SAE Aerospace
An SAE International Group

AEROSPACE STANDARD

SAE AS9102
Technically equivalent to AECMA prEN 9102

Issued 2000-08

Supersedes AS9012A

Aerospace First Article Inspection Requirement

FOREWORD

In December 1998, the Aerospace Industry had established the International Aerospace Quality Group (IAQG) with the purpose of achieving significant improvements in quality and reductions in cost throughout the value stream.

This organization, with representation from Aerospace companies in Americas, Asia and Europe and sponsored by SAE, SJAC, and AECMA has agreed to take responsibility for the technical contents of this standard.

TABLE OF CONTENTS

1. INTRODUCTION 3

1.1 Scope 3
1.2 Purpose 3
1.3 Convention 3

2. REFERENCES 3

3. DEFINITIONS 4

4. APPLICABILITY 5

5. REQUIREMENTS 5

6. FORMS 8

6.1 Form 1: Part Number Accountability 8
6.2 Instructions to Complete Form 1: Part Number Accountability 10

TO PLACE A DOCUMENT ORDER: (724) 776-4970 FAX: (724) 776-0790 SAE WEB ADDRESS: http://www.sae.org

TABLE OF CONTENTS (Continued)

6.3 Form 2: Product Accountability - Raw Material, Special Process(es), Functional Testing 11
6.4 Instructions to Complete Form 2: Product Accountability - Raw Material, Special Process(es), Functional Testing 11
6.5 Form 3: Characteristic Accountability, Verification and Compatibility Evaluation 13
6.6 Form 3 - Continuation Sheet: Characteristic Accountability, Verification and Compatibility Evaluation 15
6.7 Instructions to Complete Form 3 and Form 3 - Continuation Sheet: Characteristic Accountability, Verification and Compatibility Evaluation 15

1. INTRODUCTION:

1.1 Scope:

This SAE Aerospace Standard (AS) establishes documentation requirements for the First Article Inspection (FAI).

1.2 Purpose:

The purpose of the First Article Inspection is to provide objective evidence that all engineering design and specification requirements are properly understood, accounted for, verified, and documented. The purpose of this standard is to provide a consistent documentation requirement for aerospace components First Article Inspection.

It is intended that the documentation generated will be a quality record of the supplier and customer for review of accountability and planning, for performing periodic surveillance and audits to verify conformance, for evaluating root cause and corrective action for any non-conformances, and for problem investigations.

1.3 Convention:

The following convention is used in this standard.

- The words "shall" and "must" indicate mandatory requirements.
- The word "should" indicates mandatory requirements with some flexibility allowed in compliance methodology. Suppliers choosing other approaches to satisfy a "should" must be able to show that their approach meets the intent of the requirement and this standard.
- Words "typical", "example" or "e.g." indicate suggestions given for guidance only.
- "Notes" are used for additional clarifications.

2. REFERENCES:

1. Aerospace Standard AS9100 "Quality Systems - Aerospace - Model for Quality Assurance in Design, Development, Production, Installation and Servicing", Published by SAE, Warrendale, PA, USA, November 1, 1999.
2. International Standard EN 9100 "Quality Systems - Aerospace - Model for Quality Assurance in Design, Development, Production, Installation and Servicing", Published by ---, 1999.
3. Aerospace Standard SJAC9100 "Quality Systems - Aerospace - Model for Quality Assurance in Design, Development, Production, Installation and Servicing", Published by JSA, Tokyo, Japan, December 20, 1999.

3. DEFINITIONS:

ATTRIBUTE: A characteristic or property 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.

BALLOON DRAWING: Balloon drawing is drawing with each characteristic or requirement clearly marked with unique identifier number. The number may be circled or boxed for easy visual identification.

DESIGN CHARACTERISTICS: Those dimensional, visual, functional, mechanical, and material features or properties, which describe and constitute the design of the article and can be measured, inspected, tested, or verified to determine conformance to the design requirements. Dimensional features include in-process locating features such as target-machined (or forged/cast) dimensions on forgings, castings, and weld/braze joint preparation necessary for acceptance of finished joint. Material features or properties may include processing variables and sequences which are specified by the drawing (e.g., heat treat temperature, fluorescent penetrant class, ultrasonic scans, sequence of welding and heat treat). These provide assurance of intended characteristics that could not be otherwise defined.

DRAWING REQUIREMENTS: Requirements of the drawing (including parts lists), specification, or purchasing document to which the article is to be made, including notes, specifications, and lower-level drawings thereby invoked.

EVALUATION: Measurement, inspection, or testing to determine conformance of a characteristic to drawing requirements.

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

FIRST ARTICLE INSPECTION REPORT (FAIR): The forms and package of documentation for a part number or assembly, including FAI results, as described per this standard.

FIRST PRODUCTION RUN: 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. Prototype parts, 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.

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, internal dimensions of a welded or brazed assembly which are called out for the assembly. Inaccessible non-dimensional characteristics include material strength, certain metallurgical features and manufacturing processes including nondestructive testing.

3. (Continued):

INTERCHANGEABLE AND REPLACEABLE (I&R): A process where designated parts and assemblies are controlled by special accountable tooling in order to ensure ease of replacement at any time throughout the life-span of the aircraft.

INSPECT: Examination of an object to determine whether it conforms to standards, applicable engineering specifications, etc. (By technical dictionary, "inspection" applies to attributes, "measurement" produces variable data, and "testing" can produce variable or attribute date; but "First Article Inspection" is used for all of these.)

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.

SOURCE SUBSTANTIATION: Also referred to as "Engineering Source Approval". Engineering approval of product and/or part specific process after satisfactory substantiation testing.

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

4. APPLICABILITY:

This standard applies to assemblies and all levels of parts within an assembly, including castings and forgings, and to organizations that are responsible for producing the design characteristics of the product. Suppliers and their subcontractors shall be responsible for flow down of the requirements of the applicable revision of this standard to subcontractors who produce design characteristics, and for ensuring that characteristics conform to customer requirements.

NOTE: Procured standard catalog hardware (standard parts) is excluded.

5. REQUIREMENTS:

5.1 First Article Inspection (FAI) shall be performed for a new part representative of the first production run. This includes all details and sub-assemblies which constitute the end item ordered. The First Article Inspection record shall not be considered complete until all non-conformities are resolved. Prototype parts, 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.

5.2 The FAI requirement once invoked shall continue to apply even after initial compliance. Partial or complete re-accomplishment of the FAI for affected characteristics is required for the following events:

1. A change in the design affecting form, fit or function of the part.
2. A change in manufacturing source(s), processes, inspection method(s), location, tooling or materials with the potential of affecting fit, form or function.
3. When required as part of corrective action for a part number with repetitive rejection history (typically, a part wit three repeated rejections or as required by customer).
4. A change in numerical control program or translation to another media.
5. A natural or man-made occurrence which may adversely affect the manufacturing process.
6. A lapse in production for two years or as specified by customer.

5.3 The FAI requirements may be satisfied by addressing differences between current configuration and prior approval configurations.

5.4 Forms:

Forms given in Section 6 of this standard shall be used to document the results of the First Article Inspection. These forms may be generated by any media (e.g., electronic media); however, they must contain all the information required on the forms shown in this standard (i.e., each item listed on form must appear with the same reference number). SAE allows free reproduction of the forms of this standard for FAI. An electronic version of the form will also be made available through the internet along with this standard. All forms shall be completed in English or in a language specified by customer.

5.5 Quality Records:

All First Article Inspection documentation required by this standard shall be considered quality/ acceptance records and shall be retained in accordance with specified customer requirements.

5.6 Evaluation:

The following elements shall be reviewed by the supplier in support of First Article Inspection validation. Documented evidence of this evaluation shall be made available upon customer request:

1. Manufacturing routing sheets
2. Complete FAI forms (all pages and continuation sheets as required)
3. Referenced exhibits supporting the FAI (e.g., CMM data printouts, test data, acceptance test procedures, process certifications, etc.)
4. Copy of any nonconformance document(s), processed through appropriate material review process and associated corrective action(s)
5. Material certifications, as applicable
6. Special process certifications, as applicable (and operator certification (e.g., NDT, welding), if required)
7. Inspection plans
8. Process capability studies, as applicable
9. Gauge correlation, as applicable
10. Marked up drawing (or "ballooned" drawing) that correlates characteristic number from FAI to the drawing
11. Part marking replication

5.7 Completion of FAI Forms:

The FAI forms shall be completed in accordance with form instructions provided within this standard. The following represents the minimum information that shall be recorded on, or attached to, the FAI Form.

1. Part number
2. Serial number, if applicable
3. Design media and revision level
4. Company name
5. Supplier code number (if available)
6. City and state/country (manufacturing location/facility)
7. Name of preparer, title
8. Date of FAI
9. Dimensional characteristics
10. Material and process specification(s) and revision level
11. List of processes verified, including certification and supplier name for all customers' specified processes
12. Applicable drawing notes
13. Drawing zone locations (including drawing zone numbers)
14. Results of actual measurements and tests for each characteristic and applicable drawing note
15. Supplier's review/approval signature
16. Manufacturing and/or quality planning paper/router number including revision/edition
17. Purchase order/contract number including revision/edition, if applicable
18. Nonconformance document number(s), if applicable

5.7 (Continued):

19. Verification that all supplier engineering has been approved by the customer when applicable, including acceptance test procedures (ATPs), quality test reports, and application software data
20. Indication of overall FAI status (part acceptance/follow-up required)
21. Listing of measurement equipment and/or tooling used, as a media of inspection
22. Manufacturing and/or quality planning paper/routing review (clarity, meets design media requirements)
23. Identification of interchangeability and replaceability (I&R) characteristics, if applicable
24. Functional test procedures and approved revisions

5.8 Characteristic Accountability:

Each characteristic invoked by drawing requirement shall have its own unique characteristic number on the FAI record. This shall include: dimensions, general and specific notes, material, processing, and others as applicable.

NOTE: Reference characteristics may be omitted. Use more than one line if needed for any characteristic.

5.9 Actual results from inspection of specified design characteristics shall be expressed in quantitative terms (variable data) when design characteristic is expressed by numerical limits. Attribute data will only be acceptable when non-numerical limits are specified by the design characteristic or where qualified tooling is consistently used as a check feature and a go-no-go feature has been established for the specific characteristic. The results shall be recorded in the same units as specified on the drawing or specifications, unless otherwise approved by the customer.

5.10 When tooling is used to verify a design characteristic, traceability must be established back to the tooling via quality/inspection records. It must be assured that only qualified tooling is used, which has also been subjected to FAI verification.

5.11 Inaccessible characteristics shall be evaluated as early in process as possible (as long as they are not affected by subsequent operations).

6. FORMS:

The following forms shall be used to document results of First Article Inspection. Use additional sheets or attachments, as required.

- Form 1: Part Number Accountability
- Form 2: Product Accountability - Raw Material, Special Process(es), Functional Testing
- Form 3: Characteristic Accountability, Verification and Compatibility Evaluation
- Form 3 - Continuation Sheet: Characteristic Accountability, Verification and Compatibility Evaluation

6.1 Form 1: Part Number Accountability:

See Figure 1.

AS9102 First Article Inspection
Form 1: Part Number Accountability **Sheet of**

1a Supplier Code	1b Supplier Name 1e Prepared by / Approved by:	1c Date Submitted	1d Control Number
			☐ 1st Level ☐ Other Level

2a Detail or 1st Level Assy. Part No.	2b Rev.	2c Part Name	2d S.S. Reqd.	2e FAI Complete(Date)

a) if above is a DETAIL drawing, go to the next page "Raw Material/Special Process/Functional Test"
b) if the 1st level drawing is an assembly drawing with no 2nd level assembly drawing, go to the "INDEX" section below.
c) if there are 3 or more levels of drawings note the 2nd level assembly drawing, then go to "INDEX" section below.

3a 2nd Level Assembly Part Number	3b Rev.	3c Part Name	3d S.S. Reqd.	3e FAI Complete (Date)

Index of Part Numbers Required To Make The 1st or 2nd Level Assemblies Noted Above
List the level of all drawings, start with the Level 1 ASSEMBLY drawing.
List all sub-tier drawings following the next higher level drawing under which they appear.

4a Dwg Level	4bPart No.	4c Rev No	4d Control Number	4e Part Name	4f Supplier	4g S.S. Req.	4h FAI Complete Ck if in this Report

☐ See additional pages

5. Customer Quality Review; All Characteristics Accounted For; Meet Drawing or are Properly Documented for Disposition

Customer Signature and Code Number (if applicable)	Review Date	Customer Comments

Code Number

FIGURE 1 - Form 1: Part Number Accountability

6.2 Instructions to Complete Form 1: Part Number Accountability:

1. Title block identifies the basic document package and comprises the following elements:

   1a) Supplier code (i.e., customer supplier code): Customer supplier code is a unique number given by customer to the supplier. It is sometimes referred to as vendor code, vendor identification number, supplier number, etc.
   1b) Supplier name
   1c) Date submitted
   1d) Control number: Optional, as assigned by the supplier
   1e) Person(s) [signature, print/type] who prepared/approved document (electronic approval may be acceptable if allowed by the customer). Signature indicates that all the requirements of this standard have been met or addressed in the form, as appropriate.

2. First Level Part: Part ordered by the customer.

   2a) Part number and when applicable, part serial number
   2b) Revision number: Revision number of drawing that is supplied by the customer
   2c) Part name
   2d) Source substantiation required for that drawing
   2e) First Article Inspection. Date when completed.

NOTE: For DETAIL drawings (including MAKE FROM drawings), this completes Form 1. For ASSEMBLY drawings (including MAKE FROM) see below for additional listings.

3. Second Level Assembly Part Number: Part number(s) required to make first level drawing.

   3a) Part number and when applicable, part serial number
   3b) Revision number: Revision number of drawing that is supplied by the customer
   3c) Part name
   3d) Source substantiation required for that drawing
   3e) First Article Inspection. Date when completed.

4. Part Number/Level Index: Unless the first level part number is a DETAIL or a customer PROCESS DRAWING (with no other part numbers called out), provide a list of all part numbers that comprise the product, with the information noted below.

   4a) Drawing level: Also include MAKE FROM drawings (e.g., casting drawings) which are called out on the face of a higher-level drawing rather than by a parts list. Identify consigned raw material and customer process drawings.
   4b) Part number and when applicable, part serial number
   4c) Revision number (revision for First Article)
   4d) Control number: Optional. Supplier assigned number
   4e) Part name (abbreviate as necessary)
   4f) Part supplier: List supplier name. If part was supplied (consigned or sold) by the customer, list the customer as the supplier.

6.2 (Continued):

4g) Is source substantiation (SS) required? (Y = Yes, N = No)
4h) First Article Inspection complete? If FAI of the part number was conducted previously under another assembly drawing number, list that number. For material supplied by the customer, note consigned/sold by the customer.

5. If applicable, customer signature, code number, review date and applicable comments. Customer signature may be required prior to shipment of hardware unless a partial release is authorized by the customer quality representative. (Some customers may not require customer signature.)

6.3 Form 2: Product Accountability - Raw Material, Special Process(es), Functional Testing:

See Figure 2.

6.4 Instructions to Complete Form 2: Product Accountability - Raw Material, Special Process(es), Functional Testing:

Form 2 is required for parts or assemblies for which accountability of raw material, special processes and/or functional testing is specified on drawing.

1. Part Number and Supplier Identification:

1a) Highest level part number

1b) Supplier name, customer supplier code. Preparer's name and signature. Customer supplier code is a unique number given by customer to the supplier. It is sometimes referred to as vendor code, vendor identification number, supplier number, etc.

2. Material or Process (required when specified on drawing):

2a) Applicable part numbers and serial numbers: List the applicable part number(s) to which each material/process - source combination applies.

2b) Material or process identification: List material and process specifications (include permitted alternates), CLASS, and material form (sheet, bar, etc.).

- Raw materials include all materials which are incorporated into the final part as required by the customer drawing (e.g., weld/braze filler materials, balls for ball brazing), and unmodified catalog hardware (e.g., AN, MS fasteners) but do not include processing materials such as acid etchants.
- For coatings (e.g., electroplated, diffused, metal sprayed, painted) include both the material and process specifications.
- List any required code from customer SPECIAL PROCESS LISTING when required (i.e., source substantiation required).

AS9102 First Article Inspection
Form 2: Product Accountability - Raw Material, Special Process, Functional Testing

1a Highest Level Part Number This Page	1b Supplier Name & Customer Supplier Code Prepared by:	Sheet of

2a Part Number(s) to which Material/ Process Applies	2b Material Identity or Special Process (with code)	2c Source: List Customer Supplier Code if Required	2d Cust. Approval Expiration Date	2e Control, Special Procedures Methods, Frequency, Approved Options

3a Functional Test Type Applicable Part No.	3b Describe Testing & Controls, Equipment Type, Accuracy, Frequency of Calibration	3c Functional Testing Describe Frequency, Criteria

4 Remarks

FIGURE 2 - Form 2: Product Accountability - Raw Material, Special Process(es), Functional Testing

6.4 (Continued):

- CUSTOMER PROCESS DRAWINGS: For castings or forgings made to customer process drawings, list the drawing numbers (these do not appear on parts lists). - CAUTION - Even if such material is furnished "Full Release" by the customer to the supplier, the supplier must ensure that all requirements of the finished part drawing will be met (e.g., the process drawing may have omitted final heat treatment or ultrasonic/ macroetch inspection).
- List all processes in the order of manufacturing sequence.

2c) Source: List source name. List the customer supplier code if known. Include all sources for which data is submitted. Customer supplier code is a unique number given by customer to the supplier. It is sometimes referred to as vendor code, vendor identification number, supplier number, etc.

2d) Expiration of customer approval: For the applicable special processes if required. List the expiration date in effect at the time of processing. Additionally, include, if applicable, any external agency approval and expiration date (e.g., NADCAP expiration date identified on the NADCAP certification).

2e) Control, special procedures:

- Describe the basic methods and frequencies used to control the material or process. May refer to characteristic number.
- List process specifications.
- Include methods/frequencies used by both the material or process source and by the part supplier.
- Reference procedures that require customer approval (e.g., EB welding, ultrasonic, X-ray, eddy current) with customer approval date.
- If drawing authorizes process options approved by supplier, use appropriate customer supplied form to obtain approvals; submit a copy of the approved form with Form 2.
- When drawing calls out customer approval provide documentation of such approval (e.g., DFO, supplier agreement, approved source substantiation, tech plan).

3. Functional Testing: List only tests called out by the customer drawing (e.g., leak test, pressure test). For supplier-designed parts, list only acceptance tests, not design assurance tests or qualification tests. On Form 3 reference the data produced by functional tests.

3a) Functional type testing: Applicable part number
3b) Type of equipment, equipment accuracy and control, calibration
3c) Frequency and acceptance criteria

4. Remarks: List additional remarks or comments, if any, here.

6.5 Form 3: Characteristic Accountability, Verification and Compatibility Evaluation:

See Figure 3.

Page of	AS9102: FAI Form 3: Characteristic AccountabilityVerification and Compatibility Evaluation			1e Control No.
1a Part Number:	1f FAI ☐ ☐	1g Dwg. Rev.:	1h Product Acceptance Plan	
1b Supplier:	Other:	CIDs:	Date / Rev. By / To / Description	
1c Customer Supplier Code:	Date:	Prepared by:		
1d Dwg Rev: CIDs:	Case Records:	Customer Review:		

2 Characteristic Accountability					3 Inspection / Test Results			4 Product Acceptance			5 Compatibility Evaluation	
a Char No *	2b Drawing Requirement	2c Zone	2d Class		3a Results (Variable Data)	3b Measurement Equipment FAI	3b Measurement Equipment Production	4a Op. No.	b Accept Plan	4c Justification for <100% Evaluation	5a Supplier Process Document Requirement	b Same Y/N

*Note: Identify Key Characteristics (KC) With An Asterisk (*).

FIGURE 3 - Form 3: Characteristic Accountability, Verification and Compatibility Evaluation

6.6 Form 3 - Continuation Sheet: Characteristic Accountability, Verification and Compatibility Evaluation:

See Figure 3 (Continued).

6.7 Instructions to Complete Form 3 and Form 3 - Continuation Sheet: Characteristic Accountability, Verification and Compatibility Evaluation:

Concurrently fill out Form 3 (and continuation sheets, as needed) and mark up the drawing. Separate page(s) shall be used for each individual drawing number and supplier. (Exception: Limited sub-tier operations and more than one part covered by the same assembly drawing may be combined on one page if clearly explained.)

1. Title Block:

1a) Part number and when applicable, part serial number

1b) Supplier name

1c) Customer supplier code: Customer supplier code is a unique number given by customer to the supplier. It is sometimes referred to as vendor code, vendor identification number, supplier number, etc.

1d) Drawing revision, change in designs (CIDs): Drawing revision reviewed. List any change in designs received which were not incorporated on that drawing revision.

1e) Control number: Optional, as assigned by the supplier

1f) Items pertinent to the "Inspection/Test Results": Data documented (first article, other, date, nonconformance documents)

1g) Review block:

- Drawing revision, CIDs entries to recognize that there could be drawing changes since the drawing revision; shown under the original "Characteristic Accountability".
- Prepared by (supplier representative)
- Customer review: Name (legible) of customer quality representative

Page of	AS9102 FAI: Characteristic Accountability, Verification and Compatibility Evaluation	1e Control No.
1a Part Number:	Continuation of Form 3	1b Supplier:

2 Characteristic Accountability					3 Inspection / Test Results			4 Product Acceptance			5 Compatibility Evaluation	
a Char No*	2b Drawing Requirement	2c Zone	2d Class		3a Results (Variable Data)	3b Measurement Equipment FAI	3b Measurement Equipment Production	a Op. No.	b Accept Plan	4c Justification for <100% Evaluation	5a Supplier Process Document Requirement	b Same Y/N

*Note: Identify Key Characteristics (KC) With An Asterisk (*).

FIGURE 3 (Continued)