

Ground Based RC-9000**Supplier Quality System
Requirements**



CORPORATE OVERVIEW

Collins Aerospace is a pioneer in the design, production and support of innovative solutions for our customers in aerospace and defense. Working together, our global team shares a vision to create the most trusted source of aviation and high-integrity solutions, applying insight and foresight to help our customers succeed.

INTRODUCTION

Collins Aerospace values the strategic relationship that we have with our suppliers. We recognize that our suppliers have a key role in maximizing our customer's satisfaction. We are committed along with you to bring significant value to our customers and we welcome your input in making the materials and services you provide even better.

PURPOSE

Collins Aerospace understands that Quality Management System (QMS) types can vary among suppliers. The purpose of this document is to provide clear expectations to our ground based suppliers shipping to Plants 1026 (Salt Lake City) and Plant 1027 (Sterling). These Collins ground based plants are ISO certified and do not need all the rigor of AS9100 airworthiness requirements.

1.0 GENERAL REQUIREMENTS

Suppliers shipping to Collins Aerospace Plant 1026 (Salt Lake City) and/or Plant 1027 (Sterling) are required to be compliant with this document. These sites design, produce, and support ground based, non-airworthy simulation systems and are part of the Missions Systems Business Unit.

When shipping material to Collins plant locations other than 1026 and 1027, suppliers shall comply with the standard AS9100-based Collins Aerospace RC-9000 requirements.

Reference Section 6.0 for definitions, acronyms, references, and other items used in this document. Unless otherwise specified, "customer" or "Collins Aerospace customer" refers to Collins Aerospace's customer. Unless otherwise specified, "buyer" or "Collins Aerospace buyer" refers to Collins Aerospace

1.1 QUALITY MANAGEMENT SYSTEM REQUIREMENTS

1.1.1 COMPLIANCE

Suppliers and sub-tiers shall follow all applicable requirements within this document. Exception requests or alternatives shall be submitted via email sent to CollinsChanges@RockwellCollins.com. In addition, the supplier shall maintain a copy of any approved exceptions and make available for review by Collins Aerospace Quality Assurance or other personnel upon request.

If the supplier fails to comply with the requirements of this document, Collins Aerospace may exercise its rights and remedies in accordance with the terms and conditions of all contracts or orders between Collins Aerospace and its supplier

Supplier shall establish compliance within 60 days of the document effective date unless otherwise specified in the Member publication notification.

All documentation provided to Collins Aerospace shall be provided in the English language.



1.1.2 QUALITY MANAGEMENT SYSTEM CERTIFICATION REQUIREMENTS

Suppliers shall have a documented quality management system (QMS) which should conform to the latest revision of ISO 9001, or submit a request for exception.

1.1.3 NON-DELIVERABLE PARTS, SOFTWARE, AND SERVICES

A supplier providing a part, item, software or service that is not intended to be delivered to a customer and is used for internal Collins Aerospace purposes only - a Non-Deliverable supplier - is excluded from the requirement to have a documented QMS.

1.1.4 ORDER OF PRECEDENCE

In the event there is a requirement that appears to be in conflict with any other requirement, the supplier shall contact Collins Aerospace Procurement for written confirmation.

The order of precedence for documents is as follows:

- 1) Contract (e.g. Purchase Order; Long Term Agreement; RC-9000 via contract)
- 2) Drawing Referenced on PO
- 3) Collins Aerospace Specifications Referenced on Drawing
- 4) Industry Specifications Referenced on Drawing
- 5) ISO 9001(Current Revision)

1.1.5 NOTIFICATION OF QMS STATUS CHANGES

If the supplier or supplier's QMS is non-compliant to the applicable requirements, or if its QMS certification is revoked, suspended, changed, or will expire during the performance of the order, the supplier shall notify the buyer in writing to: collinschanges@rockwellcollins.com. Notification shall be made within 48 hours of the following: revocation, suspension, change, or expiration and provide detail for the appropriate items in the list. All affected Collins Aerospace part numbers shall be listed in the email notification. For renewals, suppliers shall upload a copy of their certification to their supplier record in Ariba Self Service within thirty days of receipt.

1.2 WORKMANSHIP

Suppliers shall document workmanship plans and acceptance standards in accordance with the performance and reliability requirements of the Collins Aerospace specifications. For electrical parts, the plans and acceptance standards shall comply with J-STD-001, Requirements for Soldered Electrical and Electronic Assemblies, and ANSI/IPC-A-610, Acceptability of Electronic Assemblies, unless otherwise stated on the drawing. Other part types shall have workmanship standards in accordance with the relevant drawings, specifications, and the supplier's QMS. Workmanship requirements specified on the component specification/drawing or elsewhere on the contract or purchase order shall take precedence over this paragraph.

1.3 RIGHT OF ACCESS

The buyer or anyone designated by the buyer, including cognizant government agencies, shall have access to all applicable areas of supplier's facilities. This includes suppliers at any level of the supply chain involved in the order and to all applicable records. This right shall also extend to the supplier's sub-tier suppliers. The supplier shall be given reasonable advance notice by the buyer to host such events.

Failure to meet schedule, quality, or program requirements may cause long-term placement of Collins Aerospace personnel or their representatives at the supplier location.

1.4 SUPPLIER-INITIATED CHANGES

Suppliers are required to inform the buyer prior to shipping material or products with changes in product, processes, components, sub-suppliers / sub-contractors, manufacturing facility locations, packaging, shipping method, or outside processors. The supplier shall notify the buyer in writing to: collinschanges@rockwellcollins.com. Provide detail for the appropriate items in the email. All affected Collins Aerospace part numbers must be listed in the email notification.

For items where Collins Aerospace has design authority, suppliers are required to obtain written approval from the buyer prior to any change(s) that could affect product quality. Suppliers are required to maintain a record of all such approvals and have them available upon request.

Note – The following is a list of changes that could affect product quality and require notification. This list is not all encompassing, and suppliers shall assess all changes for applicability.

- Notification within 48 hours of any change in top management, ownership, QMS, or a major change in the number of employees or resources used to provide Collins Aerospace products or materials.
- A change in the design characteristics affecting fit, form, or function of the part.
- A change in manufacturing source(s), process(es), inspection method(s), location of manufacture, tooling, or materials, that can potentially affect fit, form or function.
- A change in numerical control program or translation to another media that can potentially affect fit, form or function.
- A natural or man-made event, which may adversely affect the manufacturing process.
- A lapse in production for two years. Lapse is measured from the completion of last production operation to restart of production.
- Prior to any planned work transfers (e.g., from one supplier facility to another, from the supplier to a member of its supply chain, from one member of its supply chain to another).

1.5 RECORD RETENTION

The supplier shall retain all purchasing, production control, quality, manufacturing and manufacturing methods, test, and other related documents associated with the item purchased, for a minimum of 10 years after order completion. The documented information shall provide evidence of conformity to requirements and to the effective operation of the supplier's QMS. Methods and records shall be available for review by buyer's representatives, customers, and regulatory authorities.

First Article Inspection Reports and related documented information shall be retained by the supplier for 10 years plus the current year and are required to be kept in the format in which they originated. All requested information shall be provided in the language required by the contract.

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 to take possession of the records.

1.6 SUPPLIER PERFORMANCE

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 Elevated Performance Management (EPM), Corrective Action Plan or Zero Defect Plan (ZDP™)

Supplier shall permit Member access to all data in OASIS databases (e.g., registration documentation, certification, audit reports and findings, corrective actions).

Note: Member may input significant/frequent escape data, major audit findings and delinquent responses into the OASIS database feedback process.

2.0 PROCESS AND PRODUCT MANAGEMENT

2.1 SOURCE INSPECTIONS AND PROCESS VERIFICATIONS

The buyer's source inspections or process verifications shall not absolve the supplier of the responsibility to provide a conforming product, nor shall it preclude subsequent rejection. The use of a buyer's sub-tier supplier shall not be considered by the supplier as evidence of effective control of quality of the sub-tier supplier.

2.2 PRODUCT INSPECTION

Supplier's Quality Control processes shall assure the performance of inspection and process control to meet the requirements specified herein. The supplier is responsible for retention of records showing compliance with these requirements

2.2.1 CERTIFICATE OF CONFORMANCE

All shipments shall be delivered with proof of compliance by virtue of a Certificate of Conformance or suitable inspection record such as a drawing showing the verified dimensions and features or other acceptable documentation.

2.2.2 VISUAL INSPECTION

Visual inspection is to be performed under inspection area lighting conditions which are approximately 100 foot-candles and at a distance of approximately 18 inches without magnification aids. Ambient temperature will be 21°C (69.8°F) $\pm 2^{\circ}\text{C}$ (3.6°F).

2.2.3 FINISHED SURFACES

No scratches, paint runs, streaks, sanding marks, orange peel or spot weld indentations beyond the limits established by visual inspection (see 2.2.2).

2.2.4 FIRST ARTICLE INSPECTION

A First Article Inspection Report (FAIR) is only required when specified by a Collins Aerospace order (i.e., quality code RC-28 on the purchase order). The supplier shall complete and submit the first article inspection and subsequent report per RC-QMS-I-308, Rockwell Collins – AS/EN9102 Electronic FAIR Submittal Instructions, as found on the Supplier Portal. (Note: A complete list of PO codes can be found on the Supplier Portal in the Quality Assurance Purchase Order Codes link, HRC-QMS-I-358.).

2.2.5 CURRENT ARTICLE INSPECTION

A Current Article Inspection (CAI) may be requested at any time.

2.2.6 TEST EQUIPMENT

All gauges, equipment and other test devices used for product acceptance or in-process control will be included in the supplier's calibration system and the calibration shall be traceable to a national standard.

2.3 PACKAGING AND SHIPPING

While Collins Aerospace reserves the right to arrange transportation from the supplier, it is the responsibility of the supplier to adequately package the part to protect it from damage during loading and shipment. Collins will inspect the incoming container for any damage before accepting from the shipper. Collins will photograph any damage found in incoming inspection to support non-conformance documentation.

2.4 ACCEPTANCE AUTHORITY MEDIA (AAM)

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).

2.5 CUSTOMER SUPPLIED OR OWNED TOOLING, GAGES AND FIXTURES

Supplier and their subcontractor(s) must have a documented tool preventative maintenance process that must keep the tool in a serviceable condition. Supplier shall monitor tool features for excessive wear in order to consistently meet product specifications and drawings. Additionally, the supplier shall take actions to address worn tool.

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

2.6 OBSOLESCENCE MANAGEMENT

The supplier shall inform Collins Aerospace of all items that will become obsolete within the next twelve months. The supplier shall maintain regular communication with sub-tier suppliers with regard to possible



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raw material or component obsolescence. The supplier shall have a documented obsolescence management plan/process in place to mitigate delivery risk for all items that could become obsolete.

Collins Aerospace requires suppliers to notify the buyer regarding obsolescence with lead time sufficient so as not to disrupt delivery schedules. The supplier shall notify the buyer in writing to: collinschanges@rockwellcollins.com. Provide detail for the appropriate items in the list. All affected Collins Aerospace part numbers must be listed in the email notification.

2.7 COUNTERFEIT RISK MITIGATION

Collins Aerospace requires that all suppliers of electrical parts or assemblies shall document and implement a policy compliant to the current revision of SAE AS5553, Counterfeit Electronic Parts; Avoidance, Detection, Mitigation, and Disposition. Suppliers of mechanical parts are to comply with similar methodology by adopting and implementing standard counterfeit mitigation processes applicable to their industry. Suppliers shall purchase material directly from original equipment manufacturers, original component manufacturers, or their authorized distributors. Collins Aerospace Standard Terms and Conditions Form, and the Standard Purchasing Agreement (SPA), purchases from independent distributors (i.e. brokers) are not allowed without prior documented approval from Collins Aerospace. Suppliers are required to maintain a file of all Collins Aerospace approvals.

2.8 ELECTROSTATIC DEVICE PROTECTION

Devices identified as electrostatic discharge sensitive shall be handled, stored, packaged, and shipped in such a manner as to preclude damage from electrostatic discharge. Electrostatic protection processes shall be compliant to ANSI/ESD S20.20 Protection of Electrical and Electronic parts, Assemblies and Equipment or equivalent. Electrostatic protection requirements specified on the component specification, drawing, or elsewhere on the order take precedence over this paragraph.

2.9 FOREIGN MATERIAL

The contamination of goods by foreign material or objects is not acceptable as it could eventually affect product appearance and performance. The supplier shall have countermeasures in place to prevent the occurrence of FOD. SAE AS9146 may be used as a reference document for FOD prevention procedures.

By delivering items to Collins Aerospace, the supplier shall be deemed to have certified to Collins Aerospace that such items are free from any foreign materials that could result in FOD.

2.10 DELEGATED PRODUCT RELEASE VERIFICATION (AS9117)

Suppliers who have been delegated the authority to act on behalf of Collins to verify and release products/services via a Delegation Authorization Letter should align with the latest revision of AS9117, which governs Delegated Product Release Verification (DPRV). Collins shall manage and maintain the DPRV Supplier approval and oversight process.

2.11 DROP SHIPMENTS

When authorized by the PO, suppliers may ship directly to customers or other Divisions using Collins Aerospace shipping documentation. The supplier shall notify Collins Aerospace when the material is ready for shipment and coordinate the direct shipping process with the Buyer or appropriate Collins Aerospace designee. Collins Aerospace will provide all shipping documentation and instructions to the supplier.

3.0 CONFORMANCE

3.1 MATERIAL CERTIFICATION

The paperwork accompanying the shipment shall, at a minimum, include the following information:

- Name and address of Collins Aerospace facility product is delivered to
- Name and address of the organization/supplier (PO holder) providing product to Collins Aerospace and Cage Code (as required)
- Full drawing revision (Configuration Requirements)
- Part name or description per PO line item
- Part number including any applicable “dash” number as listed on PO and any other applicable part number (e.g. vendor part number)
- Quantity of parts delivered
- Serial number(s) of parts delivered for serialized parts. If serialization is not required, Work Order or Batch/Lot number shall be provided

When the applicable specification(s) establishes requirements for chemical and/or physical properties, the supplier shall obtain for each lot, test reports which provide evidence that the materials shipped possess the chemical and/or physical properties required by the applicable specifications. Test reports must provide, at a minimum, the material manufacturer's name, material manufacturer's part number, and the fabricator's order number to the material manufacturer.

When supplier utilizes test reports to accept supplier purchased raw material, the following requirements apply:

- Test reports shall be checked to confirm 100% compliance against supplier's requirements and applicable specifications prior to shipment to Collins Aerospace.
- Validation test requirement: Supplier shall periodically validate test reports for raw material accepted on the basis of test reports. That validation shall be accomplished by supplier or other independent party through periodic, scheduled tests of raw material samples. Schedules for frequency of tests will be established by the supplier based on historical performance of the raw material supplier. For metal based raw material, chemical / raw material certifications shall reflect actual values (not range), including mill data, and that the material certifications match the drawing specification requirements including part number and revision.
- Supplier shall retain test reports provided by the raw material supplier, as well as supplier's validation test results as quality records traceable to the conformance of material, as specified elsewhere in the order or contract.
- Raw material furnished by the buyer or its customer is not subject to the validation test requirement.

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. Material shall be delivered to Collins with a minimum of 70% remaining of the OEM published shelf life.

3.2 REQUESTS FOR CORRECTIVE ACTION

A Supplier Action Request (SAR, i.e. Supplier Failure Analysis, NoNC-Notice of Non-Conformity, or SCAR-Supplier Corrective Action Request) may be issued if nonconforming material is received. The supplier shall have a root cause and corrective action process consistent with the 8D methodology.

Per requirements of the SAR process, the supplier is required to provide the following for SCARs: a containment statement, a root cause and corrective action response, and be subject to escalation of notification to supplier's senior management for failure to respond. All supplier responses are rated for Measure of Effectiveness (MoE). This grading scale is available on the Supplier Portal. Even though NoNCs do not require a formal response, suppliers are required to maintain evidence showing internal root cause and corrective action for audit purposes.

Failure to provide acceptable and timely responses to SCARs may be the cause for revocation of business. Regardless of the material or product's warranty status, when requested, the supplier is required to provide a root cause and corrective action for failures that occur immediately upon installation. These are sometimes referred to as out-of-box failures.

Failure to comply with the rules of this SAR process requirement may jeopardize buyer's determination of supplier's compliance to the contract requirements. If the supplier fails to remedy nonconformances as required by the SAR, or if the supplier fails to make prompt and continued progress towards corrective action until it is satisfactorily resolved, Collins Aerospace may exercise any rights and remedies available in the terms and conditions of the contract or order between Collins Aerospace and the supplier. When corrective action progress is insufficient, Collins Aerospace may place a supplier on probation status. Suppliers on probation status will not be considered for new procurement activity.

In addition to the SAR process, suppliers implementing and currently engaged in ZDP™, shall submit updates and changes made to their Zero Defect Plan™, and D/PFMEA as applicable.

All product rework shall have documented work instructions. Supplier shall request and obtain approval for rework of product subject to frozen process control. Note: Non-conforming product not subject to frozen process control, that can be reworked to meet all product requirements within the existing manufacturing process does not require Member notification or request for approval/disposition.

Upon implementation of corrective action, to ensure effectiveness, Supplier shall have a documented process in place to ensure that 100% over-inspection (i.e., additional independent measurement of the affected characteristic(s)) is performed of the deviated characteristics for a minimum of the next three consecutive manufactured lots (quantities of parts produced under conditions that are considered uniform) unless otherwise specified by the Member.

3.3 NOTICE OF NONCONFORMING MATERIAL

The supplier must promptly notify a Collins Aerospace buyer when a nonconformity or reliability issue is discovered in the supplier's processes, components, or assemblies for any product already delivered. This communication shall be sent to CollinsChanges@RockwellCollins.com and to the appropriate buyer.

The communication shall contain the following information:

- Lot/ batch information/ date of manufacture, as applicable
- Part numbers impacted including vendor part number(s) and Collins part number(s)
- Recovery plan
- Containment plan including non-conforming quantity

- Purchase order number(s) impacted
- Non-Conformance description/problem summary and requirement violated

3.4 QUALITY ALERTS/GIDEP ALERTS

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
- 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.

3.5 MATERIAL REVIEW AUTHORITY

The supplier’s material review authority may include rework but shall not extend to “repair” or “use-as-is” without prior documented approval from the Collins Aerospace buyer. Supplier shall submit to buyer all requests for variance from contract, order, specification, or drawing requirements. Supplier shall not submit requests for variance to the Collins Aerospace customer.

Collins Aerospace reserves the right to recover administrative costs associated with the review and disposition of supplier-manufactured non-conforming product in accordance with the Purchase Order and/or contract terms and conditions.

4.0 SUB-TIER SUPPLIER MANAGEMENT

4.1 SUBCONTRACTING OF THE ORDER

The supplier shall not subcontract in whole, or substantially in whole, performance of any order without prior written consent of the buyer. Requests for subcontracting an order shall be made by the supplier in writing to: collinschanges@rockwellcollins.com. Provide detail from the appropriate items in the list. All affected Collins Aerospace part numbers must be listed in the email notification.

4.2 REQUIREMENTS FLOWDOWN

Supplier shall flow down applicable specifications, descriptions, requirements, and all requirements in this document to sub-tier suppliers. For items unique to Collins Aerospace, supplier shall indicate that Collins Aerospace is the customer and has design authority, as part of the text of the purchase contract to any sub-tier supplier.

4.3 SUB-TIER SUPPLIER MANAGEMENT AND SELECTION

The supplier shall perform evaluation and selection of any sub-tier suppliers based on their ability to supply product or service which is compliant to the buyer's requirements. Minimum criteria for this evaluation and selection shall be established, including periodic review, to demonstrate the sub-tier supplier's ability to provide conforming material or service and mitigate risk to the customer. Records of this evaluation and review shall be maintained in accordance with the document retention requirements defined in section 1.5 of this document.

5.0 ZERO DEFECT PLAN

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™ have been completed and demonstrate 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).

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."

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

5.1 SUPPLIER SAMPLING REQUIREMENTS – FOR EXECUTION OF ZDP™

Supplier shall have a documented sampling plan, refer to AS9138 as a guideline. When establishing AQL levels, supplier should use 100% for Key or Critical characteristics and 2.5% AQL for all other characteristics. Collins Aerospace reserves the right to require ASQR-20.1 for product sampling requirements. Note: Distributors are exempted from this requirement.

In supplement to product sampling requirements above, Collins Aerospace reserves the right to additionally employ requirements for Statistical FAI (SFAI). Statistical FAI requires that for sample

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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.

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.

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.

Alternatives for demonstrating Ppk can be deployed on a process basis versus a part basis with Collins Aerospace approval.

If due to the 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 which identifies 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.

Torque values do not require SFAI measurements.

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).

Reference dimensions and “approximate” dimensions do not require SFAI measurements.

Collins Aerospace reserves the right to additionally require SFAI on lower-level parts and assemblies.

5.2 QUALITY CONTROL ACTIONS FOR EXECUTION OF ZDP™

The requirements captured in Table 3 below are best practices that should be reviewed as part of the ZDP™ implementation per “Applicability” column in Table 2. Collins Aerospace reserves the right to require any of these best practices be implemented.

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

ZDP Table 2: Quality Control Action Requirements-Applicability

Requirement Category	Applicability
Assembly	All assembly processes
Circuit Card Assembly	Circuit card assembly process
Customer Interfaces	All customer interfaces
Dimensional	All measuring and dimensional inspection equipment
Material Integrity	All parts with material certificates of compliance
O-Rings	All o-rings suppliers and product assemblies with o-rings
Packaging, Shipping and Handling	All parts

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Part Markings	All parts with required part marking
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

ZDP 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 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	In order to eliminate the customer being the first location where intermittent operation due to wrong/ missing components or improperly incorporated engineering changes are detected. Test systems do not always detect these issues.

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		directly on engineering definition (BOM). For existing programs the AOI code shall be 100% checked back to the engineering BOM.	
Customer Interfaces	1	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. 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 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.	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.)	
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).	

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	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.
	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 Making	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.
	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	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. 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.	Contain non-conformances in part marking prior to shipment.

Ground Based Supplier Quality System Requirements

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	<p>All product handling equipment shall be on a Total Productive Maintenance (TPM) schedule to validate that the product protections are still in place, free of contaminants, and have not diminished or been damaged over time.</p>	<p>Ensure that part protection is maintained over time and to mitigate the generation of FOD as protective materials break down.</p>
Rework	1	<p>Any characteristics which could 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. Sampling inspection shall not be permitted for characteristics affected by rework.</p>	<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.</p>
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). ● Provide access to Collins for oversight IV&V audits and reviews of records to ensure 	<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.</p>

Ground Based Supplier Quality System Requirements

		<p>compliance with requirements.</p> <p>Where NDT processes are outsourced, the above requirements shall be flowed and executed by the source.</p>	
	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) (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)</p>	<p>Ensure Special Processes are controlled. Assure that all special processes are locked down and no changes are made unless reviewed.</p> <p>Assure that any changes to special processes are thoroughly justified before being implemented to mitigate the creation of new nonconformances.</p>
	5	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	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.

Ground Based Supplier Quality System Requirements

		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 sources does not relieve the facility or subcontractor performing the special process of the responsibility for ensuring conformance to requirements.	
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. ● 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.

Ground Based Supplier Quality System Requirements

	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>	<p>Prevent accidental over-torquing of fasteners due to the use of unspecified or improperly utilized torque wrench extensions (e.g., crow foot, or dog bone).</p>
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>	<p>Eliminate ambiguity between customer and supplier expectations regarding visually detectable anomalies that are neither explicitly prohibited nor allowed by existing design documents.</p>

6.0 DEFINITIONS, ACRONYMS, REFERENCES

6.1 DEFINITIONS

Build-to-Print:	A supplier of a component, assembly, minor system or sub-system for which the supplier has less than total design responsibility and authority
Build-to-Spec:	<p>A material defined as built to specification is a material that is defined by a performance specification, which also may include drawings detailing the envelope. The performance specification shall define the requirements while the supplier is responsible for creating a design that meets the performance specification and the envelope. The requirements are not prescriptive, allowing the supplier to utilize their engineering expertise to design the material.</p> <p>The supplier may be responsible for a defined level of qualification and qualification testing. The supplier will retain an amount of IP for their design effort.</p>
Commercial Off-The-Shelf:	(COTS) Standard catalog hardware and is a part or material that conforms to an established industry or national authority published specification, having all characteristics identified by test description, National/Military Standard Drawing, or catalog item.
Ground Based:	Non-airworthy program. Example: Simulation systems.
Performance:	The quantitative specification of an item's characteristics which may include the operating range, limits, and values.
Repair:	The subjection of nonconforming material to an approved process designed to reduce but not completely eliminate the nonconformance.



**Ground Based
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Rework:	All work performed on articles with known deficiencies so as to bring such articles into full compliance with documented requirements.
Raw Material:	A basic material used in the production of goods, finished products or intermediate materials.
Subcontract Supplier:	A producer of a major system or sub-system with or without design responsibility. This includes suppliers that provide system integration, maintenance and/or overhaul services.

6.2 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
CFR	Code of Federal Regulations
C of C	Certification of Conformance/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
DOT	Department of Transportation
DPRV	Delegated Product Release Verification
DQR	Designated Quality Representative
DSQAR	Designated Supplier Quality Assurance Representative
EASA	European Union Aviation Safety Agency
FAA	Federal Aviation Administration
FAI	First Article Inspection
FOD	Foreign Object Damage/Debris
GIDEP	Government Industry Data Exchange
HAZCOM	Hazard Communication
ISO	International Organization for Standardization
KC	Key Characteristic
KPC	Key Process Characteristic
MoE	Measure of Effectiveness
MPR	Manufacturing Process Review
MSA	Measurement Systems Analysis
MSDS	Material Safety Data Sheet
NDT	Non-Destructive Testing
NoNC	Notice of Non-Conformance
NOPQE	Notification of Potential Quality Escape
OCM	Original Component Manufacturer
QML	Qualified Manufacturers List (as defined by the US Defense Logistics Agency)

QMS	Quality Management System
QN	Quality Notification
QPL	Qualified Products List (as defined by the US Defense Logistics Agency)
RPN	Risk Priority Number
SAR	Supplier Action Request
SBU	Collins Strategic Business Unit
SCAR	Supplier Corrective Action Request
SFAI	Statistical First Article Inspection
SPA	Standard Purchasing Agreement
SPC	Statistical Process Control
SRI	Supplier Request for Information
SQA	Supplier Quality Authority
ZDP	Zero Defect Plan

6.3 REFERENCES

14 CFAR Part 21.9	Replacement and Modification Articles
14 CFR Part 120	U.S. Department of Transportation, Conducting Workplace Drug & Alcohol Testing
49 CFR Part 40	U.S. Department of Transportation, Conducting Workplace Drug & Alcohol Testing
99FP	Rockwell Collins General Terms and Conditions of Purchase
ANSI/IPC A-610	Acceptability of Electronic Assemblies
AS/EN9100	Quality Management Systems: Aviation, Space & Defense Organizations standard
AS5553	Fraudulent/Counterfeit Electronic Parts; Avoidance, Detection, Mitigation and Disposition
AS9117	Delegated Product Release Verification
AS9131	Nonconformance Data Definition and Documentation
AS9138	Statistical Product Acceptance Requirements
EIA JESD-625	Requirements for Handling Electrostatic-Discharge-Sensitive (ESDS) Devices
J-STD-001	Requirements for Soldered Electrical and Electronic Assemblies
NAS-412	Foreign Object Damage/Foreign Object Debris (FOD) Prevention
RC QMS-I-308	Rockwell Collins- AS/EN9102 Electronic FAIR Submittal
HRC-QMS-I-358	Quality Assurance Purchase Order Codes

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