

# **SQAG 001**

## **First Article Inspection Guidebook**

**Issue 5**

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Lockheed Martin UK Ampt Hill Ltd



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## 1. Applicability

This document applies to Lockheed Martin UK Amptill Ltd (LMUK) and its supply chain.

## 2. Introduction

### 2.1. Purpose

This guidebook provides directions on how to identify, plan for and satisfy Lockheed Martin UK Amptill specific requirements for completing a compliant First Article Inspection (FAI). It is based on the latest revision of AS9102 and overall LMUK expectations.

### 2.2. Objective

A FAI is performed to provide objective evidence that:

- All engineering, design, contractual and specification requirements are correctly understood, accounted for, verified and recorded.
- Materials, tooling, processes, documentation and personnel are capable of consistently producing compliant hardware.
- Part/assembly is 100% compliant, defined, base-lined and repeatable.

### 2.3. Benefit

The benefit acquired from this guidebook will result in improved 1st pass yield of first article document reviews in association with continuous deliveries of compliant material that enhance a supplier's reputation.

### 2.4. Target Audience

The guidebook is addressed to Quality Managers of sub-contractors who supply product to LMUK and LMUK SQA Department representatives. The most up to date version of this document is maintained online at <https://www.lockheedmartin.com/en-gb/suppliers/mfc-uk.html> This document may be copied by Lockheed Martin suppliers and subcontractors (at any tier of subcontracting) for use in support of Lockheed Martin contracts provided that it is not modified in any way and that this and all other copyright statements are retained.

## 3. References

### 3.1. Reference Documents

International Aerospace Standard 9102 Latest Released Revision

### 3.2. Required Forms

#### 3.2.1. Description AS9102 Forms:

- AS9102 Form 1: PART NUMBER ACCOUNTABILITY

This form is used to identify the product that is having the First Article Inspection (FAI) conducted on (e.g., detail part, subassembly, assembly) referred to as "FAI part".

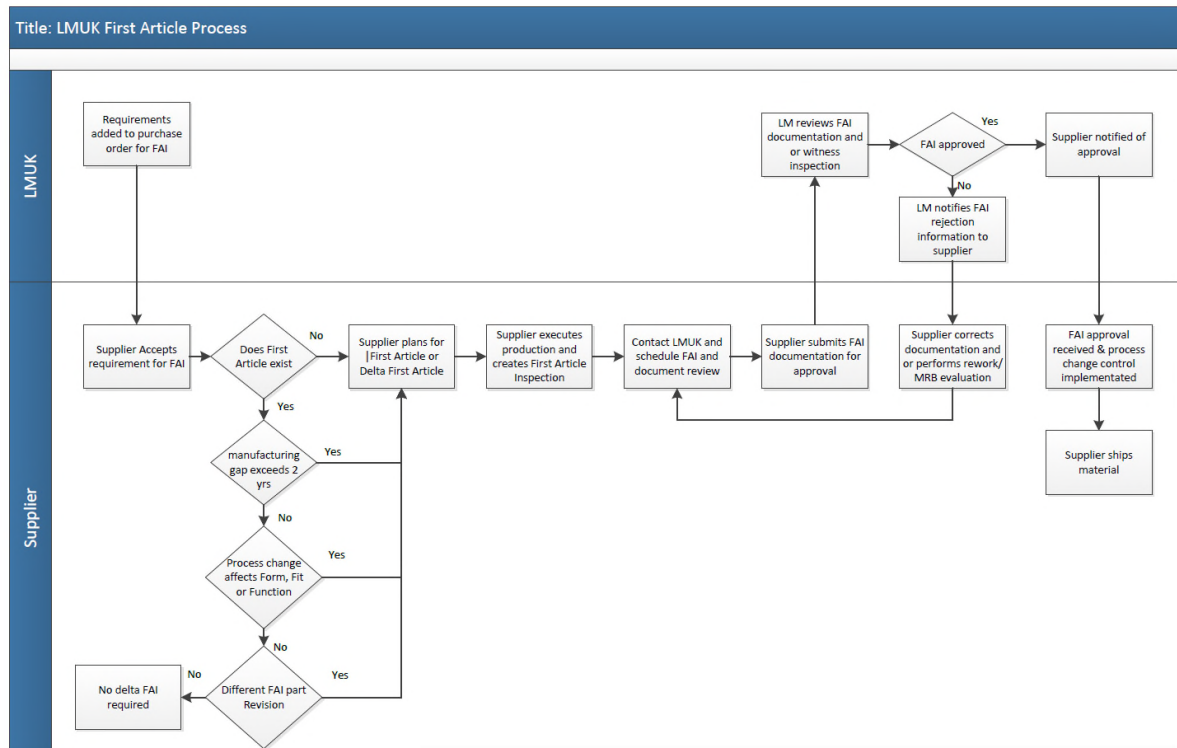
- AS9102 Form 2: PRODUCT ACCOUNTABILITY - MATERIALS, SPECIAL PROCESSES, AND FUNCTIONAL TESTING

This form is used if any materials, special processes, or functional testing is defined as a design characteristic.

- AS9102 Form 3: CHARACTERISTIC ACCOUNTABILITY, VERIFICATION and COMPATIBILITY EVALUATION

This form is used to record inspection results for the design characteristics and to document any applicable non-conformances.

## 4. REQUIREMENTS: The LMUK First Article Process



### 4.1. Purchase Order FAI Requirement

- An FAI shall be conducted by the supplier and the documented results shall be accepted by a LMUK supplier quality representative prior to any material shipment. First Article Inspection is a LMUK requirement when specified on the purchase order. As a guide any new LM part number will require FAI or if production of existing LM parts are moved to a new supplier. Consult your Procurement representative if unsure.
- FAI shall be required when a break in production exceeds time specified in contractual requirements or more than 2 years
  - Production shall be defined as an active manufacturing process that changes the state of raw material, or components, or the assembly of components (Date of Work commencement)

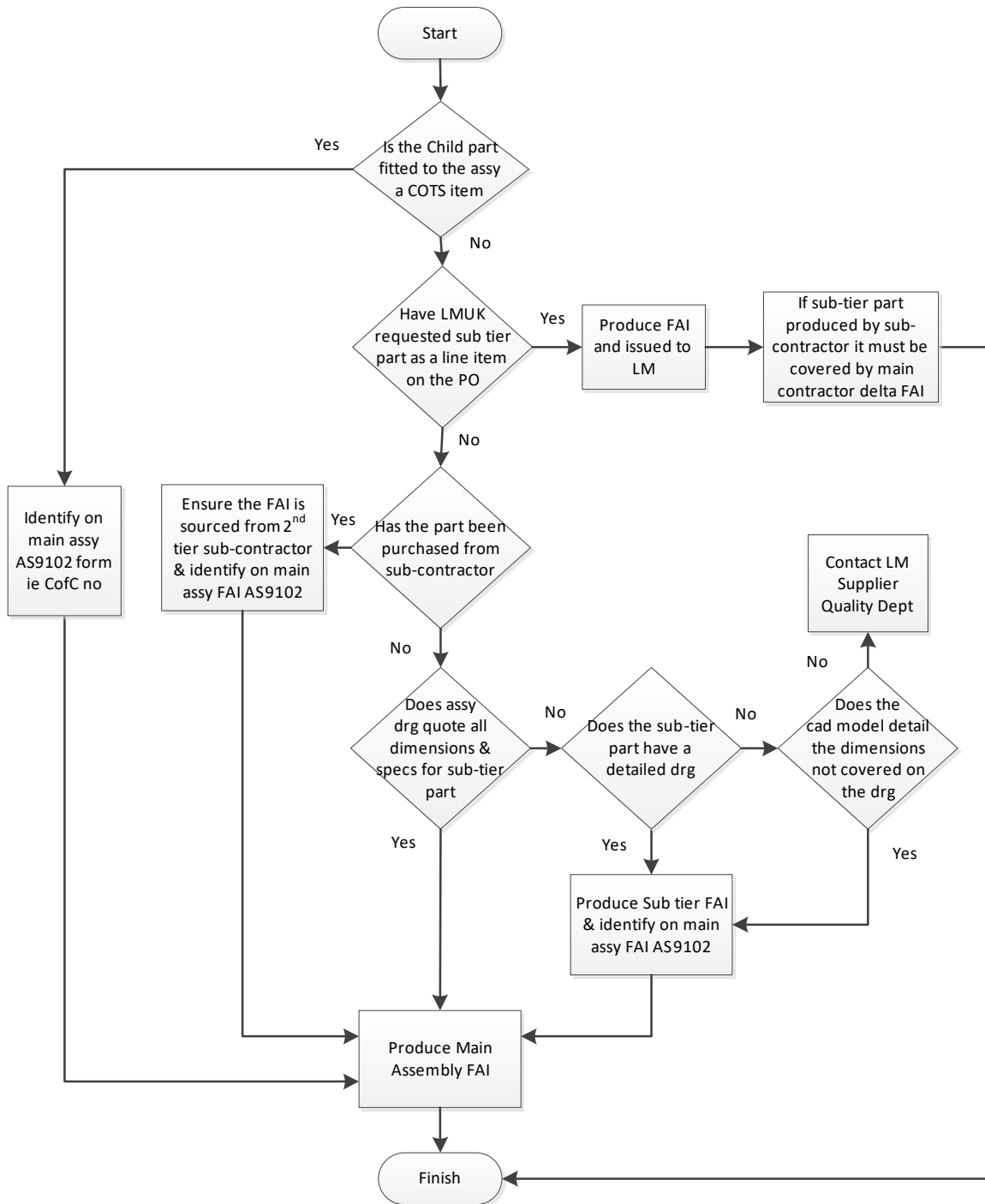
All other change requirements per AS9102 section 5.3 apply. Questions regarding FAI requirements shall be directed to the buyer / procurement representative. Program(s) may have a requirement to conduct on-site FAI witnessing at supplier's facility

## 5. FAI Planning

The following items shall be taken into consideration prior to manufacturing compliant parts and completing a FAI.

### 5.1. Pre-Planning Activities:

- Ensure that the process, planning and tooling that will produce the part being presented is one that is repeatable enough to consistently yield compliant hardware.
- Ensure that the Engineering package utilised is "Released", and the revision is per the Purchase Order requirement.
- Hardware utilised for an FAI shall be part of the first production run and may be part of the first lot of deliverable units. This FAI part should not be a qualification unit since ordinarily qualification is completed prior to FAI.
- Ensure all parts and materials included on Parts List are part of the FAI package and include a Certificate of Conformance for each.
- Verify 100% of drawing characteristics, notes, embedded specifications and sub-assemblies are achievable and supported with objective evidence. Ensure all process measurements are accounted for and verified prior to final assembly.
- Identify special processes, and if required, ensure use of Lockheed Martin approved Special Processors in accordance with Purchase Order requirements – if unsure verify with LM Supplier Quality representative.
- Ensure applicable FAI requirements are flowed down to sub-tiers and reviewed for compliance upon completion. Child part FAI (sub tier parts with LM drawing no.) are as a minimum required to be referenced in page 1 of the AS9100 form. These may be requested by LM in investigation of non-compliance / failure and must be readily available. Please see flow chart below detailing when a 'Child' part (or sub tier part is required).



- COTS items (Commercial off the shelf) need only be stated as 'Standard Part' on page 1 and DO NOT require FAI.
- Ensure controls and documented processes are in place to fulfil drawing & contractual requirements such as:
  - Quality Management Systems
  - Documented Production Processes
  - Qualification
  - Testing
  - Counterfeit Part Prevention
  - Inspection and acceptance tooling
  - Sub-tier Management
  - Approved Acceptance Test Procedure (ATP)/Verification Test Procedure (VTP)
  - Appropriate training of all personnel

- Ensure production baseline process controls are in place to achieve and maintain compliance
  - Supplier or contractor shall notify LMUKLMUK of any changes to “material change” (any alteration to the design, technical specifications, materials, component sourcing, production process, facilities or location) whether instigated by seller or its sub-tier suppliers.
- When Source Inspection applies and a PO review is required, it shall be completed in advance of the start of the manufacturing process. Source Inspection may re-inspect characteristics on a sample basis or witness the First Article (notification shall occur prior to complete FAI).

## 5.2. Equipment

- Have appropriate measurement equipment/methodology listed for each characteristic.
- Ensure all equipment is calibrated and the equipment has the physical capacity/capability to measure the part.
- Ensure equipment accuracy (i.e., at least 10 times the accuracy). Supplier should always consider MSA studies including Gauge R&R to demonstrate assurance.

## 5.3. Electronic Media Software

- Ensure use of LMUK supplied models (this should be the latest approved model, revision, and version provided in accordance with the Purchase Order), software, etc.
- Referenced model is not to be used for manufacturing or acceptance.
- Software/Firmware –If applicable, the PO lists the Statement of Work (SOW), which contains the FAI software/firmware requirements. The SOW provides detailed instructions on the process and methods that shall be used when conducting an FAI for software/firmware requirements. Software/firmware revisions must comply with appropriate forms and specifications.
- Include document required Model/Software/Gerber file revision in Form 2 (PRODUCT ACCOUNTABILITY - MATERIALS, SPECIAL PROCESSES, AND FUNCTIONAL TESTING)

## 6. FAI Submittal

FAI items that do not require source inspection should be provided to Lockheed Martin no less than 5 working days prior to shipment date.

- Questions regarding FAI submittals should be directed to the buyer listed on the Purchase Order.
- The FAI report shall be reviewed and approved by a LMUK supplier quality representative prior to any material shipment. Material received without an approved FAI is subject to immediate return. Permission to ship shall come from the procurement representative/buyer after the FAI has been reviewed and approved by a supplier quality team member.
- For parts that require FAI and Source Inspection, requests must be made no less than 5 working days prior to shipment date. Scheduling shall accommodate any in process inspections identified during PO review.

## 7. Partial/Delta FAI

The FAI requirement, once invoked, shall continue to apply even after initial compliance. The FAI requirements may be satisfied by a partial (Delta) FAI that addresses differences between the current configuration and prior approved configurations. When a partial (Delta) FAI is performed, the organization shall complete only the affected fields in the FAI forms. FAI requirements may also be satisfied by previously approved FAI(s) performed on identical characteristics of similar parts produced by identical means. When FAI requirements (partial or complete) are satisfied in this manner, identify the approved configuration in the index of part numbers on Form 1.

### 7.1. Partial/Delta FAI Requirement

A Partial/Delta FAI is required when:

- A change in design potentially affects form, fit or function.
- A change in manufacturing source, process, inspection method, location of manufacturer, tooling, or material potentially affects form, fit or function.
- A change to numerical control programs or translation to another media potentially affects form, fit or function.
- A natural/manmade event may adversely affect the manufacturing process.

## 8. First Article Inspection Example

### 8.1. Ballooning an Engineering Drawing

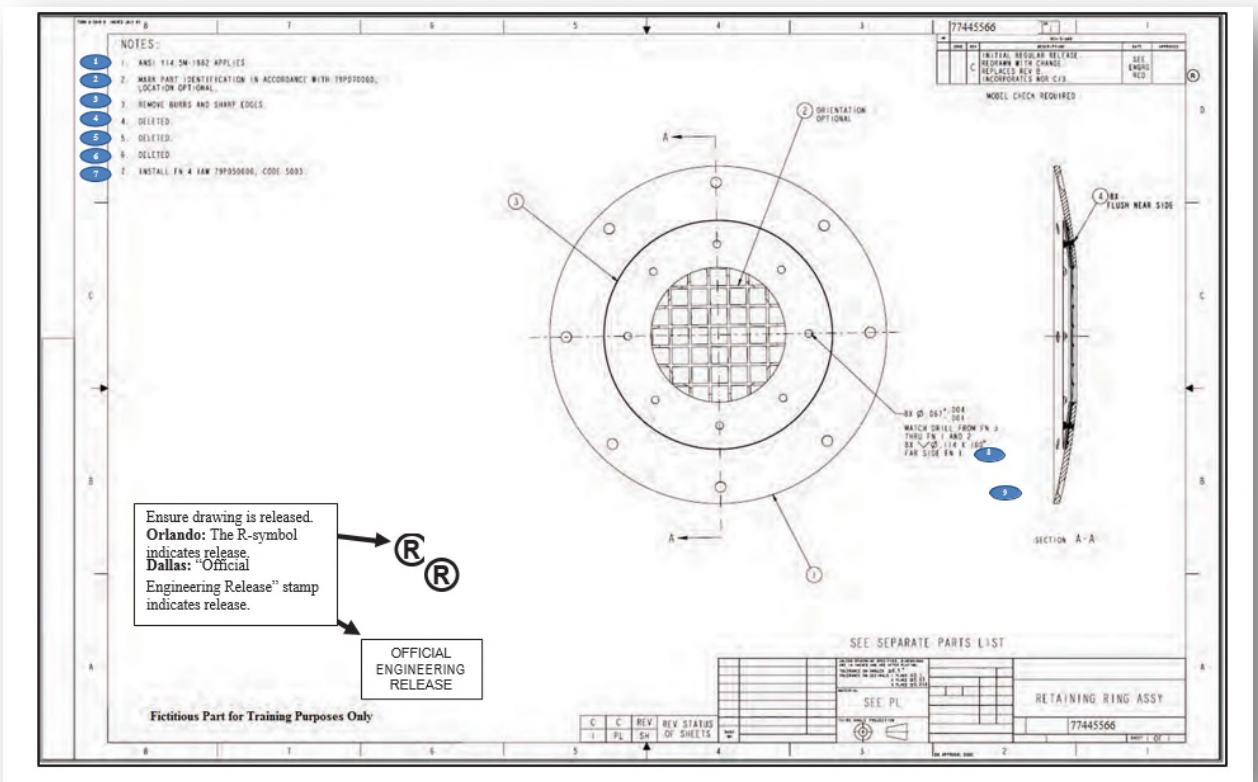
While conducting the FAI a common technique called “ballooning” is used to identify each characteristic on the drawing; this establishes an organized method to capture objective evidence that each drawing requirement is met. Ballooning is recommended to ensure accuracy and completeness. It is preferred if a ballooned drawing of the accepted FAI is submitted as part of the officially documented FAI package. An alternate method to “ballooning” is to reference drawing sheet and zone location(s).

The below example highlights a top assembly drawing (with one sub-assembly), and illustrates how each required FAI form is filled out based on the example drawing requirements.

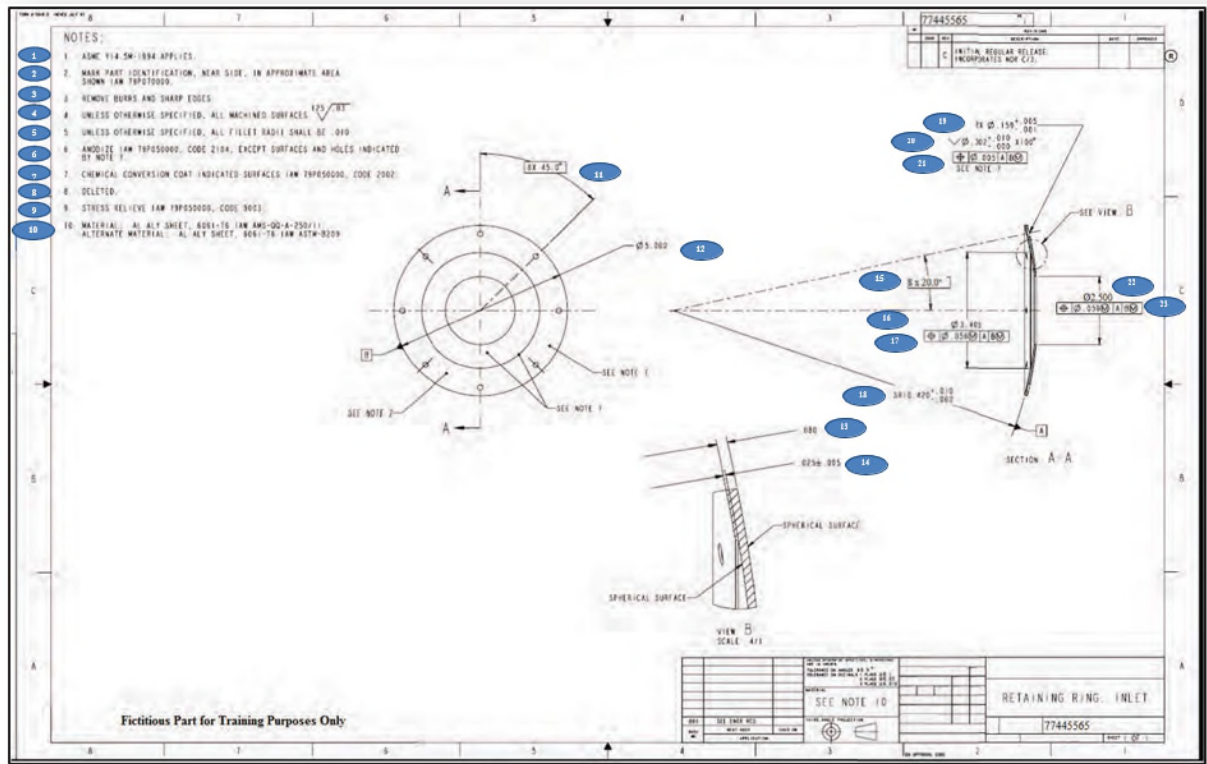
NOTE: Assembly and sub-assembly FAIs are required for all LMUK designed details, and sub-assemblies that constitute the end item as demonstrated in the example. First Article Inspection for LMUK designed details and sub-assemblies shall be performed as required by the LM PO.

The example FAI contained herein will map from initial drawing ballooning all the way through completion of the FAI. The “balloons” in the example below are used to reference the item numbers listed on Form 3 (Characteristic Accountability, Verification and Compatibility Evaluation).

## 9. Top Assembly



## 10. Sub-Assembly



## 11. FAI Form Examples

Each field in the forms below will be identified as:

- (R) Required: This is mandatory information (These fields are depicted in bold font).
- (CR) Conditionally Required: This field must be completed when applicable. (These fields are depicted in bold italic font.)
- (O) Optional: This field is provided for convenience. (These fields are depicted in standard font.)



## 12. AS9102 Form 1

SAE INTERNATIONAL		AS9102B		Page 13 of 21	
FORM 1 - PART NUMBER ACCOUNTABILITY					
Sheet ___ of ___					
1. Part Number: 77445566-001	2. Part Name: Retainer Ring Assembly	3. Serial Number: 1	4. FAIR Number: 12345-67		
5. Part Revision Level: Top Level Revision C Parts List Revision C	6. Drawing Number: 77445566	7. Drawing Revision Level: Revision C	8. Additional Changes: N/A		
9. Manufacturing Process Reference: 1234	10. Organization Name: Supplier 123 Inc	11. Supplier Code: LM123	12. P.O. Number: 41000000, Line item 1		
13. Detail Part: <input type="checkbox"/> Assembly FAI: <input checked="" type="checkbox"/>	14. Full FAI: <input checked="" type="checkbox"/> Partial FAI: <input type="checkbox"/> Baseline Part Number (including revision level): Reason for Partial FAI:				
a) If above part number is a detail part only, go to field 19. b) If above part number is an assembly, go to the "INDEX" section below.					
INDEX of part numbers or sub-assembly numbers required to make the assembly noted above.					
15. Part Number:	16. Part Name:	17. Part Serial Number:	18. FAIR Number:		
77445565-001	Retainer Ring	N/A	12345-89		
19. Signature:	<i>John Smith</i> — FAI Complete	<i>John Smith</i> — FAI Not Complete	20. Date: 5/3/2015		
21. Reviewed By:	<i>Jane Doe</i>	<i>Jane Doe</i>	22. Date: 5/3/2015		
23. Customer Approval:				24. Date:	

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### 12.1. LMUK Ampthill Expectation for Proper Form AS9102 Form 1 Completion

- 1 (R) Part Number: Enter the number of the part (FAI part).
- 2 (R) Part Name: Enter the name of the part as shown on the drawing.
- 3 (CR) Serial Number: Enter the serial number of the part.
- 4 (CR) FAIR Number: Enter the reference number that identifies the FAI. This may be an internal report number.
- 5 (CR) Part Revision Level: Enter the latest part revision that affects the part being first article inspected and include the parts list revision level as needed. If there is no revision, indicate as such. (e.g. "-")  
NOTE: The latest drawing revision (Field 7) does not always affect all parts contained on a drawing.
- 6 (R) Drawing Number: Enter the drawing number associated with the FAI part.
- 7 (R) Drawing Revision Level: Enter the revision level of the engineering drawing. If there is no revision, indicate as such by inputting "-".  
NOTE: Specify parts list revision level (if applicable) in addition to the drawing revision level
- 8 (CR) Additional Changes: Enter the reference number(s) of any changes that are incorporated in the product but not reflected in referenced drawing/part revision level (e.g., change in design, engineering changes, manufacturing changes, deviation or exclusion from certain drawing requirement, etc.).
- 9 (R) Manufacturing Process Reference: Enter a reference number that provides traceability to the manufacturing record of the FAI part (e.g., router number, manufacturing plan number, etc.).  
NOTE: Add the Manufacturing Work Order Number information as required.
- 10 (R) Organization Name: Enter the name of the organization performing this FAI and program name if available.
- 11 (CR) Supplier Code: Enter the supplier code which is a unique number provided by LMUK to the Supplier.  
NOTE: It is sometimes referred to as a vendor code, vendor identification number, supplier number, LMID etc. (CR) P.O. Number: Enter the Customer Purchase Order number/Item number, if applicable or required.
- 12 (R) Detail FAI or an Assembly FAI: Check as appropriate.
- 13 (R) Full FAI or Partial FAI: Check as appropriate.  
NOTE: For a partial FAI, provide the baseline part number (including revision level) to which this partial FAI is performed and the reason for it. For example, changes in design, process, manufacturing location, etc.
- 14 (CR) Part Number: Enter the detail or next level sub-assembly part number to be included in the assembly.  
NOTE: This entry is required only if the part number in field 1 is an assembly requiring lower level parts to be installed into the assembly.
- 15 (CR) Part Name: Enter the part name as shown on the drawing.  
NOTE: This entry is required only if the part number in field 1 is an assembly requiring lower level parts to be installed into the assembly.
- 16 (CR) Part Serial Number: Enter the serial number of the part that is installed in the assembly, when applicable.  
NOTE: This entry is required only if the part number in field 1 is an assembly requiring lower level parts to be installed into the assembly.
- 17 (CR) FAIR Number: Enter the FAI report number for detail part.  
NOTE: This entry is required only if the part number in field 1 is an assembly requiring lower level parts to be installed into the assembly.
- 18 (R) Signature: Printed name or unique identification, and signature of the person approving the FAIR. This signature certifies the evaluation activities in 9102, 4.5 are complete and the FAIR is approved. The preparer may be the Supplier.
- 19 Signature field
- 20 (R) Date of Preparation: Date when field 19 was signed.
- 21 (R) Reviewed by (Quality Management or Designee): Printed name or unique identification, and signature of the person from the organization who approved the FAIR.
- 22 (R) Date of Approval: Date when field 21 was signed.

### 13. AS9102 Form 2: Product Accountability – Materials, Special Processes and Functional Testing

<b>SAE INTERNATIONAL</b>		<b>AS9102B</b>			Page 16 of 21	
<b>FORM 2 - PRODUCT ACCOUNTABILITY - MATERIALS, SPECIAL PROCESSES, AND FUNCTIONAL TESTING</b>						
Sheet ____ of ____						
1. Part Number: 77445566-001	2. Part Name: Retainer Ring Assembly		3. Serial Number: 1		4. FAIR Number: 12345-67	
5. Material or Process Name:	6. Specification Number:	7. Code:	8. Supplier:	9. Customer Approval Verification:	10. Certificate of Conformance Number:	
Rivet Solid CS 1000	MS20426L	N/A	ABC Rivets 10 Elm St Boston, Ma. LM0000	N/A	PO98765	
Sealant	MIL-PRF-2333777D	N/A	Sam's Sealants 43rd St San Jose, Ca. LMI212	N/A	PO98765	
11. Functional Test Procedure Number:			12. Acceptance Report Number:			
13. Comments						
14. Signature John Smith			John Smith		15. Date 5/3/2015	

**13.1. LMUK Amphyll Expectation for Proper Form AS9102 Form 2 Completion**  
 NOTE: An asterisk before the field descriptions indicates an LMUK requirement in addition to the AS9102 forms.

- 1 (R) Part Number: Enter the number of the part (FAI part).
  - 2 (R) Part Name: Enter the name of the part as shown on the drawing.
  - 3 (CR) Part Serial Number/\*Lot Number: Enter the serial number/lot number of the part.
  - 4 (CR) FAI Report Number: Enter the reference number that identifies the FAI. This may be an internal report number.
  - 5 (CR) Material or Process: Enter the name of material or process.
  - 6 NOTE: List material certifications and any special process referenced on the engineering drawing.
  - 7 (CR) Specification Number With \*Revision: Enter all material and/or process specification numbers (include permitted alternates, if used), as listed on the engineering drawing and/or parts list and revision level.
  - 8 (O) Code: Enter any required code from the Customer for material or process listing.
  - 9 (CR) Supplier: Enter the Customer given Supplier code, Supplier Name & address for the organization performing special process(es) or supplying material, as applicable.
  - 10 (CR) Customer Approval Verification: Indicate if the special process or material source is approved by the Customer. Write "NA" if Customer approval is not required.
  - 11 (CR) Certificate of Conformance/\*Compliance (Yes/No): Record the number of the certificate, if available. (e.g., special process completion certification, raw material test report number, Standard Catalog hardware compliance report number, traceability number, P.O. number, lot number, job number etc.).
  - 12 (CR) Functional Test Procedure Number: Enter the Functional Test Procedure
  - 13 (CR) Acceptance Report Number: Enter the functional test certification indicating that test requirements have been met.
  - 14 (O) Comments: Enter and comments as applicable.
  - 15 (R) Signature: Enter printed name or unique identification, and signature of the person who prepared and approved this form.
  - 16 (R) Date: Enter the date when this form was completed. (When Block 14 was signed)
- NOTE: An asterisk before the field descriptions indicates an LMUK requirement in addition to the AS9102 forms

## 14. AS9102 Form 3: Characteristic Accountability, Verification and Compatibility Evaluation for Top Assembly Part

First Article Inspection Report Form 3: Characteristic Accountability, Verification and Compatibility Evaluation							
1. Part Number 77445566-001		2. Part Name Retainer Ring Sub Assembly			3. Serial Number f		4. FAI Report 12345-67
Characteristic Accountability				Inspection / Test Results			
5. Item No.	6. Reference Location	7. Characteristic Designator	8. Requirement	9. Results	10. Designed Tooling	11. Non-Conformance Number	14. Additional Data/Comments
1	Note 1		ANSI Y14.5 1982 applies and dimensions were taken after all special processes (Chem Film & Anodizing)	Accept			N/A
2	Note 2		Mark part IAW	04839-79705682-019			Visual
3	Note 3		Removed burrs & sharp	Accept			Visual
4	Note 4		Deleted	N/A			N/A
5	Note 5		Deleted	N/A			N/A
6	Note 6		Deleted	N/A			N/A
7	Note 7		Install F34 IAW 78P050000	Accept			Visual
8	Sheet 2 Zone JS		XX .067 (+.004-.001)	.071, .070, .068, .068, .068, .070, .068, .068			Plug Gage
9	Sheet 2 Zone GS		XX $\sqrt{R}$ .114 x 100'	.115, .118 x 101'			CMM
<small>(Use additional sheets as necessary)</small>							
12. Signature John Smith					13. Date 5/3/2015		

**Top Assembly Part Example**

## 15. AS9102 Form 3: Characteristic Accountability, Verification and Compatibility Evaluation for Sub Assembly Part

First Article Inspection Report Form 3: Characteristic Accountability, Verification and Compatibility Evaluation													
1. Part Number				2. Part Name				3. Serial Number				4. FAI Report	
77445665-001				Retainer Ring				N/A				12345-89	
Characteristic Accountability							Inspection / Test Results						
5. Item No.	6. Reference Location	7. Characteristic Designator	8. Requirement	9. Results	10. Designed Tooling	11. Non-Conformance Number	14. Additional Data/Comments						
1	Note 1		ANSI Y14.5 1982 applies and dimensions were taken after all special processes (Chem Film & Anodizing)	Accept			N/A						
2	Note 2		Parts marked 123456-01 in designated area Mark IAW 79P070000	Accept			Visual						
3	Note 3		Removed burrs & sharp edges	Accept			Visual						
4	Note 4		All machined surfaces exhibit 125 $\sqrt{0.3}$	Surface Finish $\sqrt{32}$			Profilometer						
5	Note 5		Unless otherwise specified (UOS) Fillet Radii .010	Less than 0.01			Radius Gage						
6	Note 6		Anodized IAW 79P050000 Code 2104	Accept			Certificate of Conformance from Plating Supplier (See attached certification)						
7	Note 7		Chemical Filmed IAW 79P050000 Code 2002	Accept			Certificate of Conformance from Plating Supplier (See attached certification)						
8	Note 8		Deleted	N/A			N/A						
9	Note 9		Stress Relief IAW 79P050000 Code 9003	Accept			Certificate of Conformance from Heat Treat Supplier (See attached certification)						
10	Note 10		Material AL ALY Sheet 6061-T6 IAW AMS-QQ-A-250/11 used for parts	Accept			Certificate of Conformance from Raw Material Supplier (See attached certification)						
11	Sht. 1 Zone C5		8 x 45.0" (Basic Dimension)	44.7/45.3"			CMM						
12	Sht. 1 Zone C4		$\varnothing$ 5.000 (+/- .010)	5.004			CMM						
13	Sht. 1 Zone B3		0.080 (+/- .010)	0.087			CMM						
14	Sht. 1 Zone B3		0.025 (+/- .005)	0.027			CMM						
15	Sht. 1 Zone C3		8 x 20.0" (Basic Dimension)	20.3/20.5"			CMM						
16	Sht. 1 Zone C2		$\varnothing$ 3.400 (+/- .010)	3.406			CMM						
17	Sht. 1 Zone C2		$\varnothing$ .056/A/B	0.003			CMM						
18	Sht. 1 Zone B2		SR 10.420 (+ .010)	10.428			CMM						
19	Sht. 1 Zone D2		$\varnothing$ 8 x .159 (+ .005 / - .001)	0.16			Pin Gage						
20	Sht. 1 Zone D2		8x $\sqrt{\varnothing}$ .302 (+ .010 / - .000) x 100° (+/- .5°)	.311 x 100° / .302 X 100°			CSK Micrometer						
21	Sht. 1 Zone D2		8x $\varnothing$ .005/A/B	0.00/0.002			CMM						
22	Sht. 1 Zone C1		$\varnothing$ 2.500 (+/- .010)	2.506			Caliper						
23	Sht. 1 Zone C1		$\varnothing$ .056/A/B	0.009			CMM						
(Use additional sheets as necessary)													
12. Signature											13. Date		
John Smith (John Smith's Signature)											5/3/2015		

### Sub-Assembly Part Example

#### 15.1. LMUK Ampthill Expectation for Proper Form AS9102 Form 3 Completion

NOTE: An asterisk before the field descriptions indicates an LMUK requirement in addition to the AS9102 forms.

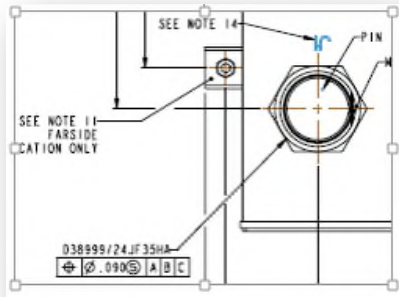
- 1 (R) Part Number: Enter the number of the part (FAI part).
- 2 (R) Part Name: Enter the name of the part as shown on the drawing.
- 3 (CR) Part Serial Number/\*Lot Number: Enter the serial number/lot number of part.
- 4 (CR) FAIR Number: Enter the reference number that identifies the FAI. This may be an internal report number.
- 5 (R) Char. Number: Enter the unique assigned number for each Design Characteristic.
- 6 (CR) Reference Location: Enter the location of the Design Characteristic (e.g., drawing zone (page number and section), specification, etc.).  
NOTE: If drawing is not ballooned, reference locations are required
- 7 (CR) Characteristic Designator: If applicable, enter the characteristic type (e.g., key characteristic, flight safety, critical, major, etc.)

- 8 (R) Requirement: Enter the specified requirement for the Design Characteristic (e.g., drawing dimensional characteristics with nominal and tolerances included, drawing notes, specification requirements, etc.).
- 9 (R) Results: Enter measurement(s) obtained for the Design Characteristics. For marking, document actual part marking in Results field.  
NOTE: For Multiple Characteristics, list each characteristic as an individual value or list with the minimum and maximum of measured values attained. If a characteristic is found to be non-conforming then the results for that characteristic must be listed individually with the measured value(s).  
When qualified tooling is used as a go/no-go gage (reference 9102, 4.7.3), record the results as an attribute (e.g. pass/fail)  
\*If a Design Requirement requires verification testing, then the actual results shall be recorded on the form. If a laboratory report or certificate of test is included in the FAI, then these results need not be written on the form, record the reference number in this field. The laboratory report or certificate of test must show specific values for requirements and actual results. Attach copies of reports or certificate, as applicable.  
\*For metallurgical characteristics with visual verification requirements that are rated against standard photographs, list the photo number of the closest comparison. A statement of conformance is acceptable (record the reference number in this field).  
For processes that require verification per Design Characteristic, include statement of compliance/conformance (e.g., certification of compliance, verification indicator such as "accept," etc.).  
\*For part marking, ensure that marking is legible, correct in content and size and properly located, per applicable specification.
- 10 (CR) Designed/Qualified Tooling: If a specially designed tooling (including Numerical Control (N/C) programming) is used as a media of inspection, enter the tool/N/C identification number and \*revision level.
- 11 (CR) Non-Conformance Number: Record a non-conformance document reference number if the characteristic is found to be non-conforming.  
\*NOTE: Any non-conformances must be dispositioned and closed out per internal requirements (i.e. MRB etc.). Supporting documents should be added to FAI package. If this is a Lockheed Martin part number, MRB authority must be granted by Lockheed Martin.
- 12 (R) Signature: Printed name or unique identifier, and signature of the person who prepared this form.
- 13 (R) Date: Enter the date when this form was completed. (Date Block 12 was signed.)
- 14 (R) Inspection Methodology: Identify and record specific gages, tooling, set-up method, visual inspection, and populate inspection methodology field of FAI Data Sheet with the type of equipment used to inspect the feature (i.e., if method is visual, document "visual" in the inspection methodology field of the FAI Data Sheet).

## 16. Common Errors Which Cause FAI Rejection

The topics listed below are common mistakes found in submitted FAI packages.

- Missing or hidden requirements for Detailed Commercial Off the shelf "COTS" Parts where dimensions are not included on the assembly drawing.
  - When required, requirements for detail parts/hardware installation must comply with the document specified. In this example, D38999 requires a hole for the installation of the connector to the assembly. The dimensions are located in the D38999 spec and not the drawing.
  - These dimensions shall be included in the FAI package.



Example: MIL-DTL-38999 has the requirements for the hole size for the connector illustrated as well as torque requirements.

- All Dimensions and/or notes not accounted for.
  - Any notes that contain a dimension shall have a physical measurement recorded. The use of "accept" or "OK" is not permitted.
- Incorrect or missing special process flow down requirements such as.
  - Special process supplier shall be LMUK approved per purchase order requirements.
  - Supplier shall be certified to build to RDD (Reduced Dimension Drawing) per purchase order requirements.
- Incorrect tolerances assigned to dimension resulting in part non-conformance.
  - Standard dimension tolerances such as .100 (three place decimal meaning +/- .010) are found in the tolerance block located in the lower right part of the drawing as shown below.

UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES AND ARE AFTER PLATING.	
TOLERANCE ON ANGLES	$\pm 0.5^\circ$
TOLERANCE ON DECIMALS	1 PLACE $\pm 0.1$
	2 PLACE $\pm 0.03$
	3 PLACE $\pm 0.010$

- Basic dimensions are normally defined as a dimension surrounded by a box as shown. Tolerances assigned to this dimension are defined by the Feature Control Frame associated with the Basic Dimension. The Geometric Symbol associated with the Feature Control Frame could be True Position, Profile, Flatness, etc.
- Incorrect Raw material/adhesives information provided.
  - Shelf life shall not be expired; appropriate adhesive shall be used on labels, etc.
  - Raw Material required to be indicated on form AS9102 Form 2.
- Parts for an assembly identified on the wrong form.
  - Parts for an assembly are required to be indicated on form AS9102 Form 1.
- Incorrect revision level.
  - Ensure PO revision matches released engineering specified for item(s) on FAI report.
  - Verify the required revision of LMUK specifications, like 79P050000, by using the link provided on the PO or by contacting the LMUK Buyer. Indicate all revision levels in block 6 of AS9102 Form 2.
  - Ensure through LMUK Procurement that you are working to the latest released engineering.
  - Special Process certifications should be to the latest revision.
- Incorrect inspection equipment used or not noted on FAI report.
  - When inspection equipment is listed, ensure that inspection equipment has sufficient measurement accuracy for requirements being measured and ensure it is recorded on Form AS9102 Form 3 Use of Gage Repeatability and Reproducibility (R&R) to validate measurement repeatability should be a part of the process development effort.
- Wrong part number identified on FAI form(s).
  - There shall be no typo's, missing dash numbers, and/or designators such as Q1, D1,TPSS
  - Example: If the purchase order requires P/N 7979797-003 Q1 the FAI form shall read the full P/N: 7979797-003 Q1
- Missing Certificates of Conformance, test reports, and FAI forms as part of the FAI package.
  - Ensure there is no Missing/Incomplete sub-tier supplier data such as:
    - Improper material alloy listed
    - Incorrect special process used
    - Incorrect specification revision levels listed
  - Ensure supplier equivalent forms meet the LMUK/AS9102 form requirements.
  - Ensure all forms are provided in the FAI package.
- FAI form(s) not signed/approved by appropriate representative and/or dated.
- Incomplete recording of "multiple actuals".
  - A feature that is required multiple times requires recording multiple actuals.

Example: FIN #6 has to be installed in 12 places (need to indicate 12 places or measurements as defined by engineering). This can include a range with max/min indicated.

## 17. Frequently Asked Questions

The items listed below describe and answer FAQs concerning Supplier First Article Inspection.

- What forms are required for a partial / delta First Article Inspection?
  - Forms 1 through 3 and MFC Form (First Article Inspection: Product/Process Verification Checklist) are required for all First Article Inspections. Complete only the affected fields for the characteristics that need to be revalidated.
- Do drawing notes that contain dimensions need to have a measurement recorded?
  - Yes. All dimensions shall have a measurement, tolerance and inspection method recorded.
- Do requirements for COTS items not included on the assembly drawing need to be included?
  - Yes. When details for part / hardware installation are contained within that specification and produced on our assembly the dimensions shall be included.
- Will use of unapproved Lockheed Martin Special Processors cause my First Article to be rejected?
  - Yes. This is also considered a part nonconformance.
- Why was the equipment or instrument recorded under inspection methodology rejected?
  - The Supplier Quality Engineer reviewing the First Article does not have confidence a valid, repeatable and reproducible measurement is obtainable
- What are the most common documentation errors that cause a First Article Inspection Report to Fail?
  - Typo errors: (inverted numbers and tolerances, etc)
  - Part numbers and subassembly parts missing (form 1)
  - Incorrect revision level (form 1)
  - Missing specification revision (form 2)
  - MFC Form (First Article Inspection: Product/Process Verification Checklist) missing
  - Visual inspection method used for a dimension (form 3)
  - Special process hierarchy not complete (form 2)
  - Special process supplier code & Supplier missing (form 2)
- When a feature indicates that multiple place measurements are required for each place
  - Yes. A feature that requires multiple times requires multiple actual measurements.
- If material certifications, test reports are not included will my first article be rejected?
  - Yes. All documentation is required for objective evidence to demonstrate the First Article meets requirements.
- Can I develop my own acceptance tooling for use without Lockheed Martin approval?
  - No. All supplier self-developed acceptance tooling must be approved by Lockheed Martin.
- What is the best process to ensure a measurement process will produce repeatable and reproducible results?
  - A Gauge Repeatability and Reproducibility study.
- What if I have additional questions concerning the completion of a First Article Inspection?
  - Questions can be directed to Lockheed Martin Procurement
- For any additional questions, please go to <http://www.sae.org/aaag/publications/>

## 18. Definitions

- 1 Approved FAI: Documented approval from LMUK Supplier Quality representative. Approval is required to ship material unless otherwise directed by LMUK.
- 2 Ballooning: This technique establishes an organized method to capture objective evidence that each drawing requirement is met. Ballooning is recommended to ensure accuracy and completeness. It is preferred if a ballooned drawing of the accepted FAI is submitted as part of the officially documented FAI package.
- 3 Certificates of Conformance (C of C): The Contractor shall submit with each shipment, a Certificate of Conformance which shall be dated and bear the signature, electronic equivalent, or electronically generated title of an authorized contractor's Representative, stating that the materials furnished to Lockheed Martin are in conformance with applicable requirements of the Contract, drawings, and specifications, and that supporting documentation is on file and will be made available to Lockheed Martin or Government Representatives upon request. Certification shall include name of contractor of materials being supplied, quantity shipped, and Contract number.
  - a. An example of an acceptable statement of Certification of Conformance is as follows: "This is to certify that all items noted are in conformance with the Contract, drawings, specification and other applicable documentation, that all process certifications, chemical and physical test reports, are on file at this facility and are available for review by Lockheed Martin."
- 4 Change Control: Formal process used to ensure that changes to a product or system are introduced in a controlled and coordinated manner throughout the life cycle. This includes flowing the change through the appropriate channels within Lockheed Martin before incorporation.
- 5 Corrective Action: Action(s) to eliminate the cause(s) of a detected nonconformity or other undesirable situation in order to prevent recurrence. The extent of corrective actions shall be proportional to the effects of related nonconformities. The FAI is not complete until the organization closes all non-conformances affecting the part and implements corrective actions. The organization shall re-do an FAI for those affected characteristics and shall record the results.
- 6 Equivalent Form: Interchangeable AS9102 or company specific forms that include the additional requirements
- 7 First Article Inspection: A procedure that provides objective evidence that all engineering, design and specification requirements are correctly understood, accounted for, verified, recorded, and that the combination of material, tooling, processes, documentation and personnel is capable of producing compliant hardware. FAI includes the manufacturing/inspection planning, manufacturing processes, tooling and software, (Numerical Control (N/C) tapes and Coordinate Measuring machine programs), test, inspection methods and equipment used in the fabrication of products.



- 8 FAI Plan: A documented plan for the company's FAI procedure. Preparation requires gathering all source documents including: Contract requirements (Purchase Order), Ballooned engineering drawings, specifications referenced in drawings, embedded or layered specifications, raw material certifications, Capability Maturity Model data, planning/shop routers, documentation validating integrity, production processes (i.e., soldering, plating, heat treating, etc.)
- 9 FAI Rejection: First Article Inspection Reports where nonconformance/s are identified shall have the status of Rejected. Nonconforming product shall not be delivered to the Buyer without required Material Review Board approval (Buyer approved Waiver or other document). The FAI shall remain in a rejected status until the corrective actions associated with nonconformance have been completed, a subsequent build has been accomplished and an acceptable Delta FAI has been completed. Any non- conformances must be dispositioned and closed out per internal requirements (i.e. MRB, RC/CA, etc.). Supporting documents should be added to the FAI package.
- 10 Manufacturing Suffix Part Number: A part number with a qualifier at the end (such as Q1, D1, TPSS). Part numbers with a manufacturing suffix have additional documentation indicating the part will deviate from engineering in some way. Ensure the technical data or engineering package received includes the required documentation. Contact the buyer if the documentation is missing.
- 11 Partial/Delta FAI): See above section on Partial/Delta or Complete Re-accomplishment of a FAI.
- 12 Reduced Dimension Drawing (RDD): Drawings that do not contain all the information required to fabricate and inspect the part, but must be used in conjunction with the computer-generated model file.
- 13 Source Inspection: LMC supplier quality reserves the right to perform in- process inspection, in-process surveillance and/or audits at any time during the life of the purchase order. Parts, assemblies, processes and tests are subject to detailed inspection by the LMC quality representative prior to assembly, test and/or delivery when required. Such inspections, tests and mandatory inspection points (MIPs) shall be identified during the purchase order review process, and failure to comply with agreed upon MIPs with LMC supplier quality shall be cause for rejection of completed end items.
- 14 Special Process: A documented method used to manufacture products where a product undergoes a physical, chemical or metallurgical transformation where conformance to the specification cannot be readily verified by normal inspection methods, and the quality of the product depends on use of specific equipment operated in a specific manner, under controlled conditions, by trained personnel with instructions, procedures and standards. All special processes must be performed at a LMUK approved supplier.
- 15 Sub-tier: Any and all suppliers that the contracted supplier uses for products and/or services.
- 16 Variables Data: Quantitative measurements taken on a continuous scale.
  - a. For example, the diameter of a cylinder or the gap between mating parts.

## 19. SQAG 001 Document Changes

Date	Iss	Clause	Changes	Change by
22-Feb-2018	2	5	New flowchart for Child FAI parts	Craig White
01-Sep-2022	3	NA	Updated graphical format to Lockheed Martin Corporate Branding	Konrad Burgoyne
30-Sep-2023	4	All	Updated to include AS9102 Rev. C requirements	Gareth Bevan
26-Feb-2025	5	<a href="#">2.4</a>	Inclusion of copyright information.	Gareth Bevan

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