Quality Clause Q2A
First Article Inspection

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The terms "Item", "PO", and "Buyer" used herein have the same meaning as "work", "contract", and "Lockheed Martin", respectively, as may be defined in another provision of the Purchase Order (PO) of which this Quality Clause Q2A is a part.

1. PURPOSE:

The purpose of First Article Inspection (FAI) is to validate Seller's product realization processes are capable of producing parts and assemblies that meet all engineering and design requirements. A well planned and well executed FAI will provide objective evidence that Seller's processes can produce compliant product and Seller understands and has incorporated all product requirements.

2. SCOPE:

A. The requirements of this Quality Clause and AS9102 are applicable in full to the PO. The requirements of AS9102 are also applicable to all lower-level detail parts and assemblies which comprise the part on the PO. This includes parts manufactured, processed, assembled, tested or inspected at sub-tier suppliers.

B. Copies of AS9102 and the FAI forms may be obtained from the Society of Automotive Engineers at www.sae.org/aaqg/publications.

C. References to AS9102 in this document refer to the revision in effect at the time of the PO. Seller may work to the latest version of AS9102.

3. DEFINITIONS:

Critical Items – For the purposes of this Quality Clause, Critical Items shall mean parts identified on the drawing or specification as Critical Safety Items (CSI), Fatigue Fracture Critical (FFC), Fracture Critical (FC), Durability Critical (DC), Maintenance Critical (MC), Mission Abort Critical (MAC), Safety Critical (SC) and Flight Science Critical (FSC). Critical Items will also include Items that have Interchangeable-Replaceable (I-R) features identified on the drawing.

Digital Production Definition (DPD) – Requirements in any digital data files that disclose, directly or indirectly, the physical or functional product requirements. This includes both the design and acceptance criteria (e.g., 3D solid models, CATIA, etc.).

FAI Planning – Those activities that are performed prior to the first production run of parts.

FAI Report Package – The collective evidence of an FAI as required by this Quality Clause and AS9102, including but not limited to the following: FAI Reports of sub-indentured parts; Certificates of Conformance (CoC); CMM or other metrology system reports; and Acceptance Test Procedure (ATP) reports.

First Production Run Parts – The first group of one or more parts that are the result of a planned process designed to be used for future production of these same parts.

Sub-Tier Supplier – For the purposes of this Quality Clause, sub-tier supplier shall include all entities that perform manufacturing, assembly, testing and inspection work for Seller, including, but not limited to, sub-tier suppliers at all levels, subcontractors, special processors, feeder plants, other Seller manufacturing sites, partners, etc.

Technical Data Package (TDP) – The complete set of technical requirements necessary to communicate design intent. A TDP may include but is not limited to only: drawings, performance-based specifications, Digital Production Definition (DPD) media, process specifications.

Note: This Quality Clause also uses terms, definitions and acronyms defined by AS9102.

4. GENERAL REQUIREMENTS:

A. Seller shall notify Buyer's assigned Supplier Quality Engineer (SQE), in writing, a minimum of five (5) business days prior to:
   1. Seller procuring items or beginning any FAI Planning activity for the PO
   2. Seller's intended date to complete inspection of the first production run parts for this PO
   3. Creating or starting any changes that affect items to be delivered under this PO as identified in paragraph 4.F.

   Buyer's assigned SQE may elect to review or participate in Seller's FAI process at any time throughout the FAI process. Buyer's SQE may elect to create a Production Validate Required (PVR) to flag the FAI item to ensure Buyer product validation prior to shipment. The FAI item will not be allowed to ship until the PVR has been closed.

B. Seller shall create a documented procedure or plan that satisfies all the requirements of this Quality Clause and AS9102. This procedure or plan will detail how Seller will validate FAIs completed by sub-tier suppliers.

C. Seller shall document completion of Seller's FAI in the English language. Seller shall record the requirements and results in the units specified within the TDP.

D. Seller shall complete the FAI on the first production part to be delivered. Exceptions or deferrals beyond the first production part shall only be allowed by written authorization from Buyer's assigned SQE.

E. Seller shall flow down the requirements of this Quality Clause and AS9102 to all sub-tier suppliers as necessary to ensure Seller is in full compliance with this Quality Clause. Seller shall flow the requirements of this Quality Clause to any sub-tier supplier where Buyer design characteristics will be part of the sub-tier supplier build responsibility. Sub-tier supplier FAI reports become an integral part of Seller's FAI documentation records and shall be made available upon request.

F. Seller shall perform a partial or full FAI for any changes required by AS9102 and any of the following changes:
   1. Any change to programming that is used in numerical controlled machines, test stations, coordinated measuring equipment, etc.
   2. A lapse in production for over two (2) years has occurred
   3. Any physical location changes of manufacturing or inspection equipment or relocation of tooling
   4. Nonconformances to Buyer requirements discovered after completion of an FAI (see paragraph 5.F)

G. The following items do not require FAI, unless otherwise directed by Buyer in the PO:
   1. Standard hardware and electronic piece parts (e.g., AN, MS & NAS standards; C, M & P standards; 2GNA00001 standard parts unless 2GNA00001 specifically requires FAI; etc.)
   2. Commercial off-the-shelf (COTS) items
   3. Metallic raw material (e.g., plate, bar, rod, etc.) and non-metallic raw material (e.g., paints, sealants, adhesives, etc.)
   4. Engineering models, design/development/concept/prototype items, etc.
   5. Items that have been manufactured and delivered to the U.S. Government where Seller has objective evidence of an FAI performed in accordance with AS9102 within the last two (2) years from the date of the PO to the same configuration as required by the PO. If Seller or the U.S. Government are experiencing nonconformances, Buyer may require Seller to complete a partial or full FAI in accordance with this Quality Clause.
   6. Items returned to Seller for repair or rework
   7. Items bought as spares

8. Items procured to Buyer's part number where Buyer has not developed drawings or specifications controlling the item's physical and functional requirements.
9. Special Tooling or Perishable Tooling.

H. For major aircraft assemblies (i.e., wings, fuselages, empennages, tails, etc.) Seller is only required to complete the FAI Planning section of the FAI (paragraph 5.A), unless otherwise directed in the PO. Completion of the AS9102 forms is not required. All constituent detail components and subassemblies within the above major aircraft assemblies that are manufactured, processed, tested or inspected by sub-tier suppliers will require full compliance to AS9102.

I. FAI by similarity will be accomplished per AS9102. An FAI by similarity requires a previously completed FAI on parts with identical characteristics of similar parts produced by identical means with no history of nonconformances. FAI by similarity shall be approved in advance in writing by Buyer's assigned SQE. FAI by similarity is not allowed for critical items.

J. Any discrepancies or nonconformances to Buyer's requirements discovered during the FAI shall result in the failure of the FAI or "not complete" as defined in AS9102. This shall extend to any parts found nonconforming if the FAI part was selected from a batch or production run. Seller shall determine root cause and take corrective action for any nonconformance to Buyer requirements discovered during the FAI. A partial FAI for all characteristics affected by the nonconformance shall be performed on the first production run after implementation of the corrective actions. If the partial FAI does not clear all identified nonconformances, the FAI shall be considered "not complete" and the requirements to complete the FAI shall remain in effect. Seller shall notify Buyer's assigned SQE, in writing, within 5 days of any nonconformance discovered during the FAI.

K. Seller shall comply with the forms usage and completion requirements of AS9102.

L. Seller shall maintain documentation of FAI results on each deliverable end item for the period specified by the PO. Seller shall provide a complete copy of FAI reports, including those of sub-tier suppliers, to Buyer upon request.

> **Note:** FAI for follow on POs need not be re-accomplished if there has been no lapse in production (reference 4.G.5) and the FAI record is still available for Buyer review when requested. Lost or destroyed FAI records will require a new FAI.

M. Buyer reserves the right to require Seller to perform a partial or full FAI for causes defined in AS9102 or Quality Clause Q2A.

5. DETAILED REQUIREMENTS:

A. <u>FAI Planning:</u>
Seller shall take the following actions prior to the start of manufacturing or subcontracting of the item on Buyer's PO:

1. All applicable characteristics from the engineering (e.g., drawings, specifications, DPD, Production Outsource Instruction Sheet (POIS), Procurement Data Sheets (PDS), etc.) and PO shall be accounted for during the FAI planning. The method of documentation for this reconciliation shall follow the best practice of "ballooning" the drawings, specifications and other requirements and providing traceability of each characteristic to the FAI report. The "ballooned" documents shall become part of the FAI documentation package. Seller may propose and use alternate "ballooning" type methods that meet the intent of this Quality Clause only after receiving Buyer SQE approval in writing.
2. All specifications, including referenced specifications within parent specifications, shall be reviewed, ballooned and reconciled to each applicable work instruction / operation planning card to ensure no product requirements have been overlooked.
3. Reconcile the engineering bill of material against the released configuration effective at the time of PO acceptance.
4. Determine the method for validating all TDP requirements and the resulting objective evidence of that validation. All geometric design features in the TDP, including but not limited to fillets, seal grooves, etc., must validated. Computer Numerical Control (CNC) programs must but validated using simulation and optimization software or using other methods that validate the CNC program prior to production manufacturing.
5. Review routing sheets, manufacturing / quality plans, manufacturing work instructions, engineering, etc., to ensure operations are planned with the appropriate level of detail and clarity. The review shall include production and inspection steps. Ensure inspection steps have appropriate measurement or sampling plans.
6. Verify employee certifications required to perform all tasks listed in operation cards / work instructions are identified and current. Employee certifications are not required to be included in the FAI package.
7. Determine how subcontracted components, sub-assemblies and special processing will be validated as part of the FAI process. As applicable, ensure only approved components, special processes and material sources have been or will be used (e.g., Engineering Material & Approved Products (EMAP), Qualified Material List (QML), Qualified Product List (QPL), QCS-001, 2GNA00001, etc.).
8. Identify Key Characteristics and Critical Item requirements and ensure these requirements are validated during the FAI. This shall include planning for the completion of an Engineering First Article Evaluation (EFAE) when required.
9. Ensure all gages and tooling used for the manufacture, processing, testing and inspection of product, including airframe tooling controlled by TMS-MC-015 (Buyer-furnished and Seller owned) are qualified, calibrated and validated, as applicable. Tooling used as a media of acceptance shall be verified against the applicable requirements of engineering, master tooling, etc., in accordance with the plan defining periodic inspection requirements and methods.
10. For all major aircraft assemblies (wings, forward fuselage, center fuselage, tails, aft fuselage, mid-fuselage panels, forward/aft plug panels, center wing assemblies and empennage), or when otherwise required by Buyer, create planning for completing Fit check at the appropriate aircraft assembly level.
11. If machine-readable part marking is required, Seller shall validate that the machine-readable information (MRI) in the 2D marking is correct per validation requirements

specified in LMA-PN015 (both the quality (grading) of the 2D mark and the data content encoded in the marking). Seller shall generate an image of the nameplate showing the human-readable information (HRI) and the 2D mark. Both are required to ensure the relationship between MRI and HRI is maintained and shall become part of the FAI data package.

B. FAI Entrance Criteria:
FAI documentation requirements begin when FAI planning begins. Once the following are met, Seller shall begin the FAI:
1. TDP (e.g., drawing, specifications, DPD, etc.) is released by Buyer.
2. Seller Acceptance Test Procedures (ATP) have been approved by Buyer, as required.
3. Seller manufacturing plans for Critical Items have been approved by Buyer, as required.
4. Buyer's assigned SQE has been notified in writing of the beginning of the FAI process (reference paragraph 4.A).

Note: Seller may begin the FAI process prior to the completion of 1 through 4 above but will be required to re-accomplish any FAI process steps if changes are made.

C. FAI Process:
1. Complete production, processing, assembly and verification activities for all detail parts, sub-assemblies, subcontracted components and special processes. Document the FAI in accordance with AS9102 and this Quality Clause.
2. Complete the EFAE, as applicable. Evidence of EFAE completion and acceptance by Buyer shall become part of the FAI report.

D. FAI Exit Criteria:
An FAI will be considered complete when the following conditions are met:
1. Successful completion of all the FAI requirements contained in this Quality Clause and AS9102, including the completion of the FAI documentation package with supporting objective evidence.
2. Successful completion and validation of all sub-tier supplier FAIs on sub-components, sub-assemblies and processing, as applicable. This includes documented objective evidence of compliance to Appendix QJ for Special Processors.
3. Successful manufacture, process, test and inspection of the FAI item, with no defects or nonconformances to Buyer's requirements.

E. Production Repeatability Demonstration:
1. Seller shall demonstrate production repeatability by successfully manufacturing, testing and inspecting one (1) part from the next three (3) consecutive and different lots/batches after the FAI item. Validation is accomplished using the Seller's normal inspection and test process for the three (3) parts with no defects or nonconformances to Buyer's requirements. Production Repeatability Demonstration is only required after the completion of the initial, acceptable FAI.

NOTE: For the purposes of this Quality Clause, "different lots/batches" means that machines, tooling and fixture setups are torn down and re-setup, between production runs unless setups will normally never be torn down between production runs.

2. Seller shall provide objective evidence for the successful manufacture, test and inspection of these subsequent items and made available for review by Buyer SQE upon request.
3. If Seller produces item on a continuous production line, Seller shall validate continued compliance to all Buyer requirements by randomly selecting one (1) part at pre-defined intervals until three (3) parts have been inspected. The pre-defined interval shall be coordinated with the Buyer assigned SQE prior to beginning the FAI.
4. Nonconformances to Buyer requirements discovered on any of the three (3) production repeatability demonstration items shall require root cause and corrective action (RCCA), and a partial FAI on the affected characteristics. Once the partial FAI is completed, the production repeatability demonstration will be repeated until successful.

F. <u>Post FAI Sustainability:</u>

1. After FAI is successfully completed, Buyer expects all subsequent production parts will be defect free. If nonconformances to Buyer's requirements affecting form, fit, function, safety or reliability are discovered after FAI, Seller shall conduct RCCA analysis to determine root causes for each nonconformance.
2. Seller shall provide documented evidence for the RCCA analysis and the actions Seller is taking for any failure following FAI completion, upon written request by Buyer.
3. After RCCA has been implemented, Seller shall perform partial FAI for all characteristics affected by the nonconformance.

   Note: Nonconformances caused by uncontrollable special causes (e.g., power outage, weather events, etc.) do not require full or partial FAI. Documentation on uncontrollable special cause determination shall be made available upon request.

Quality Clause Q2A Revision Log

REV	DATE	CHANGES
14	12/14/17	1. Updated Purpose 2. Removed verbiage on cost, price or fee from various paragraphs 3. Deleted paragraph 2.D 4. Updated the definition of Critical Item 5. Updated 4.E on flow down to clarify requirement 6. Updated 4.G to add requirement to review 2GNA00001 for FAI requirement on standard hardware 7. Updated 4.K to clarify "failed" FAI to mean the same as "not complete" 8. Updated 4.M to add Note 9. Deleted 4.N 10. Updated 5.A.1 to allow for alternate to ballooning 11. Added additional detail to 5.A.4 12. Added 5.A.13 on machine-readable part marking 13. Added note to 5.B 14. Deleted 5.C.3 as it is a redundant requirement 15. Deleted 5.D.4, 5.D.5 & 5.D.6 and moved to new section 5.E 16. Created section 5.E, making Production Repeatability Demonstration clearly separate from FAI 17. Updated 5.F.1
13	6/22/2016	1. Revised para. 2.A to remove applicability of Q2A to lower-level detail parts 2. Revised para. 2.B to fix broken link 3. Moved para. 4.F to IV.A and renumbered remaining paragraphs 4. Revised para. 4.E to clarify "applicable" flow down to sub-tiers 5. Revised para. 4.F to replace "delta" with "partial" FAI; added subparagraph numbers for clarification 6. Revised para. 4.G.5 to reduce requirement for mandatory partial or full FAI 7. Revised para. 4.G.6 excluding spares from FAI requirements 8. Revised para. 4.H to be inclusive of all programs 9. Revised para. 4.J for clarity 10. Revise para. 4.K to add 5 day reporting time 11. Revised para. 4.L to simplify wording to comply with AS9102 forms usage and completion 12. Revised para. 4.M to remove 48 hour requirement 13. Revised para. 5.A.1 and 5.A.12 for clarify 14. Moved para. 5.B.4 to 5.D.4 15. Revised para. 5.D.4 for clarity 16. Revised para. 5.E.1 and 5.E.3 for clarity and deleted 5.E.4 17. Added Q2A Revision Log

12	10/6/2015	Major Re-Write. Summary of major changes: (1) Updated the Scope section and added new definitions to the Definitions section; (2) Required FAI on the first production unit and required the FAI to be defect free; (3) Re-organized Q2A and added an FAI Planning section and Post FAI Sustainability section; (4) Eliminated differences between Buyer-designed and Seller-designed FAI requirements; (5) Changed FAI from 6 pieces to 3 pieces from 3 different lots/batches.