

AEROJET PROCEDURE

SUBJECT: FIRST ARTICLE INSPECTION

1. PURPOSE

This procedure establishes process requirements for the First Article Inspection (FAI) and can be accomplished using either the hard copy method or an electronic medium.

The purpose of the First Article Inspection is to mitigate risk and to provide objective evidence of the manufacturing process ability to produce parts which comply with Engineering Design and Specification requirements.

2. SCOPE

This procedure was created using SAE AS9102 as a guideline. It is applicable for use at Sacramento and Socorro locations for all programs with a program maturity level of 3 or higher.

It applies to all fabricated or purchased piece parts, assemblies and subassemblies, including parts consumed by further processing such as castings and forgings. Each individual part number must be addressed including all dash numbers and manufacturing assigned numbers.

Flow-down of the requirements of this procedure to suppliers is accomplished per the assigned QAR clause as stated in the applicable purchase order. Procured standard catalog hardware and CFM hardware are exempt from the requirement of this procedure.

In addition to the required applications of this procedure, it may be utilized for other hardware by IPT teams (as desired).

Customization of these requirements, such as exempting the requirement, adding it as a requirement where it would not otherwise be required, or using a special format and/or signature requirements must be documented and approved in the Program Quality Summary (PQS).

3. REQUIREMENTS / PROCEDURE

3.1 When is a First Article Required?

A complete FAI shall be performed for each unique manufacturing part number prior to or concurrent with the first part or group of parts created under a controlled and established process. This includes all details and sub-assemblies which constitute the end item ordered or fabricated. All drawing notes and characteristics as well as applicable specification requirements must be verified. Inaccessible characteristics shall be inspected and verified prior to the point that they become inaccessible.

When multiple manufacturing documents are used to meet a single engineering drawing, a reference entry must be made on the First Article Inspection Report (FAIR) document. The reference must define the features not included in the report and the document that performs the remainder those features.

When a trigger event occurs, the quality assurance representative will determine if a FAI is required to inspect the characteristics that may be affected by the event. For minor changes, a partial FAI will be performed. In some cases, the event may be significant enough that an expanded partial FAI or another complete FAI must be performed. In other cases, the event may not require performance of an additional FAI. The quality assurance representative will make the final determination as to if a FAI is required and if so, what features must be inspected.

Trigger events include but are not limited to:

1. A change in the design affecting form, fit or function of the part
2. A change in manufacturing source(s) or location(s), and/or buildings/facilities
3. A process change to planning (manufacturing and inspection steps)
4. A change to manufacturing tooling, test equipment or inspection tooling
5. A change to materials used or consumed in fabrication
6. A change in numerical control manufacturing or inspection program or translation to another media
7. A lapse in production for 2 years

Note: On-line documents are approved and valid. Printed copies are for reference only!

3.2 Compliance to Requirements

The following may be considered in support of completion of First Article Inspection requirements. (This is not an all inclusive list as there may be other sources of supporting information as well.)

1. Complete FAIRs
2. Computer generated data printouts, test data, acceptance test procedures, process certifications
3. Material certifications and/or Laboratory Work Requests
4. Special process certifications (including NDT records)
5. Process capability studies
6. Marked up or "ballooned" drawing that correlates characteristic number from FAI to the drawing

3.3 First Article Inspection Report (FAIR) Content

All FAIRs shall contain the following information recorded or attached to it as a minimum:

1. Part Number, Part Revision and Part Title
2. Serial number, if applicable
3. Shop order number, purchase order number or a reference that provides traceability to the record of the FAI item
4. All drawing note and feature characteristic dimensional requirements and actual results
5. Identification, revision letter, date and/or issue number of process planning and/or test procedures used
6. Additional reference documents such as test specification numbers and revisions
7. Copies of the manufacturing documents being verified (when appropriate). Proprietary documents shall not be attached to the FAIRs.
8. Ballooned engineering drawing or manufacturing planning use to perform the FAI
9. Signatures and Dates of FAI initiator, inspector and reviewers

3.4 Characteristics Accountability

Each characteristic invoked by drawing requirement shall have its own unique record on the FAIR. This shall include: dimensions, general and specific notes and material. When multiple characteristic features are specified on a drawing (such as a bolt hole patterns or general block notes) each occurrence of the characteristic needs to be addressed. Reference characteristics may be omitted.

3.5 Record of Results

Inspection results shall be expressed in terms consistent with the drawing (variables data). Attribute data may be recorded when collecting variables data is not feasible. Examples are if a go/no-go gage is used or if qualified tooling is used as a check feature.

3.6 Nonconformance to Requirements

When a feature is found to be noncompliant during a FAI, a nonconformance report (NC) is generated and processed per #PP-P80-PRD-5-016. When an noncompliant condition is found, inspections may be completed to fully document the condition but additional processing must stop pending direction on the NC.

Note: Those characteristics not in compliance per the NC shall be re-checked on subsequent hardware and documented in order for the FAI to continue. Characteristics not affecting form fit or function may be accepted on correction or MRB disposition without inspecting the feature on subsequent hardware at the discretion of the Aerojet quality assurance representative.

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4. RESPONSIBILITIES

4.1 Quality Assurance Representative

- Identification and Interpretation of the triggers to determine the need for a complete or partial FAI
- Determination of which features cannot be inspected as well as those that do not require variable data, and those that are controlled by special processes or tooling
- Population of the FAIR with characteristics and notes to be inspected
- Coordination with Manufacturing Engineering to create special planning or redlines to existing planning to integrate the FAI requirements
- Coordination with inspection on interpretation and completion of FAI requirements
- Coordination of disposition and corrective action related to NCs created during the FAI process
- Final review and approval of the FAIR
- Stamping or signing the FAI data (as required)
- Coordination of the FAI results with the customer representatives (as required)
- File the completed FAIR with the appropriate documentation center for storage
- Documentation of unique FAI requirement in the program PQS
- Flowdown of FAI requirements to suppliers through purchase order quality clauses (as required)
- Coordination of, and updates to Inspection Gauge tooling

4.2 Manufacturing Engineering

- Identifying FAI triggers and informing the quality assurance representative of the potential need for a complete or partial FAI
- Provide assistance to the quality assurance representative in determination of which features cannot be inspected as well as those that do not require variable data, and those that are controlled by special processes or tooling
- Creation of special planning or redlines to existing planning to integrate the FAI requirements
- Provide disposition and corrective action to NCs created during the FAI process when requested by the quality assurance representative
- Coordination of planning, process and tooling updates required by FAI findings

4.3 Inspection

- Performing inspections to capture the attributes requested on the FAIR
- Stamping or signing the FAI data (as required)
- Consultation with the quality assurance representative for clarification of FAI requirements

5. RECORDS

All First Article Inspection documentation will be retained as a quality record per standard Aerojet record retention practices. The records will be retained within the appropriate documentation control center unless otherwise specified within the program PQS.

6. FORMS

PM-F02-9801 is the standard Aerojet FAIR format for internal use and at suppliers. Alternate formats may be used as define in the program PQS.

7. DEFINITIONS

ATTRIBUTE: A characteristic that is appraised in terms of whether it does or does not conform (for example, go or no-go), with respect to a given requirement. (As opposed to variable data).

BALLOONED DRAWING: Engineering ballooned drawing that has each characteristic or requirement clearly marked with unique identifier number. The number may be circled or boxed for easy visual identification.

FIRST ARTICLE INSPECTION (FAI): An independent and documented inspection process to verify that prescribed production methods have produced an acceptable item as specified by engineering drawings, planning, purchase order, engineering specifications, and/or other applicable design documents.

FIRST ARTICLE INSPECTION REPORT (FAIR): Documentation detailing results of (FAI).

FIRST PRODUCTION RUN: The first group of one or more parts that are the result of a planned process to be used for future production of these same parts. Prototype, development, or parts built using methods different from that intended for the normal production process, shall not be considered as part of the first production run. Qualification hardware may be used for FAI as long as Engineering, Manufacturing and Quality agree that it represents future production hardware.

INACCESSIBLE CHARACTERISTIC: A characteristic that cannot be evaluated at any time after it is generated without destroying the part. Inaccessible dimensions may include internal dimensions of castings, or welded or brazed assemblies.

INSPECT: Examination of an object to determine whether it conforms to standards, applicable engineering specification, etc.

MULTIPLE CHARACTERISTICS: Identical characteristics which occur at more than one location (e.g., "4 Places") but are established by a single set of drawing requirements. Examples: bolt hole circles, dovetail slots, corner radii, cooling holes.

STANDARD CATALOG HARDWARE: Standard parts having all characteristics identified by text description, national/military standard drawing, or catalog item.

VARIABLE: A characteristic that is appraised in terms of continuous measured numerical data with respect to a given requirement. (As opposed to an attribute data).

QUALITY ASSURANCE REPRESENTATIVE: A quality engineer or process engineer authorized to act on behalf of the quality engineer (for the affected program).

8. ACRONYMS

FAI	First Article Inspection
FAIR	First Article Inspection Report
IPT	Integrated Product Team
MRB	Material Review Board
NC	Nonconformance Report
NDT	Non Destructive Test
PQS	Program Quality Summary
QAR	Quality Assurance Requirement

9. REFERENCES

SAE AS9102	Aerospace First Article Inspection Std.
PP-P80-PRD-5-016	Nonconforming Material
PM-F02-9801	Aerojet First Article Inspection Report