

First Article Inspection

RMS Expectations and Guidelines

March 2019



INTRODUCTION

Purpose

This guidebook provides directions on how to identify, plan for and satisfy Lockheed Martin Rotary and Mission Systems (RMS) specific requirements for completing a compliant First Article Inspection (FAI).

FAI is performed to provide objective evidence that:

- Engineering, design, contractual and specification requirements are 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, baselined and repeatable.

REFERENCES

Reference Documents

- International Aerospace Standard 9102 Latest Released Revision
- Lockheed Martin Purchase Order Requirement CTFIRST

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

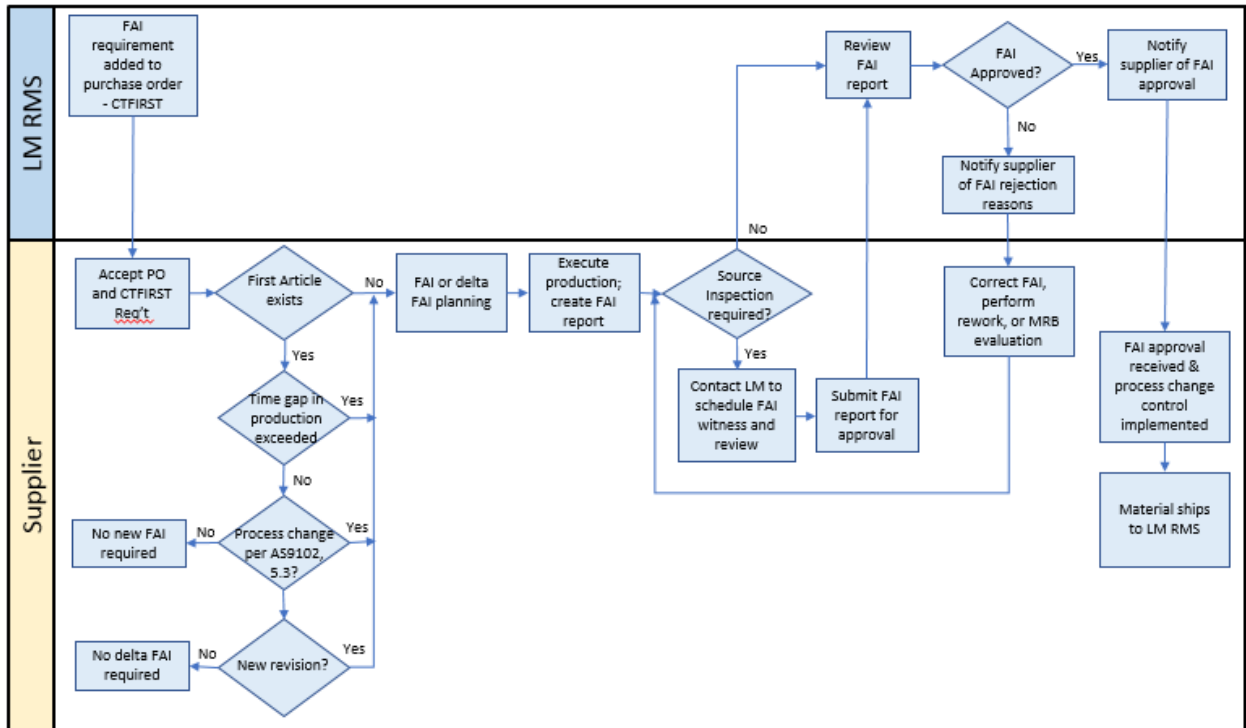
– This form is used if any materials, special processes, or functional testing is defined as a design characteristic.

AS9102 Form 3: CHARACTERISTIC ACCOUNTABILITY, VERIFICATION and COMPATIBILITY EVALUATION

– This form is used to record inspection results for the design characteristics and document any applicable nonconformances.

NOTE: Suppliers may use their own format for FAI Reports if they contain all Required and Conditionally Required information as outlined in AS9102

LM RMS First Article Process



Purchase Order FAI Requirement

NOTE: To determine if source inspection is required, you must log into your Exostar account and access the LM RMS P2P portal.

A FAI shall be conducted by the seller and the documented results shall be accepted by a LM RMS supplier quality representative prior to any material shipment. First Article Inspection is a LM RMS requirement that conforms to AS9102.

CTFIRST:

AS9102 FIRST ARTICLE INSPECTION

The supplier shall perform a first article inspection for this Part Number if any of the following conditions occur:

- 1) First time product is manufactured for production.
- 2) A change in the design affecting fit, form, function and/or interchangeability of the part.

- 3) A change in manufacturing source(s), process(es), inspection method(s), acceptance criteria, location of manufacture, tooling or materials.
- 4) A change in numerical control program or translation to another media that is utilized to produce end item parts.
- 5) A natural or man-made event, which may adversely affect the manufacturing process.
- 6) A lapse in production for two years, or as specified by the customer.
- 7) For MOTS (Modified Off-the-Shelf) or AID (Altered Item Drawing) items, FAI of the modified portion at a minimum is required.

NOTE: A first article inspection report is not required for rework/repair purchase orders or for parts or material conforming to an established industry or national authority published specification, which has all characteristics identified by text description (i.e., COTS and Mil-Spec parts).

The inspection shall include, but not be limited to a complete documented verification of all dimensions, features, notes, and specifications identified in the contract.

For all product changes, a delta FAI of the changes is acceptable. Additionally, the supplier shall be responsible for confirmation that all operations not performed in the supplier's facility meet applicable requirements.

The supplier may utilize the most current version of AS9102 for their first article inspection report, utilizing AS9102 Forms 1, 2, and 3 or equivalent forms containing all Required and Conditionally Required information as outlined in AS9102.

The supplier shall submit the FAI report and copies of the supporting documentation* as evidence of conformance to this requirement with the first shipment on the purchase order as required above. When requested, the supplier shall also provide a copy of inspection performed to verify conformance of subsequent build lots/shipments. The supplier shall retain the First Article Inspection Report for a minimum of 5 years.

*Supporting documentation may include certificates of conformance for raw materials and special processes (as defined in the AS9100 specification and identified on the engineering drawing), drawings, and test reports.

FAI Planning

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

Pre-Planning Activities:

- ✓ Ensure that the process, planning and tooling that produce the part will consistently yield compliant hardware.
- ✓ Ensure that the Engineering package is “Released”, and the revision is per the Purchase Order requirement. Unreleased drawing have numeric revisions.
- ✓ Hardware utilized for FAI shall be part of the first production run and may be part of the first lot of deliverable units. The FAI part should not be a qualification unit since qualification is completed prior to FAI.
- ✓ Ensure all parts and materials included on the Parts List are part of the FAI package and include a Certificate of Conformance for each item.
- ✓ Verify 100% of drawing characteristics, notes, embedded specifications and subassemblies are achievable and supported with objective evidence. Ensure all process measurements are accounted for and verified prior to final assembly.
- ✓ Ensure that Special Processors have either a NADCAP certification or a Lockheed Martin approval in accordance with Purchase Order requirements. (LM RMS does not accept NADCAP certification for welding, brazing, or soldering)
 - LM approvals can be viewed in Exostar. Instructions for viewing current approvals:
<https://my.exostar.com/download/attachments/7803176/Current%20Approvals.pdf?version=2&modificationDate=1534955009938&api=v2>
 - Nadcap certification can be viewed in eAuditNet:
<https://www.eauditnet.com/eauditnet/eau/user/login.htm>
- ✓ Ensure applicable FAI requirements are flowed down to sub-tiers and review for compliance.
- ✓ Ensure controls and documented processes are in place to fulfill drawing requirements such as:
 - Quality Management Systems
 - Qualification Testing
 - Approved Acceptance Test Procedure (ATP)
 - Counterfeit Materials Prevention
 - Sub-tier Management
 - Documented Production Processes
 - Testing
 - Inspection and Acceptance Tooling
 - Appropriate training of all personnel
- ✓ Ensure process controls are in place to maintain compliance to PO process change control requirements

Equipment

- ✓ List measurement equipment/methodology for each characteristic & ensure all equipment is calibrated.

- ✓ Ensure equipment accuracy (i.e., at least 10X accuracy) and capability of performing the measurement. Always consider measurement system analysis studies for close tolerances such as Gage R&R.

Electronic Media Software

- ✓ Ensure use of LM RMS supplied models (this should be the latest approved model, revision, and version provided in accordance with the Purchase Order), software, etc.
- ✓ Ensure supplier is approved to special process/PO text note SQBMP13800 for Digital Product Definition Data (DPDD)
- ✓ Referenced model is not to be used for manufacturing or acceptance.

FAI Submittal

Direct questions regarding FAI submittals to the buyer listed on the Purchase Order.

- ✓ When Source inspection is NOT required: Provide FAI documentation to LM RMS no less than 5 working days prior to shipment.
 - LM RMS supplier quality shall review and approve the FAI prior to material shipment.
- ✓ When Source inspection is required: Request source inspection no less than 5 working days prior to expected shipment date. Requests are made by accessing your Exostar account at <http://portal.exostar.com>.
- The source inspection representative shall review and approve the FAI prior to material shipment.

Material received without an approved FAI is subject to immediate return.

Permission to ship shall come from the P2P Ship-to Module after the FAI has been reviewed and approved by a supplier quality team member.

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 the FAI form.

A Partial/Delta FAI is required when:

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

First Article Inspection Example

Ballooning an Engineering Drawing

“Ballooning” is a common technique used to: 1) Identify each characteristic on the drawing; and 2) Establish an organized method of capturing objective evidence that each drawing requirement is met. Ballooning is recommended to ensure accuracy and completeness. (An alternate method to “ballooning” is to reference drawing sheet and zone location(s).)

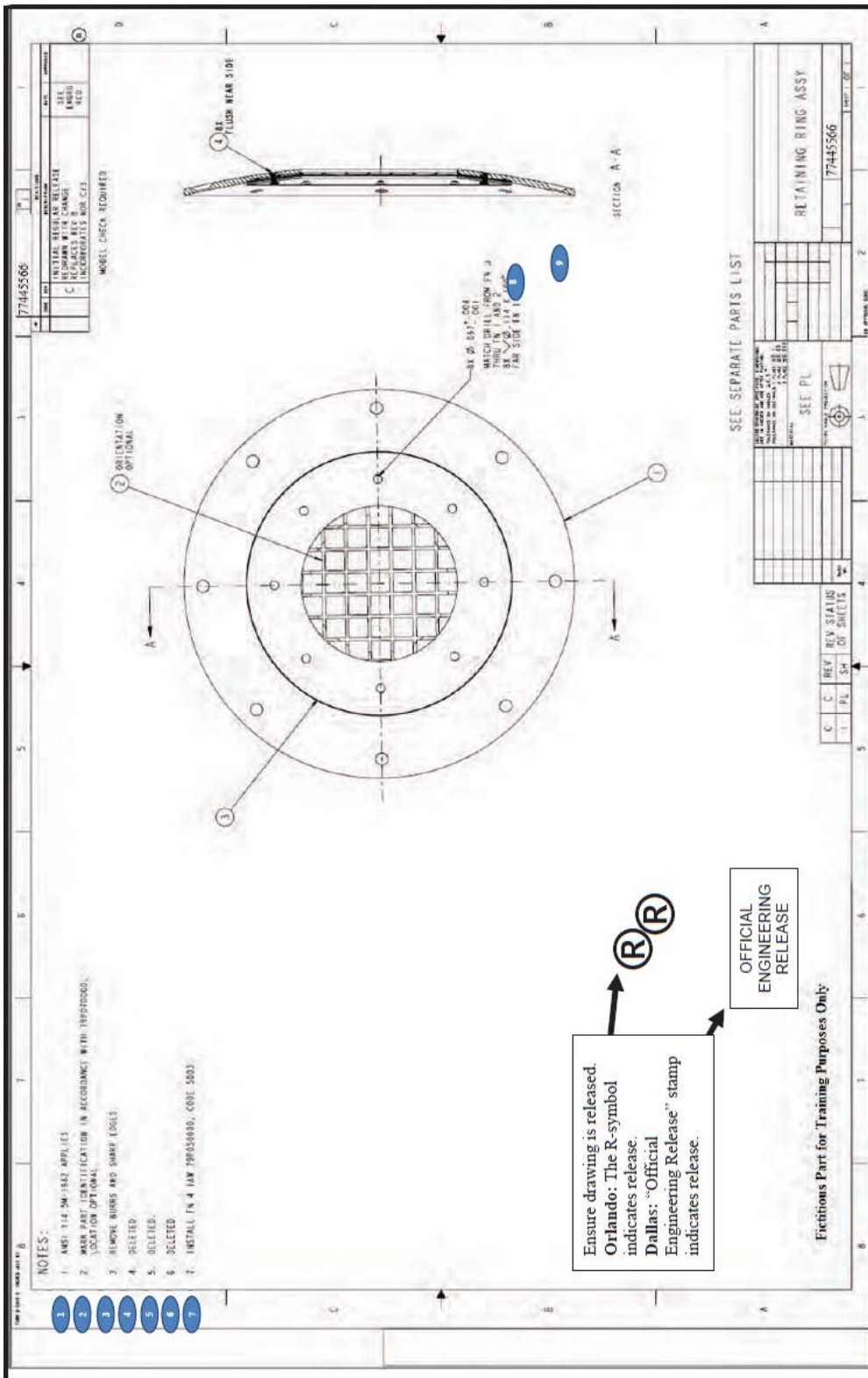
The FAI report package should include a ballooned drawing to facilitate review and approval.

The following 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.

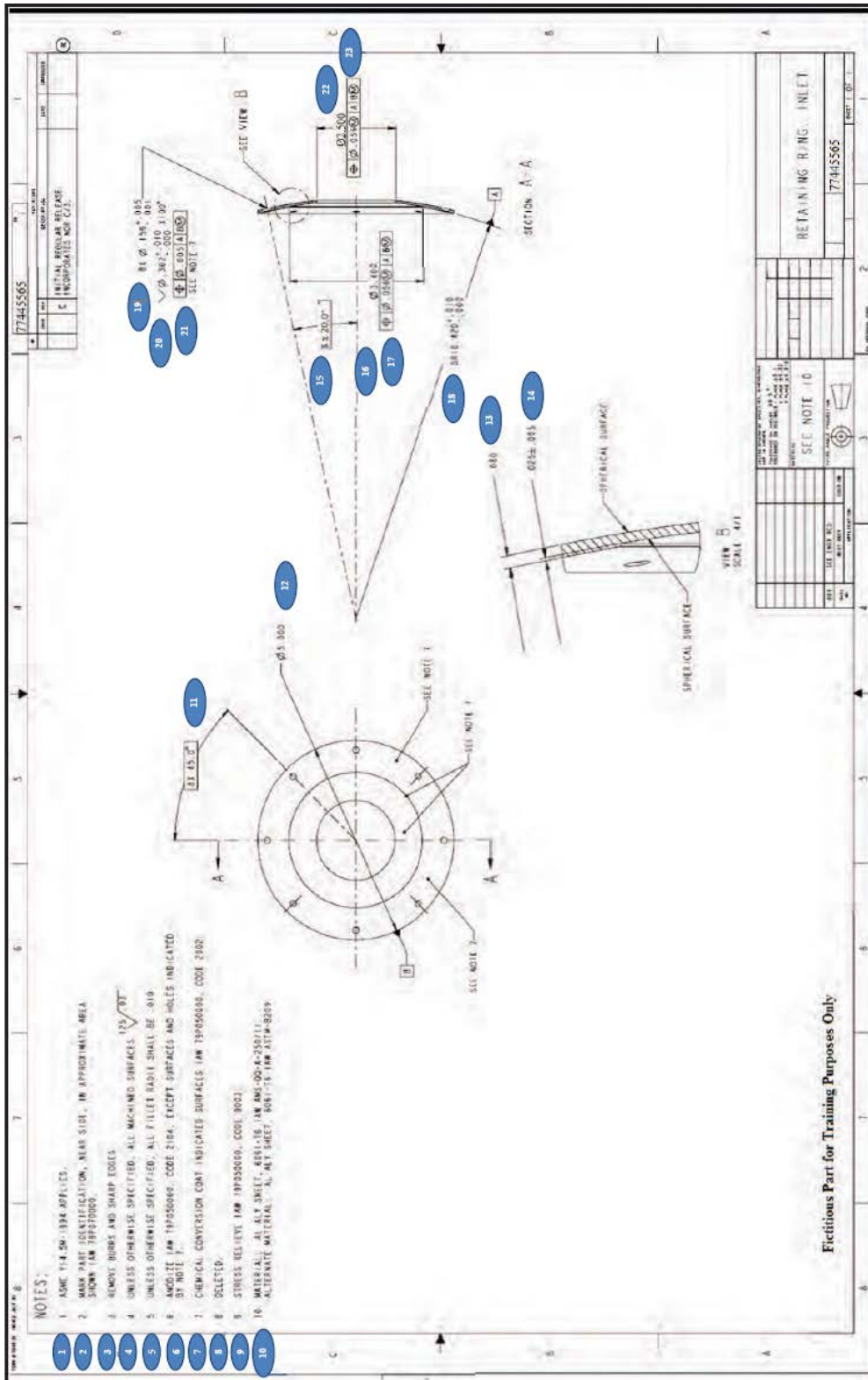
NOTE: Assembly and sub-assembly FAIs are required for all LM RMS designed details and sub-assemblies that constitute the end item as demonstrated in the example. First Article Inspection for LM RMS designed details and sub-assemblies shall be performed as required by the LM RMS PO.

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).

Top Assembly



Sub-Assembly



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.)

AS9102 Form 1

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: 10 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: 77445565-001	16. Part Name: Retainer Ring	17. Part Serial Number: N/A	18. FAIR Number: 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>		22. Date: 5/3/2015	
23. Customer Approval:		24. Date:	

Expectation for Proper Form AS9102 Form I 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. "-")
 - a. *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 "-".
 - a. *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.).
 - a. *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 LM RMS to the Supplier.
 - a. *NOTE: It is sometimes referred to as a vendor code, vendor identification number, supplier number, LMID etc. This unique code begins with "LM" or "Q" and is followed by a distinct grouping of numbers for each supplier (LMXXXXXX or QXXXXXX).*
12. (CR) P.O. Number: Enter the Customer Purchase Order number/Item number, if applicable or required.
13. (R) Detail FAI or an Assembly FAI: Check as appropriate.
14. (R) Full FAI or Partial FAI: Check as appropriate.
 - a. *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.*
15. (CR) Part Number: Enter the detail or next level sub-assembly part number to be included in the assembly.

- a. 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 Name: Enter the part name as shown on the drawing.
 - a. 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) Part Serial Number: Enter the serial number of the part that is installed in the assembly, when applicable.
 - a. 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. (CR) FAIR Number: Enter the FAI report number for detail part.
 - a. 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.*
- 19. (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.
- 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.
 - a. NOTE: This field will be signed by the LM RMS Suppler Quality/Source Inspection Representative as evidence of acceptance.*

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

SAE INTERNATIONAL

AS9102B

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FORM 2 - PRODUCT ACCOUNTABILITY - MATERIALS, SPECIAL PROCESSES, AND FUNCTIONAL TESTING

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	PO 98765
Sealant	MIL-PRF-2333777D	N/A	Sam's Sealants 43rd St San Jose, Ca. LM1212	N/A	PO 98765
11. Functional Test Procedure Number:	12. Acceptance Report Number:				
13. Comments					
14. Signature <i>John Smith</i>			15. Date 5/3/2015		

Expectation for proper AS9102 Form 2 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) 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.
 - a. *NOTE: List material certifications and any special process referenced on the engineering drawing.*
6. (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.
7. (O) Code: Enter any required code from the Customer for material or process listing.
8. (CR) Supplier: Enter the Customer given Supplier code, Supplier Name & address for the organization performing special process(es) or supplying material, as applicable.
 - a. *NOTE: Verify that the vendor is accredited/currently approved for the special process(es) specified in block 5 by using Exostar.*
9. (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.
10. (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.).
11. (CR) Functional Test Procedure Number: Enter the Functional Test Procedure
12. (CR) Acceptance Report Number: Enter the functional test certification indicating that test requirements have been met.
13. (O) Comments: Enter and comments as applicable.
14. (R) Signature: Enter printed name or unique identification, and signature of the person who prepared and approved this form.
15. (R) Date: Enter the date when this form was completed. (When Block 14 was signed)
 - a. *NOTE: An asterisk before the field descriptions indicates an LMMFC requirement in addition to the AS9102 forms.*

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

1. Part Number 7744556-017		2. Part Name Retainer Ring Sub Assembly		3. Serial Number 1		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 Y14.5 182 applies and dimensions were taken after all special processes (Chem Film & Anodizing)	Accept			N/A
2	Note 2		Met part JAW	0433-1703642-018			Visual
3	Note 3		Removed burrs & sharp	Accept			Visual
4	Note 4		Debited	N/A			N/A
5	Note 5		Debited	N/A			N/A
6	Note 6		Debited	N/A			N/A
7	Note 7		Install P11AW 78956000	Accept			Visual
8	Sheet 2 Zone JB		8X .087 (+.044, .607)	.071, .076, .066, .063 .088, .070, .063, .066			Plug Gage
9	Sheet 2 Zone GB		8X √.114 x 100	.115/.118 x 101			GMW
Use additional sheets as necessary							
12. Signature John Smith						13. Date 5/3/2015	

AS9102 Form 3: Characteristic Accountability, Verification and Compatibility Evaluation for Sub-Assembly Part

1. Part Number		2. Part Name		3. Serial Number		4. FAI Report	
77445565-001		Retainer Ring		N/A		12345-88	
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 Mnrk 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 $\sqrt{0.2}$			Profilometer
5	Note 5		Unless otherwise specified (UCS) 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 Shoot 6061-T5 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)	44.745.3"			CMM
12	Sht. 1 Zone G4		ϕ 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 G2		ϕ 3.400 (+/- .010)	3.406			CMM
17	Sht. 1 Zone C2		ϕ .056/A/B	0.003			CMM
18	Sht. 1 Zone B2		SR 10.420 (+/- .010)	10.428			CMM
19	Sht. 1 Zone D2		ϕ 8 x .150 (+/- .005/- .001)	0.16			Pin Gage
20	Sht. 1 Zone D2		8r $\sqrt{0.302}$ (+/- .010/- .000) x 100° (+/- .5°)	.311 x 100° .302 X 100°			CSK Micrometer
21	Sht. 1 Zone D2		8r ϕ .005/A/B	0.000/0.002			CMM
22	Sht. 1 Zone C1		ϕ 2.500 (+/- .010)	2.506			Caliper
23	Sht. 1 Zone C1		ϕ .056/A/B	0.009			CMM
(Use additional sheets as necessary)							
12. Signature					13. Date		
John Smith (John Smith's Signature)					6/3/2015		

Expectation for Proper AS9102 Form 3 Completion

NOTE: An asterisk before the field descriptions indicates an LMRMS 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.).
 - a. *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.
 - a. *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).*
 - b. *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)*
 - c. *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.*
 - d. *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).*
 - e. *For processes that require verification per Design Characteristic, include statement of compliance/conformance (e.g., certification of compliance, verification indicator such as "accept," etc.).*

- f. 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.
 - a. NOTE: Any non-conformances must be dispositioned and closed out per internal requirements (i.e. MRB, RC/CA, 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).

Common Errors Which Cause FAI Rejection

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

- 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:
 - Special process supplier shall be LM RMS 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 INCLUDE THICKNESS OF PLATING		
TOLERANCES ON:		
BASIC DIMENSIONS	2 PLACE DECIMALS	3 PLACE DECIMALS
UP TO 6	± .02	± .010
ABOVE 6 TO 24	± .03	± .015
ABOVE 24	± .06	± .020
ANGULAR DIMENSIONS ± 8TOL.ANG: .5°		
DO NOT SCALE THIS DRAWING		

- Basic dimensions are normally defined as a dimension surrounded by a box as shown. 4.156 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.
 - *NOTE: This is an example of a true position calculator:*
<http://www.engineersedge.com/trueposition.htm>
- 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.
- Parts for an assembly identified on the wrong form.
 - Parts for an assembly are required to be indicated.
- Incorrect revision level.
 - Ensure PO revision matches released engineering specified for item(s) on FAI report.

- Verify the required revision of LM RMS specifications. Contact the LM RMS buyer indicated on the PO for any questions. Indicate the revision levels.
- Ensure through LM RMS Procurement that you are working to the latest released drawing revision.
 - NOTE: There are many types of drawings and release processes. Most drawings will have a “-“ or alphabetical revision number in the revision block of the drawing.
 - 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 the form. 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
 - *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 contain all AS9102 Required and Conditionally Required information.
 - Ensure all forms are provided in the FAI package.
- FAI form(s) not signed/approved by appropriate representative and/or dated.
 - Form should be signed by the preparer of the FAI.
- 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.

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?
 - AS9201 (or supplier equivalent) Forms 1 through 3 and 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.
- 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)
 - 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 multiple places are measurements required for each place
 - Yes. *A feature that is required multiple times requires multiple actual.*
- 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 Gage Repeatability and Reproducibility study.

DEFINITIONS

Approved FAI: Documented approval from LMMFC Supplier Quality representative. Approval is required to ship material unless otherwise directed by LMMFC.

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.

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.

3.1 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."

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.

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.

Equivalent Form: A company specific forms that include the required and conditionally required data elements as per AS9102

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 can produce 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.

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.)

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.

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.

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.

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 LM RMS or NADCAP approved supplier.

Sub-tier: Any supplier that the contracted supplier uses for products and/or services.