LORD Corporation Local Operating Procedure

Title: First Article Inspection

Sponsoring Authority: Global Quality

- Purpose: Provide instructions to suppliers and LORD personnel for the documentation and submittal of First Article Inspection reports when required by the purchase order or inspection procedure requirements.
- Scope: The following procedure applies to all First Article Inspections unless alternate requirements are specifically invoked by the LORD or customer purchase order.

Definitions

<u>Characteristic</u>: A dimensional, visual, functional, mechanical, or material feature or property, which describes and constitutes the design of an article and can be measured, inspected, tested or verified to determine conformance to design requirements. This includes drawing requirements (including requirements in the drawing title block) and/or specification requirements determined from drawing notes. Note: Dimensions/features identified as "Reference" (i.e noted as "REF" or are in parenthesis on the drawing) are exempt and are not required to be reported on the FAI report.

<u>First Article Inspection (FAI)</u>: A complete verification that the article being inspected complies with the requirements identified in engineering drawings, specifications, and purchase order as well as any other applicable design requirement(s). The FAI package shall include the FAI form, annotated drawing, and all supporting documentation (i.e certifications, test reports, etc).

Note: The FAI may also be referred to as a First Article Inspection Report (FAIR) or an Initial Sample Inspection Report (ISIR). For the purpose of this document, all will be referred to as "FAI".

<u>Delta First Article Inspection</u>: A verification that the article being inspected complies with the changes made to the LORD drawing or LORD customer drawing. The Delta FAI records only those characteristics affected by the revision, provided an approved FAI is on file for the previous revision.

First Article Inspection Requirements:

A FAI is required whenever any of the following occur. Refer to the appendices for additional customer specific requirements:

1. General Requirements:

- This is a first time manufacture.
- There is a change in raw material used (use of an alternate material listed on the drawing).
- There is a change in tooling (new, replacement, or major modification).
- There is a change in the manufacturing process which may affect form, fit, or function of the part.
- There is a change in the plant of manufacture (either due to a natural or man-made event).
- 2. Supplier FAI (in addition to the "General Requirements"):
 - There is a revision to the LORD Engineering Drawing. A delta FAI is permissible provided an approved FAI is on file to the previous revision.
 - There is a change in the Supplier's sub-tier special process provider (i.e. heat treat, shot peening, NDT, plating, chemical processor, weld, paint/coating, etc).
 - There is a change in source of manufacture (applies to distributors/brokerage houses).
 - The part has not been manufactured in 2 years.
 - 3. LORD Internal FAI (in addition to the "General Requirements"):
 - There is a customer requirement for an FAI.
 - There is a revision to the LORD CC drawing or LORD customer drawing. A delta FAI is permissible provided an approved FAI is on file to the previous revision.
 - The part has not been manufactured in 2 years (when governed by a customer requirement).

Process Flow

	Major Steps (Responsibility)	Activities
01	FAI Sample Selection	1. After all modifications to methods of manufacture have been made, a product sample from the first production lot shall be chosen for FAI. When the manufacturing method uses multiple sources of production, including cavities, spindles, dies, tools, process lines, machines, etc., a sample must be selected from each source.
02	Drawing Selection	 For Suppliers: a. For individual part number: Use the LORD engineering drawing, per the specified revision level, as identified on the LORD purchase order. b. For assemblies: Use the LORD engineering drawings, per the specified revision levels, as identified on the LORD purchase order. An FAI is required for the assembly and each individually identified part number in the parts list, excluding commercial-off-the-shelf (COTS) items (i.e standard hardware, etc). For LORD: a. Internal FAI: Use the LORD shop copy (SC) drawing unless otherwise specified on the LORD Inspection Plan. b. Customer FAI: Use the LORD customer print (CP) if one exists, LORD customer copy (CC) if a customer print is not available, or the LORD catalog drawing if a LORD CC drawing is not available.

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03	Characteristic Identification	 Determine the FAI Form to be used to complete the FAI. Refer to the appendices (as applicable) for customer specific requirements for completing the FAI. a. For Suppliers: Unless otherwise specified, use LORD Form 1010-01, 1010-03, AS9102 (for aerospace suppliers), or an equivalent form. i. If using the AS9102 Form or when invoked by Special Quality Clause 195 on the LORD purchase order, all three forms of the AS9102 are required to be completed and submitted to LORD. LORD AS9102 Form 3 must be used in lieu of the standard AS9102 Form 3. b. For LORD: Unless otherwise specified, use the appropriate 1010 form, Form 473, AS9102 (for aerospace product), or a specific customer form. i. When designated to use the AS9102 Form in the LORD Inspection Plan, use LORD AS9102 Form 3 in lieu of the standard AS9102 Form 3. All three forms of the AS9102 are required to be completed. Obtain a hard copy of the engineering drawing and manually place consecutively numbered circles (balloons) adjacent to each characteristic (see definition) on the drawing. As an alternate, an automated program (i.e. VisualFair or similar program) may be used to identify the characteristics on the drawing. Record each characteristic in the appropriate location on the FAI form corresponding to the numbered circle on the drawing. Example: The first circled characteristic on the drawing would be recorded in the row with Item No. 1 identified. Reference characteristics may be omitted from the FAI. Note: For an FAI completed using the LORD AS9102 form, follow the requirements of the SAE 039102 specification. a. LORD Internal FAI: Characteristics of an assembly that are "hidden" and cannot be verified by inspection of the FAI form.
		characteristics are identified. Reference characteristics may be omitted from
		requirements of the SAE AS9102 specification.
		cannot be verified by inspection of the FAI sample can be verified by inspection of a typical component removed from stock. This shall be
		 For Suppliers: Blank copies of the LORD 1010 Forms and LORD AS9102 Form are available on the LORD Supplier webpage (at
		www.lord.com/suppliers) or may be requested from LORD Quality.5. For LORD: Blank copies of the FAI forms are available on the quality page of
		LORDweb or by contacting LORD Quality. Additionally, a blank FAI form (master copy for a part number) may be available in the respective part data folder.

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04	First Article Inspection	 Unless otherwise approved by LORD Quality, all inspection methods must be in accordance with LORD specification TS-026 "Standard Measuring Methods" and stated for each characteristic on the form. Units of measure are those that are specified on the LORD engineering drawing. Record the variable measurement of all characteristics in the "Actual Measure" block (or equivalent) of the row corresponding to the item number noted on the drawing. All dimensional, hardness, and test requirements must be reported with a measurement value. Dimensions stating "TYP" or multiple locations (i.e. 2X, 4X, etc) must report measurement values for each feature. All basic dimensions must be reported (unless exclusion is approved by LORD Quality). Geometric Features (i.e. True Position) for multiple features, such as hole patterns, must report the condition for each feature. For Suppliers: The FAI must also include the following LORD standard quality clauses: E, K, L, U, and V. For characteristics that are recorded on material and/or test report certifications, type "CONFORMS" in the "Actual Measure" block (or equivalent), reference the certification number in the "Comment" block (or equivalent), and include a copy of the certification(s) with the FAI submittal. For characteristics that require visual inspection, type "CONFORMS" in the "Actual Measure" block (or equivalent) and state "VISUAL" in the "Inspection Method" block (or equivalent). For characteristics that are inspected using a functional or go/no-go gage, type "CONFORMS" in the "Actual Measure" block (or equivalent) and state the gage type or gage number in the "Inspection Method" block (or equivalent). Indicate acceptance or rejection by typing "A" or "R" in the block provided. Sign and date the form in the appropriate boxes. Note: an electronic circuture or thered to acomptable.
05	Identification of FAI	signature or typed signature is acceptable. 1. For Suppliers:
	Sample	 a. The FAI sample(s) must be identified. Attach an identifying tag to the FAI sample(s) using string (do not use tape or wire). Identification shall include the supplier's name, LORD purchase order part number and drawing revision, and LORD purchase order number, as well as any identification (cavity number, serial number, etc.) that will link the sample to the source of manufacture. b. Attach an orange label to the top and one side of the shipping container. The label shall identify the shipment as containing the FAI parts. 2. For LORD: Attach an identifying tag to the FAI sample(s) using string (do not use tape or wire).

06	FAI Report and FAI Sample Submittal	 1. 2. 3. 	 For the first production shipment: The FAI form, annotated (ballooned) drawing, and applicable material/process certifications are to be included with the FAI sample. Suppliers are also required to e-mail the FAI form in the original format, a copy of the ballooned drawing, and all material/process certifications to the e-mail address identified below. Suppliers without access to e-mail may fax the complete FAI package (form, drawing, and certifications) to the Faxination® number identified below. The e-mail/Faxination® messages are to have the LORD part number at the beginning of the title to permit sorting at LORD. Note: If possible (and preferred by LORD), the complete FAI paperwork package may be sent to LORD for review prior to the first shipment of parts. LORD will review the preliminary FAI paperwork package and provide any comments or required corrections to the supplier. The final FAI paperwork package shall be submitted as indicated above. For FAI re-submittal due to changes identified in "FAI Requirements" or a Delta FAI: The FAI/Delta FAI form, annotated (ballooned) drawing, and applicable material/process certifications are to be submitted by e-mail/Faxination® as noted above when the first production lot to incorporate the changes is shipped. LORD personnel are to complete the following: a. Scan the complete FAI form and ballooned drawing and place in the respective part data folder. b. Send the original completed FAI to the cognizant Quality Engineer. c. Notify the cognizant Quality Engineer the FAI is available for review.
07	Review & Approval of	1.	Review and inspect the FAI package/sample in accordance with SOP 10-01.
	Supplier FAI (Receiving Inspection)	2.	Once the FAI is approved, scan the signed FAI form and file the entire FAI package (form, ballooned drawing, and all certifications) in the respective part data folder. Notify the cognizant Quality Engineer (and if necessary, the cognizant Product
			Engineer) the FAI has been approved.
08	Review & Approval of Supplier FAI (Quality)		 additional information or changes are needed, contact Receiving Inspection to resolve with the supplier. Note: Review any notifications for the receipt containing the FAI sample that would affect acceptance of the FAI (i.e dimensional discrepancies, significant certifications issues, etc.). It is the responsibility of the QE to determine acceptance of the FAI based on the significance of the noted notification discrepancies. For an acceptable FAI and for parts with an unique inspection plan in the business system (QP02): a. Update the FAI status. b. For each characteristic in the inspection plan, verify the inspection method identifies the same inspection method the supplier used on the FAI. Note: the inspection method may differ if/when functional gaging has been implemented, when agreed upon with the supplier or at the discretion of the QE (and documented in the inspection plan).
09	Review & Approval of LORD FAI (Quality)	1. 2. 3.	Review and approve the FAI. File the approved FAI (with all applicable certifications) in the respective part data folder. Update the FAI status in the LORD Inspection Plan (for parts with an FAI
			inspection sequence).
		4.	When required, coordinate submittal to the customer.

Supplemental Discussion

LORD e-mail Addresses and Faxination® Numbers:

Product Ship-To Location	e-mail Address	Faxination® Number		
LORD Bowling Green Facility: Bowling Green, Kentucky	LBGRI@LORD.COM	814-860-3611		
LORD Cambridge Springs Facility: Cambridge Springs, PA	LCSRI@LORD.COM	814-860-3656		
LORD Cary Facility: Cary, North Carolina	LCYRI@LORD.COM	N/A		
LORD Dayton Facility: Dayton, Ohio	LDYRI@LORD.COM	814-860-3660		
LORD Erie Facility: Erie, Pennsylvania	LERRI@LORD.COM	814-860-3665		

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References/Attachments

LORD Forms: 1010-01, 1010-02, 1010-03, 1010-04, 473, AS9102 Form 3 AS9102 SOP 10-01 TS-026 Appendix A - Bell Helicopter Appendix B - United Technologies Corporation (UTC)

Key Words

First Article Inspection

Change Summary (describe what was revised and reason)

Revision D: Supplier Notification Required. Internal Training Required.

- Added "There is a change in the Supplier's sub-tier special process provider (i.e. heat treat, shot peening, NDT, plating, chemical processor, weld, paint/coating, etc)" to "Supplier FAI" under "First Article Inspection Requirements".
- Added "Refer to the appendices (as applicable) for customer specific requirements for completing the FAI" to Item 1 of "Characteristic Identification", added "AS9102 (for aerospace suppliers)," to Item 1a
 "Characteristic Identification", and item 1ai was "When designated on the LORD purchase order, use the
 LORD AS9102 Form. All forms of the AS9102 are required to be submitted."
- Added "Reference characteristics may be omitted from the FAI." to Item 3 of "Characteristic Identification".
- Form 473 was Form 474.
- Added GV facility to the applicability
- Added appendices
- Minor editorial/format changes.

Approved by:	Name	Title
Document Owner:	Scott Suprynowicz	Staff Engineer, Global Quality
Sponsoring Authority:	Lisa Erdely-Causgrove	Manager; Global Quality
Concurred in by:	Name	Title
	Randy Harris	Manager, Supplier Quality

Document approved electronically.

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Harris, Randy C (Concur) 4/21/2011 2:20 PM - 4/21/2011 2:56 PM (LORD\randy_harris)

Erdely, Lisa M (Approved) 4/21/2011 2:07 PM - 4/21/2011 2:17 PM (LORD\lisa_erdely)

Suprynowicz, Scott A (Start Approval Process) 4/21/2011 1:17 PM - 4/21/2011 2:07 PM (LORD\scott_suprynowicz)

Appendix A - Bell Helicopter

SCOPE

- The requirements specified in this appendix are in addition to the requirements in the base document (SOP 10-10). In cases of conflict between the requirements of this appendix and the base document, the requirements of this appendix shall take precedence.
- 2. For LORD Corporation: This appendix shall apply to all FAI submittals to Bell Helicopter.
- 3. For LORD Suppliers: This appendix shall apply:
 - If the LORD purchase order is to a Bell part number (i.e. 12-digit Bell part number) and Special Quality Clause 195 is specified on the LORD purchase order. If the LORD supplier cannot complete certain fields of the FAI Form as indicated below, the supplier shall contact the LORD Buyer or LORD Quality Engineer for the applicable information or additional instructions
 - If the LORD purchase order is to a LORD part number (i.e. "Y" series part number) for Bell Helicopter and Special Quality Clause 195 is specified on the LORD purchase order, then the AS9102 Forms shall be completed per the general requirements of AS9102 using the LORD drawing. Form 2, Fields 5 through 10 shall be completed as defined below.
 - If the LORD purchase order is to a LORD part number (i.e. "Y" series part number) for Bell Helicopter and Special Quality Clause 195 is <u>not</u> specified on the LORD purchase order, then the FAI shall be completed per the general requirements of SOP 10-10 using the LORD drawing.

APPLICABLE DOCUMENTS

- AS9102 Aerospace First Article Inspection Requirement
- QPS-200 Bell Helicopter Supplier Quality Management System Requirements
- QPS-300 Bell Classified Item Program

SPECIFIC REQUIREMENTS

- 1. All Bell Part Numbered items (i.e. any component or assembly with a 12 digit part number) shall have an AS9102 FAI completed. All forms are required to be completed.
- The FAI for each Bell part number shall include the Bell Drawing, Parts List, and any Unincorporated Engineering Order (if applicable), and/or Limited Design Variation (LDV) (if applicable). Note: some older Bell drawings do not a have a Parts List (indicate as noted below).
- 3. If the FAI had been completed previous to the QPS-200 requirement and is not in the AS9102 format, ensure the FAI is identified with "GRANDFATHERED" after the report name (Example: "LB9-1232-7-1 FAI (GRANDFATHERED)").
- 4. In addition to the FAI requirements as specified in the base document, a FAI is required when:
 - a. There is a Physical Change to the part (i.e. the Physical Change number is incremented).
 - b. There is a Bell Drawing or Parts List revision change. Note: The FAI must be completed even if the change did not affect the part number that is being produced.
 - c. A Delta FAI shall be completed after an SMDR has allowed for a variance on the original FAI.
- 5. If a part is pulled from inventory after a 2-year FAI lapse and has not had a 2-year lapse in manufacturing, include the following details in document pack:
 - a. Include a copy of the original FAI
 - b. If the FAI is not in the AS9102 format, indicate that it is "grandfathered".
 - c. Include manufacturing date on the certificate of Conformance.
- 6. If the 2-year continuous manufacturing exemption comes from shipments to a Bell sub-tier supplier, provide evidence of shipment.
- 7. A FAI is not required for military or industry controlled specification fasteners and standards.
- 8. A FAI is not required for Bell standard hardware items.
- 9. FAI Inspection (for detail classified parts): When an FAI for a classified item at detail part level is completed; LORD shall contact BHT SPA to determine if FAI verification will be performed at the source. BHT SPA may at that time exercise the right to perform the verification or may waive verification to a later acceptance point.

LORD must request the inspection by BHT SPA through the BHT Buyer well in advance of the scheduled date the inspection is to be accomplished.

- 10. For LORD: All FAI reports are required to be sent with the conformed unit. The shipping container shall be identified "FIRST ARTICLE ENCLOSED" and the shipping document annotated accordingly.
- 11. For LORD: Include a FAI for first time shipment to each Bell facility (even if part and FAI have already been sent to another facility).

AS9102 FORM REQUIREMENTS

- 1. Unless otherwise specified, all fields shall be completed per the requirements of AS9102. Any form with a "Required" field or "Conditionally Required" field (as required) must be completed. All remaining fields shall be completed as applicable. If the field is not applicable, then enter "N/A"
- 2. Forms 1 through 3, Field 1: Enter the Bell Part Number (12 digit format).
- 3. Forms 1 through 3, Field 2: Enter the Part Name use the nomenclature from the Bell drawing title block.
- 4. Forms 1 through 3, Field 3: Enter the FAI part serial number or manufacturing lot number.
- 5. Forms 1 through 3, Field 4: Identify as "(LORD P/N) FAI" (Example: "J-23823-4 FAI").
- Form 1, Field 5: Field to include the Outside Data Sheet (ODS) or Manufacturing Engineering Planning Instruction (MEPI) control number and the Part Physical Change (Example: "ODS = 02D03, PHY CHG = 02" or "MEPI = 0004, PHY CHG = 00").
- 7. Form 1, Field 6: Enter the Bell Drawing or Specification Number (9 digit format).
- 8. Form 1, Field 7: Enter the Bell Drawing and Parts List revision level. If there is no Parts List, then list as "NO P/L" (Example: "FD REV B, PL REV D" or "FD REV M, NO P/L").
- 9. Form 1, Field 8: Identify any applicable Unincorporated Engineering Orders (EO) or Limited Design Variations (LDV).
- 10. Form 1, Field 9: Enter the LORD Work Order or LORD Supplier Purchase Order Number.
- 11. Form 1, Field 10: For LORD: Enter as "LORD Corporation". For LORD Suppliers: Enter your name.
- Form 1, Field 11: For LORD: Enter the Bell assigned source code for LORD Corporation use 477230 for Erie, PA or 477231 for Dayton, OH. For LORD suppliers: Enter your Bell assigned source code or your federal cage code (Example "CAGE CODE - 12345").
- 13. Form 1, Field 12: Enter the Bell Purchase Order number.
- 14. Form 1, Field 18: Enter the FAI Report Number for the component. Note: If the FAI for this component had been completed previous to the QPS-200 requirement and is not in the AS9102 format, include "GRANDFATHERED" after the report name (Example: "Y-38800-24-1 FAI (GRANDFATHERED)").
- 15. Form 2, Field 5: Enter the material or special process. Material shall include any raw material, adhesive, paint or coating as identified on the Bell drawing. Special Processes shall be as identified in the Nadcap prime matrix and/or a process requiring Bell facility approval. All other processes (i.e. marking, packaging, etc) shall be addressed on Form 3.
- 16. Form 2, Field 8: Enter the Bell vendor code for the source or enter the source name and address.
- 17. Form 2, Field 9: Enter Bell's required approval of source listed as "YES" or "NA". Note: Do not use "NO" in lieu of "NA".
- 18. Form 2, Field 10: Enter the source's Certificate of Conformance ("C of C") or certification number.
- 19. Form 2, Fields 11 and 12: If applicable, enter the LORD ATP Number for the bonded mount/bearing in Field 11 and the corresponding VTDE approval number in Field 12.
- 20. Form 3: Use the LORD AS9103, Form 3 in lieu of the standard AS9102, Form 3.
- 21. Form 3: Ensure information from the Bell title block (i.e. break edges, surface finish, etc) is included in the FAI

FORMS LORD AS9102 Form 3

Appendix B - United Technologies Corporation (UTC)

SCOPE

- 1. For LORD Corporation use only.
- The requirements specified in this appendix are in addition to the requirements in the base document (SOP 10-10). In cases of conflict between the requirements of this appendix and the base document, the requirements of this appendix shall take precedence.
- 3. This appendix shall apply to all FAI submittals to any UTC Member Company (i.e. Hamilton Sundstrand, Pratt & Whitney, Pratt & Whitney Canada, and Sikorsky Aircraft).

APPLICABLE DOCUMENTS

AS9102 Aerospace First Article Inspection Requirement

ASQR-01 Supplier Quality System Requirements

SPECIFIC REQUIREMENTS

- 1. All UTC Member Company part numbers shall have an AS9102 FAI completed per the requirements of ASQR-01 and AS9102. All forms are required to be completed.
- 2. For Sikorsky Aircraft the following requirements apply:
 - a. The FAI for each Sikorsky part number shall include the Sikorsky Drawing (all sheets) and Parts List. (The Application List is optional).
 - b. A FAI is not required for procured standard catalog hardware.
 - c. A FAI is not required for deliverable software.
 - d. A change in numerical control program or translation to another media that can potentially affect form, fit, or function is an additional reason to complete a FAI (full or delta).
 - e. Characteristics verified at the details level may be referenced in the assembly level FAI.
 - f. Form 3: Attribute Data (e.g. go/no-go): This shall be permitted if no inspection technique resulting in variable data is feasible, when the design characteristic does not specify numerical limits, or when qualified tooling is consistently used as a check feature and a go/no-go feature has been established for the specific characteristic.
 - g. Form 3 shall include a sequence for FOD Inspection.
 - h. Form 3: All inspection methods shall be per Sikorsky Specification QATI 3157.

AS9102 FORM REQUIREMENTS

- 1. Unless otherwise specified, all fields shall be completed per the requirements of AS9102. Any form with a "Required" field or "Conditionally Required" field (as required) must be completed. All remaining fields shall be completed as applicable. If the field is not applicable, then enter "N/A"
- 2. Forms 1 through 3, Field 1: Enter the UTC Member Company Part Number.
- 3. Forms 1 through 3, Field 2: Enter the Part Name use the nomenclature from the UTC Member Company drawing title block.
- 4. Forms 1 through 3, Field 3: Enter the FAI part serial number or manufacturing lot number.
- 5. Forms 1 through 3, Field 4: Identify as "(LORD P/N) FAI" (Example: "J-23823-4 FAI").
- Form 1, Field 11: Enter the UTC Member assigned supplier code for LORD Corporation.
 a. For Sikorsky Aircraft: use 007253 for Erie, PA or 007252 for Dayton, OH.
- 7. Form 1, Field 12: Enter the UTC Member Purchase Order number.
- 8. Form 2, Field 5: Enter the material or special process. Material shall include any raw material, adhesive, paint or coating as identified on the UTC Member drawing. Special Processes shall be as identified in the Nadcap prime matrix and/or a process requiring UTC Member facility approval. All other processes (i.e. marking, packaging, etc) shall be addressed on Form 3.
- 9. Form 2, Fields 11 and 12: If applicable, enter the LORD ATP Number for the bonded mount/bearing in Field 11 and the corresponding UTC Member approval number in Field 12.

- Form 3, Field 14: Record FAI Inspection Measuring Equipment used as a media of inspection. Record FAI Inspector identification (e.g. signature, stamp, electronic authorization, etc) used to signify the person that accomplished the inspection. Use the LORD AS9103, Form 3 for UTC Product in lieu of the standard AS9102, Form 3 or AS9102, LORD Form 3.
- 11. Form 3: Ensure information from the UTC Member title block (i.e. break edges, surface finish, etc) is included in the FAI
- 12. In addition to the AS9102 forms, a replication of the product part marking (via photograph or sample) that represents production marking must be included within the FAI report.

FORMS

LORD AS9102 Form 3 for UTC Product