



SUPPLIER QUALITY REQUIREMENTS	
Author: Central Supplier Quality	Issue Date: October 7, 2019 Effective Date: January 7, 2020

1.0 PURPOSE/SCOPE

The requirements herein are supplementary to AS/EN/JISQ9100, AS/EN/JISQ9120 and ASQR-01 Aerospace Supplier Quality System Requirements. These requirements are applicable to Collins Aerospace suppliers who furnish product, material, processes and services, as cited by the Collins Aerospace Purchase Order or any other additional contractual requirements. Collins Aerospace businesses may apply additional requirements as needed. The latest revision of this document shall always be applicable.

2.0 RESPONSIBILITY

- 2.1 When this document is referenced on the Collins Aerospace or their affiliates purchase orders or other contractual documents, suppliers are responsible for compliance to all requirements herein.
- 2.2 It is the responsibility of the supplier to ensure that all applicable UTC and Collins Aerospace contract requirements are flowed to their sub-tier suppliers.

3.0 REFERENCES

- AS9100 – Aerospace Standard Quality Management Systems
- AS9102 – Aerospace First Article Inspection Requirements
- AS13003 – Measurement Systems Analysis
- ASQR-01– Supplier Quality System Requirements
- ASQR-20.1– Supplier Sampling Requirements

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ASQR-09.2 – United Technologies Production Part Approval Process

ASQR-01 Form 2 – Change Notification

ASQR-01 Form 3 – Supplier Communication

ASQR-01 Form 4 – Work Transitions

ASQR-01 Form 6 – NOPQE

UTCQR-09.1 – **Process Control Requirements**

COL-FRM-0054 – Action Response Supplier Corrective Action Request

COL-FRM-0055 – Containment Supplier Corrective Action Request

Note – For **UTC documents** visit: <https://www.utc.com/en/suppliers/aerospace-supplier-quality-requirement-documents>. For Collins documents visit: <https://utcaerospacesystems.com/supplier-documents/>

4.0 Acronyms

AAM – Acceptance Authority Media

AOI- Automated Optical Inspection

ASL – Approved Source List

ATP – **Accepted/ Approved/ Automated Test Process/ Plan**

ATR – Authorize to Release

BOM – Bill of Material

C of C – Certification of Conformance

C of C – Certification of Compliance

C of A – Certification of Assurance

CAAC – Civil Aviation Administration of China

COTS – Commercial off the Shelf

CPK – **Process Capability Index**

CTQC – Critical to Quality Control

DQR – Designated Quality Representative

DSQAR – Designated Supplier Quality Assurance Representative

EASA – European Union Aviation Safety Agency

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FAA – Federal Aviation Administration

FAI – First Article Inspection

FOD – Foreign Object Damage

GIDEP – Government-Industry Data Exchange Program

HAZCOM – Hazard Communication

KPC – Key Process Characteristic

MPR – Manufacturing Process Review

MRB – Material Review Board

MSDS – Material Safety Data Sheet

Nadcap – National Aerospace and Defense Contractors Accreditation Program

NDT – Non- Destructive Testing

NOPQE – Notification of Potential Quality Escape

OCM – Original Component Manufacturer

OEM – Original Equipment Manufacturer

PFMEA – Process Failure Mode & Effects Analysis

PPK – Process Performance Index

PQR – Product Quality Report

QMS – Quality Management System

QN – Quality Notification

RPN – Risk Priority Number

SBU – Collins Strategic Business Unit

sFAI – Statistical First Article Inspection

SIP – Sustainable Improvement Plan

SPC – Statistical Process Control

SRI – Supplier Request for Information

SQA – Supplier Quality Authority

ZDP™ - Zero Defect Plan™

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5.0 REQUIREMENTS

5.1 GENERAL QMS REQUIREMENTS

5.1.1 Suppliers and sub-tiers shall follow all requirements within this document unless specifically authorized by the Collins Aerospace SBU. Exception requests or alternatives shall be submitted per ASQR-01 Form 3, the Supplier Request for Information (SRI) process.

5.1.2 When sourcing a Collins Aerospace designed part through distribution and the source is not designated on the drawing, the distributor shall ensure the product is procured from a current Collins Aerospace approved supplier. Approved Collins distributors can be found on the UTC Qualified Distribution List located at <https://www.utc.com/en/suppliers/aerospace-supplier-quality-requirement-documents>.

5.2 ORDER OF PRECEDENCE

5.2.1 In the event there is a requirement that appears to be in conflict with any other requirement, the supplier shall contact Collins Aerospace for clarification using ASQR-01 Form 3.

The order of precedence for documents is as follows:

- 1) Contract (i.e. Purchase Order, Long Term Agreement)
- 2) Drawing Referenced on PO
- 3) Collins Aerospace Specifications Referenced on Drawing
- 4) Industry Specifications Referenced on Drawing

5.3 RECORD RETENTION

5.3.1 Record retention shall be per ASQR-01 requirements and any applicable regulatory requirements (e.g., FAA TSO, CAAC, EASA)

5.3.2 If the supplier ceases business with Collins Aerospace, or the supplier is unable to maintain the quality records, the supplier shall provide the option for Collins Aerospace

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to take possession of the records. Quality records are not to be destroyed without written approval from Collins Aerospace.

5.3.3 Quality records approved for destruction shall be rendered unreadable.

5.4 ACCEPTANCE AUTHORITY MEDIA (AAM)

5.4.1 The supplier shall, within its organization and its supply chain, ensure that the use of Acceptance Authority Media (AAM) (e.g., Stamps, electronic signatures, passwords) is clearly defined within its Quality Management System (QMS). The supplier shall also be able to demonstrate, on request objective evidence of communication to their employees and supply chain that use of AAM shall be considered as a personal warranty of compliance and conformity.

Suppliers shall maintain compliance to the AAM requirements by assessing processes and supply chain as part of their internal audit activities. The areas of focus of this assessment shall include but not limited to:

- AAM application errors (e.g., omission, typos, legibility)
- AAM application untimely use (e.g., documentation is not completed as planned, “stamp/sign as you go”)
- AAM application misrepresentation (e.g., uncertified personnel, falsification of documentation, work not performed as planned)
- AAM application training deficiencies (e.g., ethics, culture awareness, proper use of authority media)

5.5 QUALITY ALERTS/GIDEP ALERTS

5.5.1 Quality Alerts are used to communicate pertinent quality related issues or other approved information to suppliers and/or processors.

Requirements defined within an Alert are amendments within the applicable Collins Aerospace SBU flow down requirements and will typically include an effective date.

Suppliers shall perform the following upon receipt of alerts:

- Review the requirements listed in the alert

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- Determine contractual impact (if any) to the alert
- Notify the applicable buyer of any potential impact.
- Take necessary actions to ensure compliance to requirements
- Respond as outlined in the alert

Government/Industry Data Exchange Program (“GIDEP”) Alerts covering product delivered directly or indirectly to Collins shall be actioned per the requirements within the Alert correspondence, and Collins informed of status whether they come through a Collins Aerospace SBU or through a supplier’s supply chain. (<http://www.gidep.org/>). Collins supply chain members shall be a GIDEP member and ensure alerts are actively monitored and addressed.

5.6 CONTROL OF NONCONFORMING PRODUCT

- 5.6.1 Suppliers without MRB authority formally approved by Collins Aerospace SBU/site shall follow the SBU’s requirements of dispositions and control. Suppliers are not authorized to disposition nonconforming product (including supplier Use-As-Is dispositions)
- 5.6.2 Collins Aerospace acknowledges suppliers with MRB authority via Collins Aerospace SBU letter of delegation. The terms and conditions listed in the letter of delegation shall be accepted in writing by the supplier, is subject to audits, and should be withdrawn at any time.
- 5.6.3 Suppliers are responsible for administrative costs incurred by Collins Aerospace associated with the review and disposition of Supplier- manufactured nonconforming product.
- 5.6.4 Confirmed supplier non-conformances (escapes) found within Collins Aerospace manufacturing processes or Collins Aerospace customers should be assessed and debited for each occurrence.

5.7 CHANGE MANAGEMENT

- 5.7.1 Suppliers shall have a documented process to manage change for product and processes. The change management process, at a minimum, shall include the following elements:
- a) Change documentation, including configuration control of manufacturing work instructions
 - b) Evaluation of risk

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- c) Risk mitigation action plans
- d) Product validation plans
- e) Collins Aerospace notification via ASQR-01 Form 2
- f) Submit method of validation along with Form 2

Note – The following is a list of changes that should affect product quality and require notification by ASQR Form 2. This list is not all encompassing and suppliers shall assess all changes for applicability

- Production from new, relocated or modified tools (except perishable tools), dies, patterns, etc., including additional or replacement tooling.
- Production following refurbishment tooling or equipment.
Refurbished equipment includes, but is not limited to: Controls are upgraded or changed; power source is changed, including electrical or mechanical drive or motion control; any change of devices that provide a force.
- Production at the same plant that is being performed with new tooling and equipment or tooling and equipment transferred from another plant.
- Change of subcontractors for special processes, **not listed on the approved special process list**, (e.g., heat treating, plating, etc.) listed in 5.14.1
- Any changes to special process parameters.
- Relocation of equipment within a facility.
- Change in test/inspection methods – new technique (no effect on acceptance criteria).
- Production produced after tooling has been inactive for volume production for **greater than 24 months**.

5.7.2 For supplier planned work transfers, the supplier shall request approval from each impacted Collins Aerospace SBU/site, along with their transition and risk mitigation plans in accordance with ASQR-01 Form 4. **Collins Aerospace shall notify the supplier of the required Engineering Test and Quality Plan actions that are required to ensure the integrity of the product throughout the life cycle of the project and is maintained after the project is complete.** Supplier Work Transfer execution **shall not commence until approval from the affected Collins Aerospace SBUs is received.** **Notification is not required if changing from one source performing a specific special process to another Collins Aerospace approved special process supplier approved for that same process.**

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Suppliers shall ensure all applicable documents and specifications are at the latest revision and available or provided to their sub-tiers. Suppliers shall validate all offloaded features, characteristics and compliance to Collins Aerospace requirements. Offload of work is a work transfer and all requirements shall be met.

5.7.3 Design or process risk assessments created or updated shall have equivalent content and format to **AS13004 Potential Failure Mode and Effects Analysis.**

5.8 OBSOLESCENCE

5.8.1 Suppliers shall provide evidence of an obsolescence management process that includes risk as well as definition of affected or potential parts and assemblies. Suppliers shall provide evidence of compliance per planned internal and external assessments with the supply base.

5.8.2 Notification of any potential, known or planned obsolescence, or if planning to procure obsolescent product shall be submitted on ASQR-01 Form 2 to the affected Collins Aerospace SBU buyer **with sufficient lead time so as not to disrupt schedules.**

5.9 SUPPLIER PROCUREMENT OF SUPPLIER DESIGNED PARTS

5.9.1 All changes to supplier designed material will be approved by Collins prior to incorporation, or as modified by prior contractual requirements.

5.9.2 Approval verifies Collins agreement with design and testing concepts for the intended application. Approval does not relieve the supplier of responsibility to meet form/ fit/ function requirements

5.10 SUPPLY OF KITTED PARTS

5.10.1 Where kits of parts are supplied, the supplier shall establish a documented process within the QMS for the Management and Control of Kit Configurations, covering the following requirements:

- Kit to be configured within the Suppliers Bill of Materials system or equivalent.
- Route cards/ picking list established for each Kit

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- Verification of issue status for each part in the Kit
- Provision and control of identification and traceability within the Kit
- Provision of adequately trained personnel
- Items subjected to concession/ production permit action shall be identified with the Collins Aerospace concession number prior to delivery

5.11 CUSTOMER SUPPLIED OR OWNED TOOLING, GAGES AND FIXTURES

5.11.1 Suppliers shall maintain an Accountable Property List to monitor activity and location of customer or government owned tooling/gages/fixtures in their custody.

5.11.2 Suppliers shall notify the SBU prior to any alterations of accountable property and ensure all calibration requirement activities are coordinated with the applicable SBU.

- This list will include both the tooling/gages/fixtures supplied by a facility and the tooling/gages/fixtures fabricated by the supplier to manufacture contracted components but owned by its customer(s).
- The supplier receiving Collins Aerospace owned tooling/gages/fixtures shall return these after purchase order requirements are completed unless written authorization is received from buyer.
- The supplier shall submit a written request and receive a formal approval before any alteration or repair is performed on customer tooling/gages/fixtures **using ASQR-01 Form 3.**
- The supplier is responsible for the repair of all **supplied** tooling/gages/fixtures damaged after receipt by the supplier, and for the preservation of tooling/gages/fixtures which are not in use.
- The supplier is responsible for the replacement or replacement costs of any tooling/gages/fixtures that are lost, damaged beyond repair, or not returned.
- All **supplied** tooling/gages/fixtures in the custody of a supplier are subject to periodic inventory audits and calibration.

5.12 PRODUCT INSPECTION CERTIFICATION

5.12.1 A Certification of Conformance / Compliance (C of C) shall accompany each shipment. A Certificate of Analysis should replace a C of C for raw materials and chemicals that assures conformance to all applicable material specification requirements. **If the SBU utilizes an electronic release system, that shall be used and satisfies the C of C requirement, provided it includes all applicable information required per Table 1 below.**

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- 5.12.2 When required, either an 8130 tag or EASA Form 1 shall be included with the provided hardware.
- 5.12.3 Chemical / Raw material certifications shall reflect actual values (not range), including mill data, and **that the material certifications matches** the drawing, specification requirements including part number and revision.
- 5.12.4 Supplier shall verify product compliance from the certification received from **sub tiers**.
- 5.12.5 The Certificate of Conformance shall provide a statement of conformity (e.g., "I hereby certify the materials / service supplied was produced in accordance with the Purchase Order, applicable drawings and specification.") and as a minimum **include applicable information from Table 1**.

Table 1 - THE SUPPLIER C of C SHALL INCLUDE THE FOLLOWING INFORMATION:

1. Certificate of Compliance	11. Part name or description per PO line item
2. Name and address of the organization/supplier (PO holder) providing product to Collins Aerospace. Cage Code (as required)	12. Serial number(s) of parts delivered for serialized parts. If serialization is not required, Work Order or Batch/Lot number shall be provided.
3. Name and address of Collins Aerospace facility product is delivered to.	13. Date of Manufacture or Cure Date for elastomeric products
4. Date of C of C issuance	14. Purchase Order Line
5. Country of Origin, including USA manufactured parts	15. If applicable, non-conformance report number (QN, MRB #).
6. Part number including any applicable "dash" number as listed on PO and any other applicable part number if different from ordered.	16. Reserved
7. Quantity of parts delivered	17. Collins Aerospace Purchase Order number
8. Collins Aerospace Configuration Requirements	18. Signature and title of authorized supplier representative with date.

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<p>9. Full drawing revision including all applicable engineering documents (including Accepted/ Approved/ Automated Test Process/ Plan / Authorize to Release).</p>	<p>19. Source or DQR/ or Third Party inspection stamp with date.</p>
<p>10. For assemblies ONLY, list of components (part of the assembly) with the following information: Part Number Drawing Revision, Part Name, Serial Number/Lot #(cure date), QN Number, Detail Part (As applicable)</p>	<p>20. The Special Process Certification shall include the special process being performed (shall match the drawing note including, the specification, class, type and color where applicable).</p>

5.12.6 In cases where the parts are procured from **authorized distributors**; traceability back to the manufacturer shall be maintained. The supplier Certificate of Conformance shall also reference the approved manufacturer’s catalog part number provided with the shipment.

5.12.7 Name changes are acceptable with proper documentation containing linkage to the original design authority; and in compliance with trade laws and regulations, as applicable.

5.13 FIRST ARTICLE INSPECTION (FAI)

5.13.1 In addition to ASQR-01 **and AS9102** requirements, the following requirements shall apply.

- **AS9102** Form 1, Field 18, “FAI Report Number”, is a REQUIRED field. If the component part is **Commercial off the Shelf (COTS)**, then “n/a” shall be entered.
- A first article inspection report shall be submitted upon request for each part revision change (without regard to form, fit, or function).

Note: AS9102 FAI forms are available at:

<https://www.sae.org/standards/content/as9102/>

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5.13.2 In addition to FAI's, Collins may require additional product validation requirements in the form of CAI's (Current Article Inspections), where by the supplier visually, functionally, and dimensionally verifies the new part by side by side comparison of the current part.

5.14 SPECIAL PROCESSES

5.14.1 In addition to special processes listed in ASQR-01, the below special processes shall also require Nadcap accreditation. All Suppliers regardless of tier providing Special Processes shall be Nadcap accredited for each Special Process, unless granted a waiver per COL-WRK-0003 initiated by the SBU.

- a) Composites
- b) Conventional Machining (When stated by Collins Aerospace flow down requirements (contracts, PO, drawing))
- c) Electronics (Bare boards, circuit card assemblies, cable and wire harness)
- d) Non-Metallic Material Manufacturing
- e) Non-Metallic Material Testing

5.14.2 When parts or materials require approved special processes, the supplier performing the special process shall be approved for the process being performed by the Collins Aerospace SBU/site. A Special Process Certification shall be included with each production shipment.

5.14.3 Based on Product or Supplier Risk, Collins Aerospace should require:

5.14.3.1 Custom Certificate of Conformance which certifies predetermined special process parameters.

5.14.3.2 Frozen process plan monitoring requires management of manufacturing plans.

5.14.3.3 Supplemental Collins Aerospace Special Process audits

5.15 CORRECTIVE ACTION

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5.15.1 In addition to supplier root cause/corrective action process as required in ASQR-01, suppliers implementing and currently engaged in ZDP™, shall submit updates and changes made to their Zero Defect Plan™, and D/PFMEA as applicable. Utilize COL-FRM-0055 or equivalent.

5.16 PRESERVATION OF PRODUCT

5.16.1 For shelf life items, the Supplier shall provide information regarding the recommended storage conditions, shelf life, expiration dates, date of manufacturing or pot life requirements. SDS sheets and HAZCOM labels are applicable to the type of item purchased from the sub tier supplier. This information should be located on either the container and/or requested certifications.

5.17 DROP SHIPMENTS

5.17.1 When authorized by the PO, suppliers can ship directly to customers or other Divisions using the supplier shipping documentation.

5.17.2 The supplier shall provide shipping documentation sent with product direct to Collins Aerospace or its representatives for Source Inspection and upon request.

5.17.3 The Collins Aerospace PO number shall be referenced on the shipping documentation.

5.17.4 When defined by Collins Aerospace SBU serialized drop ship product shall have the serial numbers recorded on the shipping document (shipper)

5.18 SUPPLIER PERFORMANCE

5.18.1 All approved suppliers/processors will be monitored for risk. This information will be used to manage oversight activities, including but not limited to the following:

- Audit frequency
- Corrective action plans
- Continuous improvement initiatives
- Increased level of inspection
- Onsite oversight by Collins Aerospace designated third party (at supplier's cost)
- 100% inspection on identified features
- Commitment to Sustainable Improvement Plans (SIP), Corrective Action Plan or Zero Defect plan (ZDP™)

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5.19 ZERO DEFECT PLAN™

5.19.1 The Collins Aerospace Zero Defect Plan™ (ZDP™) is a systematic implementation of established Quality Engineering tools and processes that focuses on protecting the Customer from receiving non-conforming-materials. The goal of the ZDP™ is to drive to zero non-conforming products. The ZDP™ methodology is defined in the “Zero Defect Plan™ How to Book”, which can be provided upon request through CentralSupplierQuality@collins.com.

Collins Aerospace reserves the right to audit and/or require any supplier to submit the ZDP™ using the Collins prescribed method and template on a prescribed cadence until the elements of ZDP™ has been completed and demonstrating results.

While all suppliers are expected to have an approach to achieving zero defects, Collins could require formal execution using prescribed methods for any of the following (but not limited to):

- Escapes impacting Collins and/or Collins customers
- New development / key programs requirements
- First Pass Yield issues impacting quality or delivery
- Receipt of new work from Collins

Execution of ZDP™, or equivalent methods, shall be extended to members of the supply chain (e.g. sub tier suppliers) when those members are posing risk to Collins Aerospace or its supplier (see above for examples).

5.19.2 Suppliers shall use MPR or equivalent process to evaluate if manufacturing operations and processes are capable of consistently producing a product compliant to the design specifications and to define corrective actions to mitigate the sources of variation identified as part of the review. MPR instructions can be found in the “ZDP™ How To Book.”

5.19.3 Evidence of execution of ZDP™ shall be made available and/or provided upon request from Collins aerospace demonstrating execution progress. The ZDP™ How To book contains the evidence requirements such as QC Actions implementation,

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QC Inspection progress, ZDP™ Planning and Execution Table and leading indicators table.

5.20 SUPPLIER SAMPLING REQUIREMENTS

- 5.20.1 In supplement to product sampling requirements outlined in ASQR-20.1 – Supplier Sampling Requirements, Collins Aerospace additionally employs requirements for Statistical FAI. Statistical FAI requires that for sample inspection to be applicable, every quantitative (variable) feature on the design blueprint is measured on a 25-piece sample. Further information on Statistical FAI can be found in the “ZDP™ How to Book”, which can be provided upon request through CentralSupplierQuality@collins.com.
- 5.20.2 If a part or site has a history of dimensional escapes then a high priority corrective action should be to complete a statistical FAI for each part.
- 5.20.3 A machine capability study should be used for dimensions produced by the same machine and process as an alternative to measuring every dimension on a specific Part Number.
- 5.20.4 Alternatives for demonstrating Ppk can be deployed on a process basis verses a part basis with Collins Aerospace approval. Request approval via ASQR-01 Form 3.
- 5.20.5 If due to nature of complex castings, complex machining, or composite molds destructive analysis is required to perform variable measurements then an alternative approach can be used in place of SFAI to demonstrate process capability. The supplier should submit an alternative inspection plan via ASQR-01 Form 3. This plan shall identify controlling dimensional characteristics (not 100% inspected). The inspection plan shall identify in-process dimensional verification using such methods as laser scan, checking fixture, ultrasonic wall check, and targeting and scribe fixture to ensure that the process is production ready and dimensionally representative of a production part and meets the design requirements.
- 5.21.6 Torque values do not require SFAI measurements.
- 5.21.7 SFAI does not apply to categorical (attribute) features that have either Binary (i.e. presence or absence) or a fixed number of values (i.e. count).
- 5.21.8 Reference dimensions and “approximate” dimensions do not require SFAI measurements
- 5.21.9 SFAI will be performed on lower-level parts and assemblies.

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5.21 QUALITY CONTROL ACTION REQUIREMENTS

5.21.1 The requirements captured in the table below shall be implemented by all Suppliers per the “Applicability” column in Table 2.

The requirements in Table 3 are intended to eliminate common categories of non-conforming material that have been identified through an evaluation of the Collins Aerospace value stream’s (Collins Aerospace and Suppliers) past performance and escapes. Table 3 includes the following:

New requirements to protect customers from known non-conformances

- Enhance and reinforce existing requirements to ensure uniformity

Quality control action applicability – Table 2 is used to communicate where the requirements in Table 3 are applicable.

Any exceptions to these requirements shall have documented approval from Collins Aerospace using ASQR-01 Form 3.

Table 2: Quality Control Action Requirements- Applicability

Requirement Category	Applicability
Assembly	All assembly processes
Circuit Card Assembly	Circuit Card Assembly Processes
Customer Interfaces	All customer interfaces
Dimensional	All measuring & dimensional inspection equipment
Material Integrity	All parts with material certificates of compliance (C of C)
O-rings	All O-ring suppliers and product assemblies with O-rings
Packaging, Shipping & Handling	All parts
Part Marking	All parts with required part marking

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Product Handling Equipment	All product handling equipment
Rework	All rework operations
Special Processes	All Special Processes as defined by Collins Aerospace.
Torque	All torque operations with a required applied torque value
Visual Standards for Cosmetic Defects	Products / product families with historically disputed cosmetic conditions

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Table 3: Quality Control Action Requirements

Category	#	Requirement	Objective
Assembly	1	Overruling of an automated inspection device (i.e. a false call disposition) shall require review and disposition by an independent, site-qualified technician or engineer.	Prevent actual failures from mistakenly being passed and provide feedback to line to correct process variation.
	2	Look-alike parts shall not be stored in adjacent locations, or kitted together in the same container, unless mistake proofing strategies are implemented. These strategies might include unique packaging, coloring, marking, or machine reading of part numbers.	Mitigate risk of an inadvertent use of look-alike parts.
	3	The supplier shall assess the build process for points where hidden features are created and align inspection control plans & methods to ensure all features are verified while accessible.	Mitigate risk associated with features that cannot be verified at later steps.
Circuit Card Assembly	1	Circuit card assembly suppliers shall utilize 3D AOI to ensure correct components, component placement, solder joint integrity, correct heel fillets, absence of lifted leads, and other visually detectable defects per IPC-A-610. Where board geometry restricts access by 3D AOI methods, alternate inspection methods with equal capability to 3D AOI shall be used to verify conformity.	Eliminate escapes due to assembly and/or process errors and from automated and manual inspection methods.
	2	It is common in the industry to use engineering circuit card assembly definition to program an automated assembly process and then take the	In order to eliminate the customer being the first location where intermittent

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Circuit Card Assembly	2	code from automated assembly and use that to program automated optical inspection. The intent of this is to avoid a mistake being made in automating assembly and then being carried over to automated inspection so that the error goes undetected. To avoid this, for all new programs, AOI shall not be based on automated assembly but shall be based directly on engineering definition (BOM). For existing programs the AOI code shall be 100% checked back to the engineering BOM.	operation due to wrong/ missing components or improperly incorporated engineering changes are detected. Test systems do not always detect these issues.
Customer Interfaces	1	<p>100% of interface and alignment features identified by Collins Aerospace shall be verified by physically engaging the feature with a fixture identically mimicking the mating surface where Collins Aerospace has provided the definition of the mating surface or representing the maximum and minimum tolerance conditions of the mating feature characteristics.</p> <p>If physically engaging a feature will compromise its function (e.g., locking threads), then an alternate method to verify proper dimension and physical location shall be documented on the process control plan</p> <p>Visual alignment features (e.g. scribe lines and connector labeling) shall be 100% visually inspected. Poke-Yoke inspection fixtures should be used wherever possible for these inspections.</p>	Ensure no installation escapes to Customer.
	2	100% of un-mated electrical connectors shall be inspected at final inspection for bent pins, pushed pins, and FOD. (Redundant per ASQR-20.1 Table C.)	

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Dimensional	1	All measurement and dimensional inspection equipment shall comply with AS13003.	Reduce dimensional escapes associated with gage variation.
Material Integrity	1	For all material Certificates of Conformance (C of C), the supplier shall verify 1) raw material back to the original mill, 2) Certificate of Assurance (C of A) matches PO/ Drawing requirements, and 3) C of A material properties report as required by material specification.	Ensure that the material represented by the C of C is the material specified by the design.
O-Rings	1	100% O-Rings shall be lubricated prior to installation, unless otherwise instructed per Purchase Order. Only appropriate lubricates shall be used unless otherwise specified or approved by Collins Aerospace. Petroleum shall not be used unless approved by Collins Aerospace.	Ensures all lessons learned regarding best practices for O-Ring assembly are acknowledged by supply base and incorporated into suppliers' processes to minimize risk of O-Ring failures.
	2	Plastic or protected metal caps shall be used to protect O-Rings or other seals from damage during handling or installation. Protected metal caps shall always be kept in protective enclosure to prevent raised burrs due to damage.	
	3	Slide or push O-Rings or other seals into place (i.e. do not roll into place).	
	4	When mating parts with O-Rings or other seals, positive alignment tooling shall be used to prevent blind cutting of seal due to misalignment	
Packaging, Shipping & Handling	1	All shipments shall comply with ASTM D 3951 unless otherwise specified by purchase order or contractual flow down.	Ensure parts are adequately protected for shipment.

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Packaging, Shipping & Handling	2	Qualified individuals shall define and execute a process compliant with DOT 49 CFR and/or IATA Dangerous Goods Regulations for all dangerous goods shipments.	Ensure compliance with DOT & FAA regulations for shipping Hazardous Materials to avoid danger & potential fines.
	3	With the exception of Bulk Bought hardware parts, all parts shall be protected from part-to-part contact during shipment. Parts damaged during shipment due to inadequate packaging shall be considered escapes to Collins Aerospace.	To eliminate escapes caused by part to part damage while in transit.
	4	O-rings shall be packaged and marked in accordance with AMS2817.	To assure O-rings are adequately protected & identified per industry standards' to eliminate escapes.
Part Marking	1	Part marking inspection and verification procedures shall include a photo or other replica of required content, format, marking method, and location per contract specifications. All features of marking shall be 100% verified including machine readable matrix marking, human readable markings related to 2D machine matrix, independent human readable markings where specified, traceability (serialization, lot date codes, etc.), and radio-frequency identification.	Contain non-conformances in part marking prior to shipment.
	2	All 2D machine readable matrix marks shall be verified with software capable of creating validation and verification. Reports of this verification shall be included in shipping paperwork.	Contain errors in 2D machine readable matrix marks prior to shipment.

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Part Marking	3	Prior to shipment, all suppliers shall have a process to detect and contain serial number duplication.	Prevent the shipment of duplicate serial numbers.
	4	<p>If Part Marking process is not fully automated (e.g., vibra-peening, ink marking, manual data entry is required), then second person verification of the output shall be implemented in addition to final inspection.</p> <p>Note: A best practice for an over inspection is to have one person read the part marking data on the part out loud while the second verifies the data in the associated paperwork.</p>	Contain non-conformances in part marking prior to shipment.
Product Handling Equipment	1	<p>The receiving, manufacturing, assembly, special process, test, storage, shipping processes, and transitions between processes shall be reviewed to eliminate material-to-material contact that could damage the part / product.</p> <p>a. Material handling containers and equipment shall be visually identified and designated for specific use. Material handling containers include any totes, bins, boxes, etc. used to handle the product or parts throughout the product life cycle at the targeted facility.</p> <p>b. Materials and construction of product handling equipment shall be compatible with part materials, part geometry, and environmental conditions.</p>	<p>Prevent handling damage in process operations, transportation between processes, storage, and shipment.</p> <p>Prevent handling damage in process operations, transportation between processes, storage, and shipment.</p>
		2	All product handling equipment shall be on a Total Productive Maintenance (TPM) schedule to validate that the product protections are still in

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Product Handling Equipment	2	place, free of contaminants, and have not diminished or been damaged over time.	FOD as protective materials break down.
Rework	1	<p>Any characteristics which should be directly or indirectly affected by rework operations shall be identified and re-verified (e.g., re-inspected, retested, environmentally screened, etc.) immediately following rework operations to ensure that operations have not cause direct damage, collateral damage, or introduce contamination.</p> <p>Sampling inspection shall not be permitted for characteristics affected by rework.</p>	Identify any potential non-conformances introduced during rework operations. Ensure previously verified requirements are not impacted as a result of the rework or repair operation.
Special Process	1	<p>Non-Destructive Testing (NDT) – Independent Verification and Validation (IV&V):</p> <p>In addition to requirements of NAS410, an independent verification and validation of NDT by the Supplier(s) Responsible Level III or qualified Level 3rd party NDT shall be put in place. The documented program shall include criteria that meets the following for all Collins parts:</p> <ul style="list-style-type: none"> Assure the source is a Collins BU Approved NDT source as defined in P.O. Witness and ensure the proficiency of each personnel performing each technique minimum annually. Develop a records audit program that pulls a 25 job sample for each part representative off technicians performing the work. Scope of this review shall also ensure completeness of records in comparison to approved technique (e.g., – Technique calls for 7 images, 7 images were recorded and properly retained). 	Ensuring conformance to Special Process requirements. Assure that all special processes are controlled and verified with changing of process or suppliers and any major events at the Special Process supplier.

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Special Process	1	<ul style="list-style-type: none"> Provide access to Collins for oversight IV&V audits and reviews of records to ensure compliance with requirements. <p>Where NDT processes are outsourced, the above requirements shall be flowed and executed by the source.</p>	Ensuring conformance to Special Process requirements. Assure that all special processes are controlled and verified with changing of process or suppliers and any major events at the Special Process supplier.
	2	Suppliers that utilize parts that have been Heat Treated shall verify that material properties test results identified in the associated specification are included on the C of C (e.g., hardness, conductivity, tensile, etc.).	Address systemic gap in Heat Treat supplier compliance across Collins Aerospace
	3	Suppliers that utilize anodized parts shall verify that material properties test results identified in the associated specification are included on the C of C (e.g., conductivity, etc.).	Address systemic gap in Anodize supplier compliance across Collins Aerospace
	4	<p>Special Process (SP) Change Management: The Supplier is responsible to ensure special process sources meet the drawing/specification requirements through initial validation of either a number of pieces and/or lot testing. Unless otherwise notified by the Collins SBU the default is validation of 25 pieces, spanning at least 3 lots where lot processing is conducted. Subsequent validation shall be accomplished by sampling for each part number at each source. Validation shall be completed by the Producer's Quality Manager/designee or responsible NDT L3. The following special processes categories as listed by Nadcap shall require validation: Chemical Processing (CP), Coatings (CT), Composites (UTAS SBU dependent) (COMP), Conventional Machining as a Special Process (UTAS SBU dependent)</p>	Ensure Special Processes are controlled. Assure that all special processes are locked down and no changes are made unless reviewed. Assure that any changes to special processes are thoroughly justified before being implemented to mitigate the creation of new nonconformances.

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	4	(CMSP), Electronics (ETG), Heat Treating (HT), Materials Testing (MTL), Metallic Materials Manufacturing (MMM), Non-Destructive Testing (NDT), Non-Conventional Machining (NM), Surface Enhancement (SE), Welding (WLD)	
Special Process	5	<p>Revalidation shall be accomplished through testing the parameter change or new source processing review and measurement or testing to validate that the process changes or source change maintain drawing or specification requirements and that the product is not adversely affect the product. This will include measurements, review of the processing information and non-destructive means up to and including destructive testing where required. Collins SBUs will have prescriptive requirements for parts as required. Validation of any SP will be documented and submitted to Collins SBU for review. In addition, validation of Special Processes shall be required for the following events at a SP facility: SP Disclosures, Advisories, Potential Ensuring conformance to Special Process requirements. Assure that all special processes are controlled and verified with changing of process or suppliers and any major events at the SP supplier. Product Impact findings, change in facility location or management/ownership, and/or catastrophic event (e.g. fire affecting the SP). These validation requirements as listed above are in addition to ASQR-20.1, Supplier Sampling Requirements - paragraph 4.2.4.2 requirements. Once the validation is completed then the requirements of ASQR-20.1 are invoked. When specified on the drawing or PO, Suppliers shall use only sources approved by the specific member company to perform these special processes (each special process supplier shall obtain initial approval from each specific member company). Use of approved</p>	<p>Ensuring conformance to Special Process requirements. Assure that all special processes are controlled and verified with changing of process or suppliers and any major events at the SP supplier.</p> <p>Ensuring conformance to Special Process requirements. Assure that all special processes are controlled and</p>

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Special Process	5	sources does not relieve the facility or subcontractor performing the special process of the responsibility for ensuring conformance to requirements.	verified with changing of process or suppliers and any major events at the SP supplier.
Torque	1	<p>A validation of torque tool settings and output shall be performed and recorded against acceptance criteria, using a torque tester, per the following:</p> <ul style="list-style-type: none"> For manual torque tools validation shall be performed a minimum once per shift using a stationary tester and defined validation range requirements for each torque tool. For auto or clutch torque tools, validation shall be performed a minimum once per month using a rotary tester and defined validation range requirements for each torque tool. 	Validate that the torque tool is set properly and that the tool output is within defined validation range requirements
	2	<p>After final torquing, all fasteners shall be re-checked with a torque tool set between the original set point or lower (within the specification range), or to the set point less prevailing torque.</p> <p>For automated torque tools with angle monitoring enabled, this does not apply.</p>	Ensure that each torqued fastener has been torqued to at least the minimum value. This also ensures that none of the torqued fasteners were loosened by torquing additional fasteners within the operation.
	3	<p>When selecting a torque tool the following requirements shall be adhered to:</p> <ul style="list-style-type: none"> The increment between two graduations marks of a scale shall be in compliance with ISO 6789 The increment between two graduation marks of a scale shall not exceed 10% of the total torque tolerance on the drawing. 	Ensure that the gage used in applying torque is capable of providing the required resolution.

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	3	<ul style="list-style-type: none"> The torque setting of the tool shall be within a set range in compliance with ISO 6789 	Ensure that the gage used in applying torque is capable of providing the required resolution.
Torque	4	<p>If used, torque tool extenders shall be defined on the work instructions with tool identification numbers and specific use configuration.</p> <p>The torque range values shall be defined on the work instructions, including the impact of the angle of the extender with respect to the handle during the application of the torque.</p> <p>Torque tool extenders will change the effective torque and shall be validated in the as-used configuration per Torque Requirement 1.</p>	Prevent accidental over-torqueing of fasteners due to the use of unspecified or improperly utilized torque wrench extensions (e.g., crow foot, or dog bone).
Visual Standards for Cosmetic Defects	1	<p>The supplier shall establish mutually agreed to visual standards for acceptable and unacceptable cosmetic conditions with the customer for features, parts, and product families that have historically disputed defects. (e.g., provide common photo set to OEM inspector and Customer inspector)</p> <p>These standards shall be documented in a revision controlled document and a copy will be provided to the customer for their review and comment. Note: Examples of cosmetic conditions include nicks, scratches, dents, surface finish characteristics, etc.</p>	Eliminate ambiguity between customer and supplier expectations regarding visually detectable anomalies that are neither explicitly prohibited nor allowed by existing design documents.

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6.0 SUPERSEDED DOCUMENT(S)

COL-ASQR-PRO-0003-00

7.0 FLOWCHART(S) N/A

8.0 REVISION HISTORY

00	Initial Issue	January 2, 2019
01	Joint BU discussion and revision of similar processes	October 7, 2019

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