Collins Aerospace

Landing Systems

LS-SBU-A001-SQM [00]

Landing Systems Supplier and Product Quality Requirements	
Function: Supplier Quality Management	Effective Date: March 8, 2021

INTRODUCTION

When referenced by Purchase Order or Contract, this document defines Collins Aerospace Landing Systems supplier and product quality requirements for all purchased products by and for all Collins Aerospace Landing Systems sites throughout the supply chain.

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1 Purpose and Scope:

1.1 This document is a supplement to Raytheon Technologies (RTX) and United Technologies Corporation (UTC) Supplier Quality System Requirements, ASQR-01 and Collins Aerospace Supplier Quality Requirements, COL-ASQR-PRO-0003.

1.2 This document defines Landing System (LS) quality requirements for suppliers, sub-tier suppliers, processors, and sub-tier processors, referenced in this document as: Supplier(s).

1.3 This document applies to all purchased product by and for all LS sites when required by purchase order or contract.

1.4 This document applies to all LS suppliers and processors when ASQR-01, COL-ASQR-PRO-0003, and LS-SBU-A001-SQA are invoked by direct reference on the purchase order.

1.5 Wheels and Brakes specific requirements herein are identified (*WB) and Landing Gear specific requirements herein are identified (*LG).

1.6 No deviations from these requirements are permitted unless specifically authorized in writing by LS Supplier Quality Management.

2 Responsibility:

2.1 LS Supplier Quality Management (SQM), in collaboration with LS Supply Chain Management (SCM), are responsible for the management and administration of the requirements contained within this document.

2.2 Suppliers are responsible for ensuring the use of LS and customer-directed supply/process resources.

2.3 Suppliers are responsible for ensuring the capability of all sub-tiers and the quality of all product and services provided.

2.4 Suppliers and Processors are responsible for contacting your LS Supply Chain Management or LS Supplier Quality Representative(s) for questions or clarification.

2.5 Right of access - Supplier shall notify LS Supply Chain Management for coordination of activities if contacted directly by LS customers or regulatory agencies.

2.6 Suppliers and Processors shall ensure that persons are aware of their contribution to product or service conformity, product safety and the importance of ethical behavior.

3 Document Links:

3.1 LS has provided a document retrieval site within each supplier's MOVEit account. It is the responsibility of each supplier to ensure access and compliance to the current revision of these documents including drawings, process specifications, and manufacturing control drawings. It is the responsibility of the supplier to flow down the specific requirements including Collins Aerospace, LS, and customer requirements to their respective sub-tier suppliers and processors.

3.2 Required LS SQM procedures, forms, and additional non-technical information can be found on the RTX Supplier Portal.

3.3 LS provides periodic electronic notifications to all suppliers with MOVEit accounts of current drawing, specification, and manufacturing control drawing releases. It is incumbent on the supplier to ensure they have access of this electronic notification.

3.4 Access to the standard flow down documents are as follows:

3.4.1 For COL-ASQR-PRO-0003, LS-SBU-A001-SQA, Doc 200, RTX Terms & Conditions Addendum: https://utcaerospacesystems.com/supplier-documents/

3.4.2 For ASQR-01 referenced documents and related forms: https://www.rtx.com/suppliers/united-technologies-suppliers/united-technologies-asqrd

4 Quality Alerts:

4.1 See ASQR-01 and/or COL-ASQR-PRO-0003

5 Engineering Data:

5.1 Unless effectivity is specifically defined within a document's release, product shall be manufactured / processed to the latest process specification revisions and manufacturing control drawings in effect at the time of Purchase Order / Contract acceptance.

5.2 Suppliers are responsible for ensuring they have the current and or latest drawing, specification requirements, and manufacturing control drawings per current purchase order(s) requirements.

5.3 Use of an older revision drawing, specification, or manufacturing control drawings is not acceptable unless authorized on Purchase Order.

6 Engineering Change Proposal Requests (ECPRs):

6.1 Suppliers may request an engineering clarification by completing an Engineering Change Proposal Request (ECPR), form LS-LG-F-014-ENG. Instructions for completion and submittal of the ECPR, LS-LG-W309-ENG, is available in the RTX Supplier Portal.

6.2 The ECPR shall be properly completed including the reason or the justification for the ECPR. An incomplete ECPR will be returned to the originator for resubmission.

6.3 The results of a LS review of the request shall be forwarded to the supplier.

6.4 An accepted ECPR is not acceptance to commence manufacturing until the design authority is formally changed to reflect the ECPR request. Suppliers shall follow an approved MRB disposition (e.g., Quality Notification or Form 815) process until the design authority is formally changed.

7 Quality Record Retention:

7.1 See ASQR-01

8 ITAR and EAR Compliance:

8.1 Suppliers, Processors and their sub-tiers shall ensure compliance to ITAR and EAR requirements. Any US supplier manufacturing or handling ITAR products shall be Directorate of Defense Trade Controls (DDTC) registered. Any Canadian Supplier manufacturing or handling ITAR products shall be Controlled Goods Directorate (CGD) registered.

8.2 If a non-US supplier is using a US sub-tier supplier for ITAR work that US sub-tier shall be DDTC registered. The US sub-tier shall also have authorization (i.e. ITAR exemption, license to export the ITAR product back to the non-US supplier).

8.3 All technical and/or proprietary information, regardless of program, shall be transferred between LS and outside sources through the 2 following methods only:

8.3.1 MOVEit for the following technical and/or proprietary information or documents:

- LS supplied specifications
- Technical data such as Models, Drawings, ECNs, and parts lists
- First Article Inspection Reports for 2D drawing and MBD (3-D Modeling)
- Alteration or repair of LS or LS customer tooling / gages / fixtures
- LS Failure Analysis Report (FAR)
- Supplier Corrective Action Requests (SCARs)
- LS Approved Processor List (Doc 200)
- Engineering Coordination Memos
- Quality Notification (QN)
- Manufacturing Plans
- Technique Sheets
- Control Plans/ FMEAs
- Engineering Change Proposal Request (ECPR)

8.3.2 Encrypted WinZip email for the following information:

- Disclosures
- Service and Warranty Information

9 Material Substitutions:

9.1 Material substitutions shall not be allowed unless authorized by engineering drawing / model, material specification or supersession LS Material Review Board (MRB) disposition or superseding of a material specification. This applies to (and is not limited to):

- Material grade (or stock such as bar, rod, tube, extrusion, and flat)
- Material Condition (i.e. heat treat)

10 First Article Inspection:

10.1 All FAIs shall be approved by Collins Supplier Quality (SQ) or approved 3rd party representative prior to product shipment to Collins.

10.1.1 Collins has selected Net Inspect to be the repository for supplier FAIs. Suppliers shall submit FAIs in Net Inspect. If a part number is not immediately available in Net Inspect,

Supplier shall request the part number to be added though Net Inspect. If export control regulations prevent technical data from being shared in Net Inspect, MOVEit shall be used for FAI submission.

10.2 First Article Inspection Reports (FAIR) shall be prepared per AS/EN9102, ASQR-01, COL-ASQR-PRO-0003 & LS-SBU-A002-SQA requirements.

10.3 Suppliers shall have a process for FAI Planning. FAI Planning shall occur prior to the start of manufacturing. Industry best practice is to have the assigned LS Supplier Quality (SQ) representative review the FAI plan to ensure completeness and FAI expectations will be met prior to the start of manufacturing. The LS SQ representative shall respond to FAI planning review within 5 working days.

10.4 Complete FAIRs, including lower level assemblies, shall be made available to the LS SQ representative for approval and or acceptance of completion.

10.5 The LS SQ recognized inspection representative, shall respond to requests and schedule for FAI review within 5 working days.

10.6 If Net Inspect cannot be used due to technical data transfer, completed FAIR packages shall be scanned and submitted to MOVEit once approved by LS SQ representative, prior to the product(s) shipment to an LS site.

10.7 In addition to requirements outlined in ASQR-01, COL-ASQR-PRO-0003 and LS SBU-A002-SQA, at a minimum a partial FAI shall be performed when transferring to a new processor or sub-tier.

10.8 Suppliers shall ensure all FAIRs are readily available to support the revision of product being delivered.

10.9 First Article Inspection Using Model Based Definition (3-D Modeling):

10.9.1 The Model Based Definition shall be the governing authority in the supplier's manufacturing, inspection, and all subsequent operations.

10.9.2 Suppliers shall flow down all required information to their sub-tier supplier from the design authority. If the flow down information is not generated by the 3D model, a point by point overlay based on the model definition authority will be submitted to LS Engineering approval prior to processing.

10.10 In the case of CMM, laser, optical or other 3D electronic measuring equipment verification of attributes of the part from the Model Based Definition, the measuring equipment software shall be capable of properly interpreting the model without translation errors.

10.11 For forgings, castings, and swagings, an LS Manufacturing Process and Technology (M&PT) Product Qualification Process Approval shall be included with the FAI package.

10.12 LS Oakville offload purchase orders only: Parts manufactured to an Offload Manufacturing Process Sheet (MPS) operation shall have an FAI created to the criteria and requirements as defined by purchase order.

10.13 When the engineering drawing / model or contract requires first article submittal to an LS customer, specific requirements shall be communicated to the supplier by LS.

11 Product Qualification Process Requirements for Forgings, Castings and Swagings (Forging Metallurgical Qualification):

11.1 Product Qualification process shall be performed prior to beginning production.

11.1.1 A detailed product qualification report and a manufacturing plan / traveler / router / technique sheet representing all process steps used to manufacture the forging casting or swaging shall be submitted to the LS M&PT of the procuring facility for review and approval prior to beginning production.

11.2 Required elements as part of the product qualification process are as follows:

11.2.1 Description of each process and operation applicable to the parts, including heat treat racking or loading information (sketch or photograph preferred).

11.2.2 Thermal treatments, including "set" temperatures and times.

11.2.3 The results of all metallurgical and quality evaluations as required by design, drawing/model, applicable specifications and purchase order. Evaluation results are to include the following, as a minimum:

- Two sets (one for LS and one for supplier) of original photographs of microsections (at least 1X magnification that is not photocopies). Grain flow shall follow the general part contour with no re-entrant grain flow lines.
- Microstructural verification including decarburization/carburization test results
- Chemical analysis report
- Mechanical properties test report
- Hardness test results
- Nondestructive test results
- Dimensional layout report
- The raw material certifications from which the product qualification part was manufactured
- All certifications for any outside special processing and testing
- Copies of each LS closed rejection reports (QNs) covering non-conformances that exist on the product qualification part, as applicable.
- Nondestructive testing (NDT) techniques. Nondestructive testing (NDT) procedures and techniques shall be authorized by the applicable certified Level III. For handed Forgings, Castings and Swaging (left or right) only one product qualification approval shall be required providing the opposite hand process is identical.

11.2.4 Any magnetic particle, x-ray, or ultrasonic inspection techniques used to inspect the parts. Nondestructive testing (NDT) procedures and techniques shall be approved by a certified Level III of the applicable NDT process. Approval signature is required on applicable procedures and techniques. Level III certification shall be from a recognized, independent approving body.

11.2.5 When the engineering drawing / model requires product qualification report submittal to the LS customer, two copies of the product qualification report with original grain flow photographs (when required) shall be submitted.

11.2.6 Unless otherwise specified on the engineering drawing / model or purchase order, the product qualification for left and right-handed parts is required for one, but not both, provided processes are identical for both left and right-handed parts.

12 Records of Manufacturing:

12.1 The supplier and supplier's sub-contracted sources shall maintain manufacturing records that provide traceability to all manufacturing and inspection operations. These records shall clearly indicate material status and acceptability and shall include the following information as a minimum:

- Part number, revision, and material traceability and acceptance.
- List of all serial numbers (if serialized) or quantity of parts (if non-serialized) and applicable lot number(s).
- Clear description of operations performed in the proper sequences to produce the completed product to include in process, receiving, and final inspections.
- Record the number of parts accepted or rejected at each completed operation. Rejected serial numbers, if serialization is a requirement, and rejection documents/reports shall be noted adjacent to the applicable operation.
- Record date and acceptance or rejection activity at each operation with operator's unique identifier.
- Part identification operations shall include: requirements, applicable specification, content, method and representative sample of completed feature.
- When manufacturing lot quantities are reduced or "split", this activity shall be recorded at applicable operations on both the original and on the new shop traveler / router / work order. If serialization is required, the serial numbers remaining on the original and the serial numbers being transferred to the new shop traveler / router / work order shall be clearly noted.
- For operations performed by a sub-tier or an outside source, record information traceable to source used, process purchase order, or certification number shall be recorded on the shop traveler / router / work order.
- Verification of any special process planning to ensure compliance to the specification parameters shall be accomplished prior to the actual process being performed. Objective evidence of the plan approval shall be retained and available upon request. This can include:
    - Evidence of any required rework activities
    - Evidence of completion of MRB disposition actions.

13 Material Certifications:

13.1 Laboratory certifications shall reflect actual values, including mill data.

13.2 The supplier is responsible for approval of material received including traceability to the manufacturing source and heat lot (as applicable).
13.3 All raw materials consumed within the product or assembly shall have an accompanying material certification and test report, when applicable, available for source inspection.
13.4 The supplier is responsible for ensuring a process exists to ensure all material certifications and test reports are validated and verified to ensure it meets the design authority requirements. This process and inspection is separate from a receiving inspection process and should occur prior to LS source inspection and is for all suppliers, including those with design authority.
13.5 All LS consigned material (i.e. forgings and castings), drop-shipped from a LS forging supplier or LS raw material supplier to a LS manufacturing supplier shall be accompanied by a packing slip and Certificate of Conformance.
13.6 Material that is shipped directly from a LS site to a manufacturing supplier shall include the Certificate of Conformance and LS shipping ticket having a LS quality unique identifier.

14 Process Certifications:

14.1 Suppliers shall verify product compliance from services provided by sub-tier suppliers and processors.
14.2 The use of LS (Doc 200) and / or customer authorized processors does not remove the requirement for the supplier to ensure all product and process requirements are verified and validated.

15 Forgings, Castings, Swagings, & Raw Material:

15.1 All forgings, castings and swagings shall be identified with a vendor code or logo, which shall be specific to that particular supplier and/or per drawing requirements.
15.2 Suppliers shall maintain traceability from the raw material manufacturer's heat or lot numbers to each individual forging, casting, or swaging. Heat or lot numbers shall be noted on supplier's Certification of Conformance.
15.3 Suppliers shall develop, document, and implement a raw material verification process to ensure material(s) received from the supplier's sub-tier sources meets all the applicable technical and quality requirements.
15.4 Suppliers shall annually select a sample of each material type per material supplier (e.g. carbon steel, alloy steel, stainless steel, aluminum, etc.) and have it independently tested at an accredited ISO/IEC 17025 laboratory for material composition and chemistry to verify compliance with applicable engineering requirements. Test reports provided upon original material delivery may not be used as proof of compliance; this is intended as a third party validation.
15.5 Raw material suppliers to LS and to LS suppliers shall have a process control methodology in place for identifying tracking and trending the following key characteristics:
- Ultimate Tensile Strength (UTS)
- Yield Strength (YS)
- Elongation

- Reduction of Area (RoA)

Results and actions taken shall be made available upon request to LS or LS suppliers upon request.

15.6 All bar stock material (each piece) shall be identified with the heat or lot number, purchase order number, or color code as appropriate.

15.7 Material traceability (heat or lot) shall be transferred to the unused bar stock prior to storage.

16 Identification: Part Marking and Serialization:

16.1 Part marking and serialization shall be clearly identified in the supplier's control plan / manufacturing documentation for all parts.

16.2 Suppliers shall have a process in place to ensure no duplication of serial numbers on any given part number regardless of revision or configuration changes.

16.3 Suppliers shall maintain a serialization record for each serialized component manufactured. Identification and traceability is required for all material, per design requirements.

16.4 All product identification (including permanent etching) shall be clearly legible after final surface coatings (including prime and paint) unless specifically allowed per engineering specifications. Country of origin must be identified on all products, bag or tags for imported parts in accordance with U.S. Customs regulation 19 CFR Part 134.11 e.g. "Made in China", "Product of Japan", "Assembled in Italy", etc.

16.5 All identification shall be applied prior to final inspection.

16.6 All products shall be identified with LS customers (e.g. Boeing, Lockheed, Gulfstream) part number as required by the released engineering drawing and specification requirements.

16.7 Serial numbers shall comply with drawing and/or specification requirements.

16.8 Prefix codes will be assigned by LS SQM.

16.9 If products are of opposite configuration, left and right handed product, the same serial number shall not be used on both hands, opposite configuration.

16.10 The prefix code of the finished part supplier shall be used in place of the forging, casting, extrusion or swaging supplier prefix code, Example:

Forging	P1234
Finished	XYZ1234

16.11 The numeric portion only of the forging, casting, swaging, and raw material forging serial number should apply to the machined detail parts.

16.12 Suppliers of the detail items shall provide cross-reference traceability to the original forging, casting, swaging, and raw material forging serial numbers if new serial numbers are assigned:

16.12.1 The supplier shall identify on the appropriate quality and shipping documents the serial number of the forging used for the resultant part.

16.12.2 The supplier shall provide this information for all serialized forging, casting, swaging, and raw material LS consigned and LS sold forgings.

16.13 Non serialized parts shall be identified with date of manufacture, batch or lot number. Drawing/Specification Requirements apply.

16.14 Identify product with the appropriate design activity code per the engineering drawing / model requirements.

16.15 The LS manufacturer's identification codes are as follows:

- Oakville, Ontario MFR02121
- Burlington, Ontario MFR02KZ1
- Fort Worth, Texas MFR6K4C8
- Troy, Ohio MFR97153
- Cleveland, Ohio MFR13002 (used only when defined by contract)

16.16 Supplier manufacturing codes shall not be used unless specifically called out on the released engineering, drawing, and/or part marking specification.

16.17 When serial number traceability is required by design requirements, applicable serial numbers shall be identified on all supplier and supplier's sub-tier quality and manufacturing records (i.e. travelers and process certifications).

16.18 Application of drawing / model revision letters on product is only allowed when required by purchase order, engineering drawing / model or specification.

16.19 "Kits" shall have the following identified in a prominent location:

- Each detail item shall be identified per applicable requirements of engineering drawing / model, specifications, and this document.
- Quality acceptance approval of the kit.
- Assigned kit part number and revision level.
- Purchase order number and latest amendment level.
- A supplier assigned unique non-repeatable number for each kit that provides complete traceability to all products within each kit.

17 Manufacturing Process Control: Plans and Techniques:

17.1 Manufacturing plans (MPS) shall be generated for all individual components and assemblies.

17.2 The planning shall include all engineering data references (specification, flag note, etc.) necessary to control and produce the parts and include all of the machining, processing, test and inspection operations necessary to complete the parts to the purchase order and engineering requirements. This includes applicable satellite plans and techniques from sub-tier suppliers and processors.

17.2.1 Coolants used per specification controls must be identified, in compliance, and documented on the submitted plan, when required. (For example: BAC MFG. control DWG 160T1000 high strength steel, Note 3, BAC 5440, BAC5008 (applicable table indicates approved coolants)).

17.3 Developmental aids, including a manufacturing plan template and other similar information are available from LS upon request.

17.4 Supplier is responsible to review and approve all manufacturing and process plans associated with the LS purchase order, including sub-tiers associated with LS product realization.

17.5 The manufacturing plan(s) shall be retained on file at the supplier's manufacturing facility or sub-tier when applicable, and shall be available upon request by LS.

17.6 The plan documentation shall be available in English and include the following details, as a minimum:

- Name of applicable manufacturer with facility address.
- Full part number including dash number. When purchase orders refer to part numbers other than the design engineering part number, the planning shall clearly reference both part numbers.
- Engineering drawing / model revision level.
- Planning revision table including revision dates and descriptions of changes and traceability to the individual making the change. All planning changes shall be documented, including editorial changes to correct typographical errors or minor editorial changes.
- Raw material (including forging part number if applicable), raw material specification, raw material size and heat treat condition.
- All operations shall be noted in their proper manufacturing sequence, including all inspection and test points.
- Optional sequences or operations shall be defined in the planning.
- Part identification description including method and text.
- Operations that are required to be performed per a particular specification shall list that specification as part of the operation description in the planning.
- Special process operations shall list the name and location of the processor, applicable specifications and specific parameters (i.e.: type, class, as applicable).
- Special processes shall be controlled and special process sources shall be approved on Document 200 as well as customer approved processor listing as required.

17.7 Maximum section thickness at time of heat treat shall be noted.

17.8 All thermal processing shall be listed as a separate operation (i.e., embrittlement relief, stress relief, etc.). Required times, conditional delay requirements and temperatures shall be documented.

17.9 Machining techniques which impart significant localized heating (i.e. EDM, ECM, plasma application, and laser use) shall only be used when authorized by engineering requirements, or MRB disposition.

17.10 All manufacturing plans and techniques shall be reviewed by the supplier at least every five years to ensure compliance to current engineering and specification requirements.

17.11 Supplier shall have a process to control the timing of the reviews.

17.12 All NDT techniques shall be approved by a recognized NDT Level 3 authority.

18 Manufacturing Process Sheet (MPS) Review and Approval:

18.1 Manufacturing Process Sheet (MPS) requiring LS approval shall be submitted and approved by LS prior to start of manufacturing. See LS-SBU-A004-SQA LS Manufacturing Plan Review and Approval.

18.2 Planning must be in compliance with all Engineering requirements.

18.3 Planning review and approval process is not an authorization to deviate from Engineering

requirements. Manufacturing deviations from Engineering requirements must be requested through an ECPR (See Section 6).

19 Straightening of Parts:

19.1 Unless specifically permitted by the engineering drawing and/or its applicable supporting specifications, authorization by LS Material Review Board and/or Materials & Process Technology is required before performing straightening on steel parts heat treated to tensile strengths greater than 150 KSI.

19.2 The supplier shall maintain all necessary documentation and data records for each part straightened, and will be made available to customer upon request.

19.3 Straightening of steel parts, regardless of temperature, by means of plastic deformation which results in a modified dimensional condition is prohibited.

20 Final and Source Inspection:

20.1 Quality verification for all product(s) and/or service(s) purchased by LS shall be performed at the supplier's facility prior to shipment to a LS facility/site.

20.2 (*LG) Suppliers shall utilize LS-SBU-F005-SQA Final Product Review and Acceptance Record to ensure all requirements are verified prior to release or source inspection by LS authorized personnel.

20.3 Certificate of Conformance shall be provided for each shipment in accordance to LS-SBU-A003-SQA, Release of Products and Services-(Certificate of Conformance Requirements).

20.4 Source inspection does not relieve the supplier of any responsibility and/or liability for full compliance with all contract and quality requirements.

20.5 Waivers for change of source location shall be documented using LS-SBU-F010-SQA.

- The supplier's LS SQM focal shall be advised of the request for waiver.
- The approved LS SQM waiver shall accompany the shipping documents.

20.6 Inspection sampling plans: see ASQR-01 Monitoring and Measurement of Product

20.7 Source Inspection (Delegated Suppliers):

20.7.1 Requirements and training material for inspection including Source and Designated Quality Representative (DQR) is available on MOVEit (Reference AS13001 Supplier Self Release Training Requirements).

20.7.2 Lots shall be inspected for dimensional and specification conformance by the supplier's final inspection personnel in accordance with the supplier's quality system and applicable LS quality flow down requirements.

20.7.3 The DQR verification shall be separate and independent from the supplier's final inspection process.

20.7.4 Authorization and training of DQR personnel will be the responsibility of LS SQM.

20.7.5 The DQR shall stamp and date the LS-SBU-F005-SQA and each certification, as evidence of review and acceptance.

20.7.6 The DQR shall note acceptance of each shipment by stamping and dating the "Certification of Compliance" and the supplier's packing list/shipper by using the LS supplied DQR acceptance stamp.

20.7.7 Use of the DQR stamps by any other person than the assigned DQR will be cause for loss of qualification.

20.8 (*LG) Source Inspection (Non-delegated or loss of delegation suppliers)

20.8.1 Non-delegated or loss of delegation suppliers are responsible for all costs associated with having their product verified prior to being received by LS, except for First Article Inspection verification.

20.8.2 The Supplier shall contact their assigned LS quality representative to request LS product verification at the Supplier's facility when the product is complete and accepted through the Supplier's Quality Management System.

20.8.3 The LS recognized inspection representative, shall respond to requests and schedule for source inspection within 2 working days.

20.8.4 The LS recognized inspection representatives are available Monday to Friday 8am to 5pm, local standard time, including travel time. Requests for source inspection outside of working hours may be subject to charge back of associated labor costs.

20.8.5 The supplier shall plan their manufacturing process and lead times to accommodate adequate time to support source inspection activities and remain compliant to purchase order due dates.

20.9 Supplier of Raw Material (Plate, Bar, Tube etc…) and or Special Processes (chrome, heat treat etc…) who supply material or services directly to LS sites are not requirement to have source inspection performed by LS systems DQR or third party inspector.

20.10 Material and Special Processes shall meet the requirements of sections, 13, 15, 20.2, 20.3, 30.5, 30.6 of this document as applicable. The Certificate of conformance shall reflect these requirements.

20.11 The supplier or special processors' Quality Manager shall sign and date all certificates of conformance in lie of LS assigned DQR or third party inspection.

21 LS Oakville Offload Operations:

21.1 For operations offloaded from LS Oakville, parts are to be inspected and certified as follows:

- All Offload operations are subject to FAI review and approval by LS SQM or Designate.
- Supplier is to perform 100% inspection for all criteria and requirements as indicated on the offload MPS and as per purchase order requirements.
- Supplier is required to retain records of parts inspection.
- Supplier is to certify parts to the applicable purchase order requirements.

21.2 Depending on several key factors (e.g., supplier location, availability of DQR or Source Inspector, Program (Customer) request, SQM reserves the right to allow certifications of compliance to be approved and parts shipped without DQR stamp. Guidance to be provided by SQM as product is completed and ready for source.

22 Special Inspection Requirements / Techniques:

22.1 Suppliers shall verify threaded product using the thread inspection method defined as System 22 in ANSI/ASME B1.3 (current revision) with the following modifications (unless more stringent requirements are specified by contract or drawing):

22.2 Visual Inspection per ANSI/ASME B1.3, paragraph 6c.

22.3 Maximum Material functional acceptance to a GO thread gage per ANSI/ASME B1.3, Column A1, Row 1.1, of Table 1 or Table 2 as applicable. Use a thread plug gage per ANSI/ASME B1.2 section 4.1 for internal threads. Use a thread ring gage per section 5.1 for external threads. Suppliers shall procure and maintain calibrated gages for functional product verification before and after any plating. After plate gauges shall be used for final product acceptance.

22.3.1 In the event of a thread attribute gauge dispute between facilities (i.e. suppliers and LS site gauges that accept and reject the same parts); the NIST calibration certification provided by the supplier from an ISO/IEC 17025 accredited lab shall be the refereeing source. If the dispute still cannot be resolved, the supplier or LS may choose a third party as a refereeing source which is an ISO/IEC 17025 accredited facility or higher on the NIST hierarchy.

22.4 Major diameter size measurement per ANSI/ASME B1.3, Column J2, of Table 1, external threads only.

22.5 Pitch diameter size measurement per ANSI/ASME B1.3, Column C2, of Table 1 or Table 2 as applicable.

Note: It is recommended that those suppliers that manufacture class #3 series internal and external threads shift their process means toward minimum material condition.

22.6 Minor diameter size measurement per ANSI/ASME B1.3, Column K2, of Table 1 or Table 2 as applicable.

22.7 Root radius size measurement per ANSI/ASME B1.3, Column L, of Table 1, external threads only.

22.8 Exception: For tapped holes with internal threads of nominal size less than 0.190”, only the functional acceptance and the minor diameter inspections need to be performed.

22.9 Suppliers shall verify splined product using the spline inspection method defined in ANSI B92.1 section 16.4 (which includes, but is not limited to, the use of GO composite and NOGO sector gages) unless more stringent requirements are specified by contract or drawing.

23 Drop Shipments

23.1 When authorized by PO, suppliers can ship directly to LS customers or other LS Divisions using the supplier shipping documentation:

23.1.1 The shipper shall be provided by the LS buyer that identifies drop shipment instructions / requirements.
23.1.2 The PO number shall be referenced.
23.1.3 If serialized, the serial numbers being shipped shall be recorded on the shipper and submitted to LS SQM or designee through MOVEit for final clearance. LS buyer shall provide the stamped and dated shipper and Collins Certification of Compliance back to the supplier upon successful completion of serial number clearance.
23.1.4 The supplier shall provide a completed LS shipper, packing slip, supplier Certification of Compliance and Collins Certification of Compliance with the parts per the LS buyer instructions.

24 LS Supplied Tooling, Gages, and Fixtures:

24.1 See COL-ASQR-PRO-0003.
24.2 See Customer Requirements section within this document for additional requirements.

25 Handling, Storage, Preservation and Shipping:

25.1 Electro Static Discharge (ESD) sensitive material:
25.1.1 Suppliers delivering Electro Static Discharge sensitive product shall ensure its protection during the manufacturing process and identification per MIL-STD-1686 and ESD packaging for delivery (connector caps, bags, and bubble sheets) per MIL-STD-2073 and MIL-HDBK-263.
25.2 Protection of sensitive surfaces:
25.2.1 Machined parts with finished or semi-finished unprotected (not plated) surfaces shall be protected as per LGPS 1000 Corrosion Protection of Parts or applicable specifications.
25.2.2 All threaded items shall have thread protection.
25.3 Packaging Specifications: See COL-ASQR-PRO-0003.
25.3.1 The packaging of product shipped to LS shall ensure protection from transit damage and shall at a minimum comply to:
- Reference ASTM-D3951 for “Standard Practice for Commercial Packaging”
- Reference MIL-STD-2073-(current revision) for “Standard Practice for Military Packaging”

26 Nonconforming Product:

26.1 Suppliers shall not ship nonconforming material unless authorized in writing by MRB disposition or receipt of an approved LS-LG-F001-QA Request for Custody form.
26.2 (*WB) MRB submission:
26.2.1 Supplier shall submit a completed Supplier Material Review Record (Form 815) to the LS Buyer/or Supplier Quality focal.

26.2.2 A unique MRB number will be determined by LS.

26.2.3 Product which has been accepted by MRB are identified per instructions provided with the form.

26.2.4 Shipment for material with MRB shall be identified per MRB instructions. All material certifications for MRB approved material shall reference appropriate MRB number.

- Approval must be granted by LS prior to product shipment.
- Approval for shipment does not establish any precedent for future non-conforming material.

26.2.5 The supplier must maintain a copy of the dispositioned Supplier Material Review Record (Form 815) with their quality records for the affected material.

26.3 (*LG) Quality Notification (QN) submission:

26.3.1 For a discrepancy discovered that may be reworked into a conforming condition **prior to subsequent processing**, the supplier's standard internal rework process shall be followed. Rework records shall be maintained as per the Records of Manufacturing.

26.3.2 Any NDT rejections shall be submitted to LS MRB for review and disposition.

26.3.3 Suppliers shall document the discrepancy on a LS Quality notification (QN) form LG-DIV-SQA-FORM 2963:

- See naming convention requirements for QN submission in MOVEit
- Shall contain a clear description of actual or suspect nonconformance

26.3.4 When completing the Vendor Initiated Quality Notification Entry Sheet, the requestor shall include all appropriate email addresses at bottom of form (e.g., buyers, quality, and associated required communication points between supplier and customer). The QN number will be communicated back to the supplier.

26.3.5 Once disposition is obtained from LS MRB each element of the disposition shall be stamped off and dated as evidence of completion.

26.3.6 Subsequent request by LS for reconvene or continuation to obtain final MRB disposition shall be on LG-DIV-SQA-FORM 4486.

26.3.7 If any special processes are used for the repair, the supplier shall list the processor used, the certificate number, and date.

26.3.8 Except when specifically authorized by the engineering drawing / specifications or LS MRB disposition, welding on any LS assemblies or machined/formed detail components for the purpose of repair is prohibited.

26.4 Disclosures (Notice of Escapement, NOE):

26.4.1 (*LG) In lieu of ASQR-01 Form 6, suppliers shall provide written notification to LS within 24 hours when a nonconformance is determined to exist, or is suspected to exist, on product already delivered to LS or LS customers using the AS9131 template.

26.5 MRB Administrative Costs

26.5.1 Suppliers are responsible for all administrative costs and Customer penalties incurred by LS and associated with the Material Review (MR) and disposition of supplier manufactured nonconforming product.

26.5.2 Any costs associated with rework of discrepant material shall be charged to the supplier.

27 Service and Warranty:

27.1 Service and warranty repair components shall not be mixed with new production components during manufacturing or storage. They shall not be assembled into new production without the written authorization of LS and (when required) concurrence of LS customer.

27.2 All service and warranty components shall be uniquely identified for traceability in the supplier's system throughout the repair process.

27.3 Repairs shall not begin without a repair purchase order and LS authorization.

27.4 Parts and assemblies received from LS or an LS customer which are not accompanied by a service routing, inspection requirements/definitions, or having a specific disposition shall be inspected and tested (if appropriate) to confirm the rejection. Items are to be subsequently disassembled for component inspection when applicable. When parts and assemblies are accompanied by a service routing or inspection QN, the instructions contained therein are to be followed.

27.5 The inspection results and analysis, Failure Analysis Report (FAR) showing the date of original manufacture and date returned items were received, shall be maintained, controlled, and submitted to LS for review and approval, upon request. The results shall include:

- All inspection/rejection MRB generated on components found discrepant (all MRB shall be marked "Service").
- Corrective actions for discrepant items that are the supplier's responsibility, and a repair quotation (when applicable) with a listing of all LS consigned inventory required to complete a specific repair.
- Serialized Component list (the supplier is responsible for only the components replaced during the warranty or repair rework).
- ATP/Test Report.
- MRB clearance list of all new/consigned parts used in the repair (list all other open issues or QNs with the serviced item).
- Any MRB QNs generated with approved MRB clearance during the repair process.
- Replaced items shall be accompanied by Certification of Compliance, which shall include applicable data such as cure dates for O-rings, seals, etc.
- FARs shall be completed within 30 days upon receipt of returned product.

27.6 All documentation shall be traceable to the LS service work order and/or purchase order number.

27.7 FAR reports shall be submitted through MOVEit when required.

28 Corrective Action Process:

28.1 See ASQR-01 and COL-ASQR-PRO-0003

29 Preventive Action/Continuous Improvement:

29.1 Control of Key Characteristics:

29.1.1 Suppliers shall have a process for control and analysis of key characteristics as defined within the engineering drawing, model, purchase order and when the part(s)/process is specifically designated for SPC/process capability by LS.

29.1.2 All data pertaining to key characteristics shall be made available upon request and will require approval by LS Supplier Quality Management.

29.1.3 When required, data will be provided in the format prescribed per AS9103, Variation Management of Key Characteristics (VMKC).

29.1.4 All processes that effect key characteristics shall be evaluated for statistical process capability (Cpk).

29.1.4.1 Cpk values less than 1.67 shall be addressed by the supplier with an improvement plan.

29.1.4.2 Cpk values less than 1.33 shall be addressed by the supplier with a Corrective Action (supplier's format)

29.2 Zero Defect Plan™ (ZDP™) shall be used for escape mitigation and long term corrective and/or preventive actions when requested by LS. Link to ZDP™ methodology can be found here: https://global.utas.utc.com/sites/Quality/SitePages/ZDP.aspx

30 Special Processes:

30.1 Nadcap accreditation is required for processors of Nadcap commodities.
Approval of Special Processors (Doc 200):

30.1.1 The request shall be made in writing to Supply Chain Management using form LS-SBU-F001-SQA – Request for Processor Approval, stating the processor's company information and listing the processes and specifications the supplier is requesting the processor to support.

30.2 Approvals are granted for each individual processor / process / specification combination, and are site location specific. Physical relocation of processing requires LS re-approval prior to any use of that re-located process.

30.3 Document 200 is the LS listing of approved processors available on the supplier portal. When new processors are approved by LS but not evident, pending revision of the public version of Document 200, an e-mail from LS Supplier Quality Management may suffice as evidence of approval until the public version is revised.

30.4 Special process sources approved for a LS, Military or Industrial specification that has been superseded, shall be considered approved for the superseding specification.

30.5 Suppliers use of Approved Processors:

30.5.1 Only LS approved sources shall be used to perform special processes on production parts manufactured for LS engineering drawings/design.

30.5.2 When product is required to be processed to a LS customer controlled specification (e.g. Boeing BACxxxx, DPSx.xx, PSxxxxx, Lockheed 5PTPxxx, etc.), selected process source shall be listed in the LS Document 200 listing as approved for a quality system and the

applicable special process for equivalent industry specification, and in the applicable customer's approved supplier listing (e.g. Boeing D1-4426, Lockheed QCS-001, etc.) for the controlled process and specification.

30.5.3 The supplier shall maintain and use an approved processor list, and are responsible for ensuring that approved sources meet the requirements of the applicable specifications.

30.5.4 Suppliers are responsible for ensuring that processing meets the requirements of the applicable specifications defined in the engineering and contractual requirements.

30.5.5 The supplier's purchase order shall flow down to the processor all applicable information required to perform work to engineering and contractual requirements and as required by individual process specification and end customer requirements. The purchase order shall clearly specify the full scope of processing to be performed, MRB actions required, applicable specification number(s), revisions and addendums or modifications, part numbers, quantity, serial numbers (if applicable), applicable program and prime customer and identify LS as the supplier's direct customer.

30.5.6 In the event of any conflict between the purchase order and engineering requirements, the processor shall contact their customer and/or LS Supplier Quality representative for clarification and verification prior to commencing any work on the product.

30.6 Processor Requirements:

30.6.1 Work shall be planned, approved and executed in accordance to the scope of work being performed.

30.6.2 A packing slip, Certificate of Compliance, and inspection records shall be included with all shipments.

30.6.3 Unless allowed by LS specification requirements, for serialized parts, heat treat sources shall record actual hardness values for each serial number.

30.6.4 Objective evidence of compliance to specifications and drawings shall be made available upon request.

30.6.5 A performance metric that will measure internal rework for each approved process and will be made available upon request.

30.6.6 For a discrepancy discovered within a special process, the guiding specification for that specific special process may provide rework guidelines.

31 Specific LS Customer Requirements:

31.1 Airbus:

31.1.1 Suppliers shall implement a Risk Management and mitigation process for all processes including sub-tiers.

31.1.2 All Airbus Quality requirements must be in accordance with GRESS (current revision) and Airbus Quality Requirement document found on MOVEit.

31.1.3 Product designated with key characteristics shall include an approved interchangeability document completed per requirements with each shipment.

31.2 Lockheed Martin Aeronautics (LMA):

31.2.1 Suppliers shall comply with applicable Appendix QX (current revision) LM Aero Supplier Quality Requirements found on MOVEit.

31.2.2 LM Counterfeit Parts Prevention (for the following verbiage Seller is defined as LS suppliers, Buyer is LS):

Seller shall establish and maintain a Counterfeit Parts / Material Prevention and Control Plan using AS5553 (Ref. elements of Section 4) and/or AS6174 (Ref. elements of Section 3) to ensure that Counterfeit Work is not delivered to Buyer. The purpose of Seller's Plan shall be to develop a robust process to prevent the delivery of counterfeit commodities and control commodities identified as counterfeit.

a) For purposes of this clause, Work consists of those commodities delivered under this Contract that are the lowest level of separately identifiable items (e.g., articles, components, standard hardware, goods, raw materials and assemblies). "Counterfeit Work" means Work that is, or contains, items misrepresented as having been designed and/or produced under an approved system or other acceptable method. The term also includes approved Work that has reached a design life limit or has been damaged beyond possible repair, but is altered and misrepresented as acceptable.

b) Seller shall only purchase products to be delivered or incorporated as Work to Buyer directly from the Original Component Manufacturer (OCM)/Original Equipment Manufacturer (OEM), OCM/OEM authorized distributor chain, Aftermarket Manufacturer, or Authorized Reseller. These products shall have verification that Work is traceable to OCM/OEM; OCM/OEM authorized distributor chain, Aftermarket Manufacturer, or Authorized Reseller that identifies the name and location of all the supply chain intermediaries from the part manufacturer to the direct source of the product for the Seller. Work can only be acquired from independent distributors or brokers in cases of diminishing material supply (DMS) or obsolescence and shall be subjected to a screening process appropriate to the commodity in accordance with the Counterfeit Parts / Material Prevention and Control Plan. If traceability is not obtainable, written notice shall be provided to the Supplier Quality Engineer and Buyer prior to delivery with records of evidentiary tests and inspections performed and conformance of the product to specified acceptance criteria that ensures verification activities taken to assure authenticity. Written notice is not required for raw material and standard hardware purchased from independent distributors or brokers, but products must be able to provide commodity level traceability to the Original Manufacturer.

c) Seller shall notify Supplier Quality Engineer and Buyer in accordance with 2.2 with the pertinent facts if Seller becomes aware or suspects that it has furnished Counterfeit

Work. Seller shall provide to Supplier Quality Engineer and Buyer, upon request, the supply chain traceability to an Original Manufacturer or authorized distributor chain that identifies the name and location of all the supply chain intermediaries from the part manufacturer to the direct source of the product for the Seller.

d) Seller shall include this clause or equivalent provisions in lower tier subcontracts for the delivery of items that will be included in or furnished as Work to Buyer. Sellers eligible for utilization of the Government-Industry Data Exchange Program ("GIDEP") shall utilize the GIDEP process to alert the industry of encountered counterfeit parts. If additional information is required, the supplier shall contact the LS buyer. The LS buyer will then contact the appropriate PQE or Program Management for clarification. For suppliers providing LM product, suppliers shall comply with LM's PM-5010 (current revision)

31.3 Transport Canada:

31.3.1 To assure continued compliance to our customers as well as regulatory bodies, in this case Transport Canada, reference 561.13 (3) No supplier who performs work for a holder of a manufacturer certificate under this Subpart shall subcontract the work to another supplier without having first obtained the written consent of the holder of a manufacturer certificate. As a supplier to LS providing product to LS as a manufacturing certificate holder per Transport Canada and you plan to subcontract any work that does not constitute an approval within the current construct of This document, i.e. MPS approvals, Doc 200, you will need to contact your buyer or SQM representative requesting written consent prior to subcontracting. The request will be in the form of the supplier choice and will include the subcontractor company name, address of manufacturing (service) and a short description of the sub-contracted service to be provided.

LS shall communicate the written consent back to the author of the request.
Copies of the request and written consent shall be maintained by the supplier and shall be subject to the requirements of record management as outlined in section 1.7 of this document.

31.4 Boeing:

31.4.1 For U.S Government owned special tooling (ST) accountable to Boeing or Boeing owned special tooling (ST) the requirements of D950-11059-1, BDS Seller Special Tooling Requirements is applicable.

31.4.2 The supplier shall ensure that all standard hardware with Boeing design authority is procured from approved manufacturers and distributors in compliance with Boeing's D-590 Parts Standards specification requirements.

31.4.3 The supplier shall ensure that First Article Inspection records for all standard hardware with Boeing design authority are available upon request.

31.4.4 Reference Boeing D1-4426: User Instructions & Requirements:

31.4.4.1 "5.1.2.1 Purchasers are required to adequately define and document the statement of work, where appropriate: specification, specification revision, specification departures, Type, Class, Grade, program number, design authority, pre/post processing steps, as applicable. The organization shall ensure the adequacy of specified purchase requirements prior to their communication to the processor. Note: This applies to tier one suppliers or Landing System sites offloading special process work to an approved Boeing source."

31.4.4.2 "7.2.1 Processors shall perform contract review prior to accepting an order to ensure the purchaser has adequately defined and documented the statement of work which includes, where appropriate: specification, specification revision, specification departures, Type, Class, Grade, program number, design authority, pre/post processing steps, as applicable."

31.4.4.3 Note: The specific purchase order processing information required to be flowed down on the purchase order to the special processor is identified in the Boeing Appendix D. Some information is always required and other information is required when applicable.

- This appendix is available on the Boeing Approved Process Sources D1-4426 web site http://active.boeing.com/doingbiz/d14426/Appendix-D.pdf

31.4.5 Where Boeing build to print Digital Product Definition is the design authority, suppliers are responsible for compliance to the applicable sections of Boeing's D6-51991 – Quality Assurance Standard for DPD at Boeing Suppliers; link http://www.boeingsuppliers.com/.

31.4.6 Supplier's compliance to D6-51991 will be assessed. Reference LS-LG-W-426-ENG, on the supplier portal for more information and LS requirements.

31.4.7 For Boeing Commercial product, Boeing quality clauses: A17, A98, Q09, Q13, Q29 Q31, S68, S78, T88, U40, found on the supplier portal, are required to be flowed down from LS to our suppliers and Boeing requires that the provisions/requirements set forth above be included in LS direct supply contracts as well as the obligation that they be flowed to the sub-tier supply chain.

31.4.8 **Boeing Document D1-4426,"Approved Process Sources":** Suppliers and Sub Tiers shall comply with Boeing document D1-4426 "Approved Process Sources" http://active.boeing.com/doingbiz/d14426/index.cfm
D1-4426, subject to revision from time to time, defines the approved sources for special processing, composite raw materials, composite products, aircraft bearings, designated fasteners, and metallic raw materials. The Seller's purchasing information shall conform to the purchasing data requirements of Boeing document D1-4426 Appendix D. These purchasing data requirements can be found at:
http://active.boeing.com/doingbiz/d14426/Appendix-D.pdf

31.5 Sumitomo Precision Products (MRJ program):

31.5.1 AQ1-11108 Visual Inspection Procedure of Parts for MRJ program. Compliance of AQ1-11108 is invoked to LS and its suppliers that provide product supporting the Mitsubishi Regional Jet program per SPP Quality Control Document AQI726. Both are available on the supplier portal.

31.6 Goodrich Actuation Systems:

31.6.1 In addition to LS quality requirements, compliance to 981-151-001 "Supplier Quality Assurance Requirements" and PFC-SC-025 DON "Supplier Quality Requirements" is required when supporting the Goodrich Actuation Systems programs. Both are available on https://suppliers.utc.com/SPPortal/Pages/Forms

32 References (Outside of LS):

SAE AS9100 (current revision) Quality Systems – Aerospace – Model for Quality Assurance in Design, Development, Production, Installation and Servicing
SAE AS9102 – Aerospace, First Article Inspection Requirements
SAE AS9103 – Variation Management of Key Characteristics
SAE AS9120 – Quality Management Systems – Requirements for Aviation, Space and Defense Distributors
SAE AS9131- Quality Management Systems – Non Conformance Documentation
ISO 9001 (current revision) – Quality Management System - Requirements
Airbus – GRESS – General Requirements for Equipment and System Suppliers
ISO 10012 (current rev.) - Measurement Management Systems
Lockheed Martin Appendix QX (current revision)
Transport Canada CAR 561 (current revision)
National Defense Authorization Act, Section 818, Detection and Avoidance of Counterfeit Electronic Parts
Boeing D1-4426 – User Instructions and Requirements
Sumitomo AQ1-11108 - Visual Inspection Procedure of Parts for MRJ program
AS13001 - Supplier Self Release Training Requirements

Revision Date	Reference	Comments
3/8/2021	00	Changed naming convention from "LS-SBU-A001-SQA [05]" to "LS-SBU-A001-SQM [00]". Reformatted entire document.

33 Change Log