

Q2A – First Article Inspection (FAI) – AS9102

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The terms “Item”, “PO”, “Buyer” and “Seller” used herein have the same meaning as “Work”, “Contract”, “Lockheed Martin” and “Seller”, 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 (1) Seller’s product realization processes are capable of producing parts and assemblies that meet all engineering and design requirements, and (2) those processes are stable and repeatable. 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 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/aagg/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, if desired, at no additional cost, price or fee to the PO.
- D. In the case of a conflict between AS9102 and this Quality Clause, this Quality Clause takes precedence.

3. DEFINITIONS:

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.

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.

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) or Maintenance Critical (MC).

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 Seller procuring items or beginning any FAI Planning activity for the PO. Buyer's assigned SQE may elect to review or participate in Seller's FAI process at any time throughout the FAI process. When a partial or full FAI is required due to changes identified in Paragraph 4.F, Seller shall also notify Buyer's assigned SQE, in writing, a minimum of five (5) business days prior to creating or starting any changes that affect items to be delivered under the PO.
- B. Seller shall create a documented procedure or plan that covers all the elements 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 on the drawing, DPD or specification.
- D. Seller shall complete the FAI on the first production part to be delivered. Exceptions or deferrals beyond the first production part will only be allowed with written authorization from Buyer's assigned SQE. Seller's failure to complete the FAI in accordance with this Quality Clause may result in actions by Buyer, up to termination of the contract, for failure to perform.
- E. Seller shall flow down the requirements of this Quality clause to all sub-tier suppliers as applicable. By extension, all sub-tier supplier FAI reports become an integral part of Seller's FAI documentation and shall be made available upon request to Buyer's assigned SQE at the time of FAI submittal by Seller.
- F. Seller is required to perform a partial or full FAI, as required by AS9102, when: (1) Seller or Seller's sub-tier supplier makes any change that affects the form, fit, function, safety or reliability of the part on this PO. These changes include, but are not limited to, those listed in AS9102, and any changes 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) the causes of nonconformances to Buyer requirements discovered after completion of an FAI are other than special cause variation (e.g., computer crash, power outage or surge, tool breakage, etc.).

Partial FAIs will only require one (1) part to demonstrate the change had no impact.

- G. The following items do not require FAI, unless otherwise directed by Buyer:
 - 1. Standard hardware and electronic piece parts (e.g., AN, MS & NAS standards; C, M & P standards; 2GNA00001 standard parts; 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/concept prototypes, 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, unless otherwise approved in writing by Buyer, 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 and items bought as spares.
 7. Items procured to Buyer's part number where Buyer has not developed drawings or specifications controlling the item's physical and functional requirements.
 8. Special Tooling and 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 in Detailed Requirements section below (Section 5.A), unless otherwise directed in the PO. All constituent detail components and sub-assemblies within the above major aircraft assemblies that are manufactured, processed, tested or inspected by sub-tier suppliers will require full compliance to AS9102.
- I. F-35 program teammates BAE Systems Limited and Northrop Grumman Corporation shall perform FAIs in accordance with AS9102, including flow down of AS9102 for procured products, except those that meet the requirements of paragraph H above.
- J. 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. Parts may be grouped into families that utilize common manufacturing processes. A limited number of each family will undergo an FAI to validate the common processes, procedures and work instructions. This grouping shall be approved in advance in writing by Buyer's assigned SQE. The remaining parts shall require a partial FAI focused on part specific attributes and dimensional features. FAI by similarity is not allowed for complex or critical items.
- K. Any discrepancies or nonconformances to Buyer's requirements discovered during the FAI shall result in the failure of the FAI. Seller shall then take corrective action. 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 incomplete 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.
- L. Seller shall comply with the forms usage and completion requirements of AS9102.
- M. 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 to Buyer upon request. The FAI reports shall be provided at no increase in cost, price or fee to the PO.
- N. Once AS9102 forms have been completed for one (1) part, Seller shall use internal processes / procedures, as defined in Seller's Quality Management System, to verify product conformance to the FAI Exit Criteria requirements of Q2A.

- O. Buyer reserves the right to require Seller to perform a partial or full FAI at no additional cost, price or fee to the PO.

5. DETAILED REQUIREMENTS OF SELLER:

A. FAI Planning:

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.
2. All specifications, including referenced specifications within parent specifications, shall be reviewed, mapped 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 DPD requirements and objective evidence of that validation.
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. Assure inspection steps have appropriate measurement or sampling plans.
6. Verify that employee certifications required to perform all tasks listed in operation cards / work instructions are identified and current.
7. Determine how subcontracted components, sub-assemblies and special processing will be validated as part of the FAI process. As applicable, assure 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 assure these requirements are validated during the FAI. This shall include planning for the completion of an Engineering First Article Evaluation (EFAE) when required.
9. Assure 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. Create a process flow matrix for the part or part family and a plan for validating the capability and stability of each process step.
12. Document a process for packaging and shipping in accordance with PO requirements.

B. FAI Entrance Criteria:

FAI documentation requirements begin when FAI planning begins. Once the following are met, Seller shall begin the FAI:

1. Engineering (e.g., drawing, specifications, DPD, etc.) is released by Buyer.
2. Seller Acceptance Test Procedures (ATP) have been approved by Buyer, if required.
3. Seller Manufacturing Plans for Critical Items have been approved by Buyer, if required.
4. Buyer's assigned SQE has been notified in writing of the beginning of the FAI process (reference paragraph 4.A).

C. FAI Process:

1. Complete FAIs for all detail parts, sub-assemblies and subcontracted components and special processes. Document these FAIs 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.
3. Complete the FAI for the item on Buyer's PO. Document the FAI in accordance with AS9102 and this Quality Clause.

D. FAI Exit Criteria:

An FAI will be considered complete when the following are met:

1. 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. 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.
4. Seller's completion of Safety of Flight and Qualification, if required.
5. Successful manufacture, test and inspection of one (1) part from the next three (3) consecutive and different lots/batches after the FAI item (FAI part plus 3 additional parts). Validation is accomplished using the Seller's normal inspection and test process for the 3 parts with no defects to Buyer's requirements. A full FAI report is not required for these subsequent parts. However, objective evidence for the successful manufacture, test and inspection of these subsequent items is required and shall be made available for review upon request. 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. Failure of any of the three (3) additional items will require root cause and corrective action (RCCA), a full or partial FAI on the affected characteristics, followed by one (1) part from three (3) consecutive and different lots/batches.
6. Completed Fit check at the appropriate aircraft assembly level, when required.

E. Post FAI Sustainability:

1. After FAI is complete, 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. An RCCA plan shall be provided to Buyer's assigned SQE within 30 days of the discovery of the defect, or as otherwise agreed to by Buyer's assigned SQE. While performing RCCA, Seller shall consider the following elements for applicability as part of the RCCA: special causes; process changes that require a partial or full FAI; the need for variation

reduction actions based on statistical analysis; the need to perform a Process Failure Mode and Effects Analysis (PFMEA); etc.

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. Seller shall then accomplish a partial or full FAI for all characteristics affected by the defect. Seller shall perform the partial or full FAI at no additional cost, price or fee to the PO.

Quality Clause Q2A Revision Log

REV	DATE	CHANGES
13	6-22-2016	Summary of changes: <ol style="list-style-type: none"> 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 sub-paragraph 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