITH CIRCOR ON THE SM-3 TSRM PROGRAM

Scope. The purpose of this document is to provide the needed descriptions of quality flow-down requirements for the SM-3 program from Raytheon to Northrop Grumman Innovation Systems (NGIS) Elkton to Circor. The NGIS quality assurance requirements listed below with the sub-listed items are required to meet the requirements flowed down by Raytheon and NGIS. This document is a part of every Purchase Order from NGIS Elkton to Circor. Additional Quality Assurance Provisions may be called out on the purchase order on a case by case basis. Articles defined in the purchase order will not be accepted if certifications, documentation, test data, or reports specified herein are not submitted.

The intent is not to change anything, either in product or documentation, which Circor does or has been doing when delivering the CGR to Honeywell. The same documentation will still be delivered to Honeywell as part of the CGR Sub-assembly, P/N 3255314-11-900.
001, No Process Change Policy
This clause supplements the Product Changes/ Part Obsolescence clause of the Purchase Order Terms and Conditions:
Upon notification of product changes as required by the Product Changes/ Part Obsolescence clause of the Purchase Order Terms and Conditions, NGIS will provide written acknowledgement of the notification, and when processes are approved by NGIS (e.g. by incorporation of 01Q005 or 01Q005A in the purchase order), approval of the change.
Notwithstanding NGIS approval of changes to processing or inspection parameters, the supplier remains responsible for meeting all purchase order requirements.
This clause does not apply to "Commercially available off-the-shelf (COTS) items" as defined in FAR 2.101, Definitions.

002, General Quality Assurance Provisions
This document establishes general requirements for product assurance that are applicable to items ordered under the purchase order of which these provisions form a part. These provisions are intended to assure that the procured items meet the quality and reliability requirements of NGIS and our customer, and apply unless expressly excluded or superseded in the purchase order. Additional Quality Assurance Provisions (QAPs) may also apply as designated in the purchase order.
Foreign Object Damage Prevention (FOD)
The supplier shall ensure that Foreign Object Damage (FOD) is controlled with the aim of preventing damage or degradation of the deliverable item, or of creating a hazardous condition to users of the deliverable item. Techniques that have been proven effective for control of FOD include: proper housekeeping; control of tools, personal items, and facilities; control of in-process hardware and consumables, including in-process scrap; kitting; and use of parts protective equipment.
Correspondence
All correspondence relating to particular articles shall reference the specification(s) and/or drawings(s) (including number and revision) and the purchase order number. All correspondence shall be directed to the procurement division of NGIS.
Conflict in Instructions
In the event of apparent conflict among the purchase order provisions, the supplier shall obtain clarification from the procurement division of NGIS as to the exact interpretation of requirements. Failure to obtain clarification may subject the procured articles to rejection.
Responsibility for Compliance
The inspections set forth in the drawings and specifications shall become part of the supplier's overall inspection system or quality program. The absence of any inspection requirements in the drawings or specifications shall not relieve the supplier of the responsibility of assuring that all products or supplies submitted to NGIS for acceptance comply with all requirements of the purchase order. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit NGIS to acceptance of such defective material.
Supplier Qualification
Upon NGIS acceptance of first article inspection or first piece(s) inspection (as required), supplier is restricted to use only those suppliers of materials, components and services (i.e., sublet machining, molding, forming, etc.) that participated in the initial contract qualification. Supplier's quality program shall maintain a listing of these suppliers, corresponding to the product or service they provide, including the associated drawing or specification by which the material or service is controlled. At time of purchase, the supplier's quality program shall assure that only those suppliers who are qualified and contained in the listing are used for follow-on purchase.

Any change in supplier participation that deviates from these qualified suppliers shall be requested in writing from NGIS.

Special Tooling and Special Gages and Equipment
Special tools and special gages and equipment which are used for dimensional control and acceptance in lieu of inspection by standard methods or standard gages and equipment shall be designed and maintained to assure repetitive compliance to governing drawings within the specified tolerance zone(s) of the dimension(s) being controlled or accepted.

Discrepant and Nonconforming Articles
The supplier is not granted material review board (MRB) privileges on this purchase order/subcontract. Nonconforming articles shall be withheld from subsequent manufacturing operations until written authorization for use or shipment is received from NGIS. Unless authorized in writing by NGIS, repairs utilizing any process or equipment not used in the normal manufacturing process for the item/material are strictly prohibited. Examples include but are not limited to:

1. Weld repairs where welding is not part of the normal process;
2. Using plating or chemical etching to modify component dimensions if not part of the normal process;
3. Installing plugs, bushings, thread inserts, etc. when not specified on the drawing.

Requests to use or deliver nonconforming materiel will be made to the buyer. The request shall include complete details of the discrepancy. An explanation of the root cause, and a statement of the corrective action proposed to prevent recurrence will be submitted with the request or within a reasonable time thereafter.

If a Quality Assurance Representative (QAR) is servicing the supplier's facility, the QAR will review the request prior to submittal for clarity of discrepancy. The QAR should review root cause and corrective action proposals prior to submittal.

Upon completion of material review board consideration, Buyer will forward the disposition to the supplier. If the buyer authorizes further processing of the discrepant materiel, the supplier’s records and the certification package will reference and include a copy of such authorization. No discrepant material will be shipped by the supplier, except with the buyer’s written authorization.

Resubmission of Rejected Articles
All articles, including associated documentation, rejected by NGIS and subsequently reworked to drawings, specifications, etc., shall bear indication of each resubmission. The accompanying documentation (discrepancy report, corrective action report, re-inspection data, etc.), as required, shall be identified in the same manner as the article. The supplier
shall contact the NGIS procurement division for identification of articles submitted as replacement(s) for NGIS rejected and supplier scrapped articles.

Packaging
When the drawing, specification, or purchase order lacks specific packaging instructions, the supplier shall use best commercial practices to ensure that the quality of the delivered part(s) is maintained and that damage, deterioration, and loss in transit are prevented. Any packaging supplied by NGIS shall be reused to the maximum extent possible. If supplied packaging is degraded or cannot be re-used, the material supplied on this order shall be packaged as specified elsewhere in this order. Damage to specially-fabricated shipping containers shall be reported to the buyer before any repair is attempted. Packaged items shall be free of dirt and other contaminants that would contribute to deterioration of the item or which would require cleaning by NGIS prior to use. Items susceptible to corrosion or deterioration shall be provided protection such as preservative coatings, volatile corrosion inhibitors, or a desiccated environment. Items requiring protection from physical and mechanical damage, or which are fragile, will be protected by wrapping, cushioning, or other means to mitigate shock and vibration, and to prevent damage during handling and storage. Cushioning or wrap can be any suitable, appropriate material; except newspapers may not be used when painted surfaces are involved. Partitions or divisions must be used when necessary. Items susceptible to damage by Electrostatic Discharge (ESD) shall be packaged in antistatic bags of conductive carbon ("black poly") or antistatic bags per MIL-PRF-81705 Type III. All external and internal packaging shall be properly identified with “ESD Sensitive Item” labels. Transparent “pink poly” bags or material shall not be used where the material can come into direct contact with the product.

Failure Report
NGIS will be notified within 24 hours of any material, component, tooling, or motor case failure during manufacturing or testing. In addition, the supplier will submit to NGIS written failure reports within 72 hours of any failure. Failure reports will identify the failed item by serial number, part number and applicable revision letter. The supplier will submit a failure analysis and corrective action report to NGIS within 15 days of any failure. The report will include, as a minimum, the mode of failure, cause of failure, corrective action to be initiated, and a list of other parts affected.

Documentation Retention
The supplier will maintain records necessary to show conformance with all requirements of the purchase order/subcontract. These records include dimensional inspection records, process control charts, temperature recorder charts, x-ray film, nondestructive testing records, personnel certification documentation, nonconformance reports, process qualification data, hydrostatic test records, and certifications of materials and special processes. These records will be maintained for a minimum of 10 years after the date of completion of this purchase order.

003, AS9100 Quality Management System
The material supplied on this contract shall be controlled under a Quality Management System that conforms to all requirements of SAE AS9100 (Quality Management Systems - Requirements for Aviation, Space and Defense Organizations).
004, Source Surveillance
NGIS reserves the right to place Quality Assurance Representatives (QARs) in the supplier's facilities, as deemed necessary, to ensure conformance with contractual requirements in any phase of design, processing, fabrication, testing, and inspection of the article(s) being produced. The supplier shall provide all reasonable facilities and assistance for the safety and convenience of such personnel in the performance of their duties. Such representatives shall be allowed full access to witness all operations involved in the fulfillment of this contract.
The supplier shall grant the same access to representatives of the buyer's customer, when accompanied by NGIS personnel.
The supplier shall secure the same privileges from lower-tier subcontractors.

005, Right to Access
NGIS, NGIS customer and/or regulatory agencies shall have the right to access the supplier's facility and Quality records during the course of contract or purchase order.

006, Government Right of Access
During performance of this order, your Quality Control or Inspection system and manufacturing processes are subject to review, verification and analysis by authorized government representative. Government inspection or release of product prior to shipment is not required unless you are otherwise noted.

007, Subcontracted Special Processes
All special process suppliers used in the performance of this purchase order shall be approved by NGIS. If the supplier elects to utilize special process sources other than those on buyer's approved supplier list, the supplier shall provide evidence of approval by another NGIS aerospace facility or perform a survey using a survey questionnaire acceptable to NGIS and forward it to the buyer for approval. The supplier shall have required approval(s) in place at the time of hardware processing.
The supplier is encouraged to submit the name(s) of intended special process suppliers to the buyer for consideration at the earliest practicable time. Form F11021 available on the NGIS website should be used for this purpose.
The certification package shall include the approved Form F11021 approving the use of the selected special process supplier.
Special processes include but are not limited to: heat-treating; plating, passivation, and application of surface finishes; nondestructive test (NDT) (radiographic, magnetic particle, penetrant, and ultrasonic inspection); welding, soldering, and brazing.
008, Flowdown Requirements
The supplier is responsible for compliance with all quality and technical requirements imposed by NGIS even when the supplier subcontracts part of the work. The supplier’s responsibilities with respect to subcontracted work include:
- Transmission (flow down) of applicable quality and technical requirements to subtier suppliers
- Flow down of this provision to their subtier suppliers and verification that this provision has been properly implemented.
- Selection and control of subtier suppliers, unless otherwise specified in the purchase document.
- Assuring traceability of items processed through subtier suppliers
It is the supplier's responsibility to assure that the purchase order to the subtier supplier requires sufficient acceptance data to clearly fulfill the requirements imposed by the NGIS purchase order to the supplier.

009, Approval of Planning including Non Destructive Testing (NDT)
Prior to fabrication of any deliverable item, the supplier shall provide, for buyer approval, the planned manufacturing, testing, and inspection procedures to be used in the fulfillment of this purchase order/subcontract. These procedures shall include, as applicable, drawings of special tooling that may be used for dimensional acceptance and plans for performing tests on raw, semi finished, and/or finished materials, including special inspection process techniques to be approved by an NDT Level III at NGIS. These procedures must document all operations that will be performed in conjunction with the fulfillment of this contract. Buyer approval of plans referenced above shall not be required if the plans have been approved on a previous contract. A list of the previously approved documents that will be used, including the document title, name, revision, and approval reference, shall be submitted to the NGIS Quality Assurance Representative (QAR), if in residence, and to the buyer prior to use.
Any changes to the approved planning must be submitted to the buyer. Changes that affect the stated requirements of the part (Class I changes) shall be approved by the buyer prior to implementation. All other changes (Class II changes) shall be submitted for concurrence in classification, and may be implemented immediately at the supplier's risk.

010, Supplier Shelf Life Control
Inspection acceptance records and environmental control limitations of materials employed in the manufacture of the end item designated must indicate as a minimum: material, specification (s), lot number, purchase order number, inspection acceptance markings, shelf-life limitations, and storage conditions as recommended by manufacturer or required by specification. Supplier shall systematically control materials to ensure acceptability for use and to prevent nonconforming materials from being incorporated into the end item.
011, First Article Inspection (FAI)
A first article inspection, meeting the requirements of AS9102, is required to establish; compliance with governing drawings, specifications, processes, and procedures to be employed, and specific program requirements for the control of quality that will assure the acceptability of the articles. The supplier shall notify NGIS, through the procurement division, ten (10) days prior to first article inspection, so that the number of first articles required shall be established. At this time, NGIS may elect to send a representative to visit the supplier's facilities to evaluate the quality program and perform or witness first article inspection. If NGIS decides to waive this right, the supplier shall, upon request, forward the directed number of first articles (identified accordingly) along with inspection results (by variables data) and any additional substantiating documentation to NGIS. NGIS reserves the right to perform a first article inspection and notify the supplier of the acceptance, conditional acceptance, or rejection of the first article(s). The notice of acceptance or conditional acceptance shall not relieve the supplier from complying with all requirements of the specifications, drawings and all other terms and conditions of this purchase order. In the event first article is discrepant additional first article samples will be required prior to release for production. Shipment of production articles will not be received by NGIS pending the acceptance of the first article. Any production effort prior to NGIS authorization will be at supplier's risk.

A new first article inspection shall be required when:
• A significant design or process change has been made that affects the original first article and is applicable only to those characteristics affected by the change.
• The item has not been produced for a period of 12 months.
• A change in facilities utilized to produce the article has taken place.
• New, damaged, reworked or revised special tools, gages or equipment, when dimensional control of manufactured articles is affected.

First article inspection data sheets, AS9102
The supplier must signify conformance to requirements of drawings and specifications by executing the “first article inspection data sheets”, signed by an authorized representative of supplier's facility. These sheets and any required documentation must be included with each shipment. Note that no alterations are permitted to the inspection data sheets. Every item must be completed as required. Initialed data corrections are permitted. Material cannot be accepted by NGIS unless the inspection data sheets and any required certifications are complete and correctly executed.
The supplier and subtier supplier through the supplier, if applicable, shall be responsible for meeting all requirements of drawing(s) and specifications. Actual acceptance inspection and test results must be maintained in supplier's files, subject to examination, indicating inspection, acceptance, and traceability of materials incorporated in the end item in accordance with governing drawings and specifications.

012, Inspection
Nondestructive inspection, and inspection of critical and major characteristics as defined on the drawing, will be performed on each piece. Minor characteristics may be inspected 100% or may be sample inspected in accordance with ANSI Z1.4, Single sampling, General
Inspection Level II, Normal Inspection. The AQL shall be chosen such that AC=0, RE=1. An attribute that is sample inspected and found discrepant shall be 100% screened. The supplier is to perform dimensional inspection and record the results. Actual dimensions are to be recorded and reported for each piece inspected. The supplier is responsible for meeting all dimensional requirements of the drawing.

013, Foreign Object Damage (FOD) Prevention
The subcontractor shall establish procedures to implement a Foreign Object Damage (FOD) Prevention program using NAS412 as a guideline. The program shall be proportional to the sensitivity of the product(s) design to FOD, as well as, to the FOD generating potential of the manufacturing methods. Existing subcontractor practices and procedures that meet specific requirements shall be documented and submitted to the buyer for review and concurrence. The procedures shall include the following elements as a minimum:

• Guidance on practices that, when followed, will eliminate damage caused by foreign objects during manufacturing, rework, and assembly and test, including but not limited to:
  o Inspection of materials and components on receipt at the work station for cleanliness and damage, and ensuring that they are clearly and properly identified;
  o Continual cleaning of finished and in-process materials and the surrounding work area as part of the normal in-process work effort;
  o Steps in shop documentation to check for the presence of FOD.
  Wearing attire that is appropriate for the specific work area – by both operators and transients – including removal of all personal items, including jewelry (e.g., rings, watches, necklaces, earrings, badges), and restraining of all eyewear and ear protection;
  o Elimination or limiting FOD-causing processes;
  o A program to prevent tools, accompanying documents, and other items necessary to the manufacture of the item from becoming foreign objects; and
• Ensuring that items not necessary to the manufacture of the item are not introduced into the work area
• Establishment and maintenance of a training program for the FOD program.
• Identification of those categories of employees who require FOD training.

014, Serialization
The supplier is responsible for assigning serial numbers as specified on the drawing. Serial numbers shall be unique across all purchase orders. Serialization to be in accordance with (IAW) Honeywell drawing 3255328-4.

015, Certification of Conformance
A Certification of Conformance is required with shipment. The certification shall include, for each item covered by the certification, the following minimum information:
• Purchase order number

• Part number and revision of the item supplied, as specified on the purchase order
• Serial or lot numbers covered by the certification (as applicable)
• A statement that the certified item meets all drawing, specification, and/or purchase order requirements
• Signature of the Quality Assurance Manager or other responsible member of the supplier’s company (a typed name with title on a computer generated document is an acceptable substitute for signature).
• The title of the person signing.
• The suppliers name and address
• Manufacturers name and address if different from seller

Material received without certification is subject to rejection and return to the supplier at the supplier's expense.

**Note:** Test reports or other supporting documents generated from a computer system with a statement of validity without additional signatures will be accepted providing the certificate portion of the data packet is signed or stamped as outlined above.

### 016 Process Documentation Revision Statement
A listing of applicable Process Documents and their respective revision levels shall be included with the Certificate of Conformance in addition to the standard requirements specified in Quality Assurance Provision 01Q010. The listing shall include reference to the NGIS document approving each listed Process Document. The term Process Document includes Work Instructions, Travelers, Planning Documents, Routings, and Test Procedures.

When the Supplier utilizes NGIS approved subcontracted special process suppliers in the performance of this purchase order, a listing of those Process Documents with revision level along with the NGIS approval reference shall be included with that Certificate of Conformance.

### 017, Drop Shipments Required
The material (product) purchased on this order is to be shipped to other than the buyer's facilities. Prior to shipping the product(s) on this order the supplier shall complete Form 98030 (Authorization to Ship) and send it to the Buyer's designated receiving department, as defined on the form, with all the copies of the packing list, quality record sheets, certifications, source inspection acceptance, and other product assurance data required by this order. The supplier must assure traceability, by serialization or lot number(s), of materials (including CFM) through their process and to the drop shipment destination.

Supplier is not authorized to ship material until the NGIS-approved Authorization to Ship form is received from the buyer. Supplier shall retain a copy of the approved form and include a copy of the approved form with the shipping documentation to the "ship to" destination of this purchase order. The supplier shall notify the buyer when shipment has been made. NGIS advance review and approval will not in any way reduce the supplier’s responsibility for complete conformance to contractual requirements.

Form F98030 (Authorization to Ship) is available from the buyer and from the NGIS website.
018, Supplier’s Calibration System
The supplier shall control all inspection and test equipment used for acceptance of deliverable items covered by this PO in accordance with ANSI-Z540-1, ANSI-Z540-3 or ANSI/ISO/IEC 17025. Test reports and or certificates shall be submitted with the shipment and shall be in compliance with the associated calibration system requirement. A supplier that manufactures and/or calibrates specialized inspection equipment and is not accredited to one of the above calibration standards may, upon approval by the NGIS buyer, calibrate such equipment if (1) the standards used are NIST traceable, (2) the calibration process is defined and standardized, and (3) the resulting certifications or reports are essentially comparable to one of the above standards. The supplier’s calibration system is subject to review and approval by NGIS Quality Assurance at all times during the performance of the PO.

019, Domestic Source Required
This item must be produced by a domestic manufacturing source. This includes any raw material used in the manufacturing of the end item. The certification shall identify the original manufacturers and their lot numbers for each lot in the shipment. Multiple lots within a shipment shall be kept separate and clearly identified as to the original manufacturers and their lot numbers.

020, Traceability
Parts, components and materials included in the deliverable product will be traceable to their source and to all available objective evidence of acceptability. Parts will be identified with the part number (including dash number), revision, and serial number and/or lot number.

021, Software and Firmware Quality Control Program
The subcontractor shall have a process to control the quality of software and/or firmware to produce and/or test delivered products. The subcontractor shall be able to show that the software and/or firmware process provides mechanisms for correctness verification of the software and/or firmware, as well as providing configuration control of the software and/or firmware. The subcontractor shall insure that only properly approved versions of the software and/or firmware are available for testing delivered products.

022, Pure Tin Finishes
Electronic, electrical, electromechanical and mechanical piece parts and assemblies, including the internal fabrication of hardware, delivered under the provisions of this purchase order shall not have pure tin finishes. Any tin-lead plating or solder process/processing shall result in a finish of no less than 3% lead composition. This applies to component leads and terminations, carriers, bodies, cages, brackets, housings, mechanical items hardware (nuts, screws, bolts), etc. The supplier shall provide a statement of compliance to this provision via the Certificate of Conformance (C of C)
with each shipment. The supplier shall be responsible for managing compliance with this requirement with sub-tier suppliers, and provide evidence of the appropriate flow-down and management of this requirement to the satisfaction of the buyer.

023, Alerts and Advisories
The supplier shall participate in GIDEP in accordance with MIL-STD-1556, GIDEP Contractor Participation Requirements. The supplier shall assure that substandard products are not used in hardware provided to NGIS, by taking corrective action in response to Alerts, Safe-Alerts, Problem Advisories and Product Change Notices in all instances where there is an impact on this purchase order. The supplier shall respond to NGIS requests for information regarding MDA or other customer advisories as required.

024, Training and Certification
The supplier shall implement and maintain training and certification programs, as required, based on the type of hardware manufactured and operations performed to ensure that personnel have the necessary skill and knowledge to perform their assigned duties.

025, Risk Management and Metrics
Supplier shall establish and maintain a risk management program to continuously identify, analyze, mitigate, monitor, and report systems engineering process, product, technology, cost, schedule and other program risks as deemed necessary by the product manufactured. Supplier shall notify NGIS buyer of any known risks and the mitigation taken for tracking purposes by NGIS. Results of the risk management process shall be used for continuous improvement and risk reduction. NGIS representatives will be allowed to review at their discretion.

026, Soldering
Soldered devices shall comply with the requirements of IPC/EIA J-STD-001E Class 3, as modified below, unless otherwise specified on the Purchase Order

a. Solder alloys Sn60Pb40, Sn62Pb36Ag2, and Sn63Pb37, shall be in accordance with J-STD-006.

b. Solder alloys other than Sn60Pb40, Sn62Pb36Ag2, and Sn63Pb37 shall not be used for electrical and electronic assembly soldering unless otherwise specified on the drawing or purchase order.

c. 100% X-Ray inspection shall be performed on Ball Grid Arrays (BGAs) and Bottom Terminated Components (BTCs) and components with Bottom Thermal Plane Terminations (D-Paks) unless they are part of a documented process control program approved by NGIS and noted on the purchase order.

d. When NiPdAu (nickel / palladium / gold) is used as a surface finish where the gold is applied either through electroless or electrolytic processes resulting in over 8 micro inches of gold, there shall be objective evidence, made available for review, that there are no gold related solder embrittlement issues.
027, Government Source Inspection
If QAP 01Q003 is imposed on the purchase order, these requirements will be issued by the NGIS Elkton DCMA office to the Government inspection office servicing the supplier's facility.

028, Supplier Assessment
The deliverable output is a Supplier generated Supplier Requirements Compliance Matrix (SRCM) (supplier format acceptable). The SRCM is intended to provide objective evidence that the supplier will comply with all purchase order requirements, including but not limited to: Technical Data Package requirements, Quality Assurance Provisions, delivery and schedule expectations, and terms and conditions.