QUALIFICATION REQUIREMENTS FOR MANUFACTURE OF CRITICAL SAFETY ITEMS EXCEPT FLIGHT SAFETY CRITICAL PARTS

1. APPLICATION.

1.1. This Qualification Requirement applies to all engine items managed by GKG specifically determined and approved by the Cognizant Engineering Authority (CEA)/Engineering Source Authority (ESA)/ Design Control Activity (DAC) to be Critical Safety Items (CSI) except Flight Safety Critical Parts (FSCP). The CSI item designation is identified on a MQR-1 listing that is maintained by the appropriate CEA office.

2. DEFINITIONS.

2.1. **Approval Part/Item** - Part/Item for which source approval is sought.

2.2. **Category 1 Offeror** - A manufacturing source, which in conjunction with their sub-vendors has performed all requisite processes on the approval part, for the Original Equipment Manufacturer (OEM) or a Department of Defense (DoD) propulsion system. Sub-vendors are subject to approval by Cognizant Engineering Authority.

2.3. **Category 2 Offeror** – Manufacturing source, which in conjunction with their sub-vendors has performed all requisite processes on a similar part for an OEM or a DoD propulsion system. Sub-vendors are subject to approval by the Cognizant Engineering Authority.

2.4. **Cognizant Engineering Authority Head or Head of the Design Control Activity for this MQR means the following:** The Propulsion Chief Engineer and the Engineering Office Chief for the respective propulsion system.

2.5. **Cognizant Engineering Authority, Engineering Source Authority, or Design Control Activity are the same for this MQR:** Means the systems command of a military department that is specifically responsible for ensuring the air worthiness of an aviation system or equipment in which an aviation safety item is to be used.

2.6. **Critical Characteristic** – Any feature throughout the life cycle of a Critical Item, such as dimension, tolerance, finish, material, or assembly, manufacturing or inspection process, operation, field maintenance, or depot overhaul requirement that if non conforming, missing, or degraded may cause the failure or malfunction of the Critical Item.

2.7. **Critical Safety Item or Propulsion Critical Safety Item or Aviation Critical Safety Item all mean the same thing for this MQR as follows:** An item shall be identified as CSI when failure of that item could result in loss or substantial damage to the air vehicle or weapons system, or death or serious injury to personnel. Damage sufficient to create a Class A accident or a mishap of severity category I constitutes "substantial damage". Items determined to be a "flight safety part," "flight critical part," "flight safety critical part", "flight safety critical rotating part", "fracture critical part" or similar terminology shall be designated as CSIs by the Service CEA/ESA. Items determined as "structurally significant," "fracture critical" or "safety of flight structure" shall be identified as CSI.

2.8. **Fabricate** - The manufacturing steps necessary for the making of new parts.

2.9. **Inspection Method Sheets (IMS)** - document used to describe the steps involved in executing an inspection or series of inspections to include tooling, gages, fixtures, dimensions and other parameters necessary to execute the required inspection(s).

2.10. **Major Characteristics** - A part feature which, if non-conforming, could compromise the function of the part, resulting in a significant maintenance burden and/or reduction in weapon system performance.

2.11. **Manufacturing Process Sheets (MPS)** - documents used to describe the steps involved in executing an operation or series of operations to include tooling, machinery, dimensions, speeds, feed rates, coolants, cutters, tape numbers and other operating, process and/or set-up parameters necessary to execute the operation. At a minimum, significant processes in Appendix A shall be fully defined.

2.12. **Material** - A general term referring to material at any stage in the manufacturing process.

2.13. **National Aerospace and Defense Contractors Accreditation Program (NADCAP)** – The Performance Review Institute (PRI), an independent, not-for-profit trade association affiliated with the Society of Automotive Engineers (SAE) through NADCAP, accredits subcontractors and suppliers to aerospace and defense industry consensus standards.

2.14. **NIST** - National Institute of Standards and Technology.

2.15. **Offeror** - Company furnishing a source approval package in an attempt to obtain engineering source approval to supply the approval part in its finished state to Oklahoma City Air Logistics Center (OC-ALC).

2.16. **Original Equipment Manufacturer or Prime Contractor for this MQR means the following:** Term typically applied to the source responsible for the original design and development of a product or system. In this case it shall refer to sources primarily responsible for the design and development of aircraft gas turbine engines for a US DoD activity or a North Atlantic Treaty Organization (NATO) country.

2.17. **Production Quantities** - Quantities that establish a reasonable level of confidence in a prospective source's ability to consistently produce parts whose integrity is equivalent to that exhibited by parts that originally passed substantiation testing. As a minimum it shall be considered representative of several production lots or greater quantities commensurate with those specified in current solicitations or OC-ALC annual buy projections and shall be exclusive of quantities produced in experimental or developmental programs.

2.18. **Purchaser** -The Purchaser as defined in all applicable government specifications as well as all OEM specifications relative to the part described in this document shall refer to the OC-ALC contracting activity issuing the procurement requirement.

2.19. **Raw Material** - Ingot, bar, billet, or sheet stock used directly in the fabrication of the finished part or forgings/castings used in the fabrication of the finished part.

2.20. **Significant Process** - A process which is capable of producing alterations in the material structure of a part which cannot normally be evaluated without destructive testing and which can compromise the mechanical properties and ultimately the reliability of the part. Examples of processes that are considered to be significant by OC-ALC Propulsion are listed in Appendix A.

2.21. **Similar part** - A part that satisfies all of the specific criteria for similarity as defined in the Qualification Requirements (QRs) for the approval part.

2.22. **Sub-vendor** - A source supplying material, products, and/or services to the Supplier as required in the performance of the contract. This term applies to all facilities other than the Supplier's facility including those of the same company.

2.23. **Technical Order** - A technical manual published by the Air Force containing (in this case) technical information required to develop inspection methods processes for aircraft engine parts.

2.24. **Value Added By OEM** – Any action, manufacturing or inspection process, data, instructions, or equipment that is essential to the manufacture of the part, but is not documented in the data package. Examples of value added are the use of OEM qualification of sources for forgings, castings, raw materials; the use of OEM tooling, fixtures, gages or inspection master hardware; the use of OEM MPS, IMS, or other process related data not referenced on the part drawing(s); quality assurance of sub-vendors of significant processes all as related to the performance of manufacture.

2.25. **Flight Safety Critical Parts** – Is a subset of **Aviation Critical Safety Item** and besides meeting the definition of **Aviation Critical Safety Item** is also defined as engine components which meet ALL of the following criteria:

- Component failure would result in death or weapon system loss
- Or results in a non-recoverable in-flight shutdown (NRIFSD) rate of 0.5 per 1,000,000 engine flying hours
- And component is highly stressed
- And component contains critical characteristics which cannot be fully inspected by non-destructive inspection (NDI)
- And component failure mode is fatigue and/or stress corrosion
- And component is manufactured from high strength steel, titanium, high-temperature nickel or cobalt alloy

3. SCOPE

3.1. This document establishes the minimum technical requirements which prospective sources must satisfy in order to obtain engineering source approval for the specified applications.

3.2. All documentation provided in a Source Approval Request (SAR) must be in the English language and the measurement system used on the OEM drawing. Cost data may be removed from documentation.

3.3. Engineering source approval shall be valid for three years from the date of the OC-ALC letter notifying the contractor of engineering source approval. Approved sources will be required to resubstantiate their capability. Resubstantiation shall involve documenting that no significant changes to process location, sequence, or parameters have occurred, the offeror has the current drawings and specifications, and no significant quality deficiencies are awaiting corrective action. Significant changes or unresolved quality deficiencies may result in additional testing, or revocation of source approval status, depending on the nature and extent of the changes and/or quality deficiencies. Resubstantiation is valid for three years from the date approval would expire and may be submitted six months prior to previous approval expiration.

4. CONTRACTOR RESPONSIBILITY STANDARDS: [Federal Acquisition Regulation (FAR) 9.104]

4.1. Offerors must submit a complete technical data package on all similar items as specified in Paragraph 7.

4.2. Offerors must submit a complete technical data package on the approval item as specified in Paragraph 7.

4.3. General standards as specified in FAR 9.104-1 apply.

4.4. Special standards as specified in FAR 9.104-2 apply.

4.4.1. The specific special standards to be applied are Category 1 Offeror and Category 2 Offeror.

5. PROOF OF CAPABILITY: (FAR 9.105-1, FAR 9.200)

5.1. Proof of satisfactory manufacture of production quantities of the approval item or a similar item within the last three years for an OEM or a DoD propulsion system.

5.1.1. The "similar" item must satisfy the following criteria for similarity:

5.1.1.1. Used in a proven aircraft turbofan or turbojet engine.

5.1.1.2. Fabricated of the same or a similar material that is equivalent or more difficult to form and finish manufacture.

5.1.1.3. An item which demonstrates the ability of the prospective source, in conjunction with their subvendors, to perform all requisite significant manufacturing processes applicable per the item drawing and sub-tier specifications traced from the drawing. Significant processes are defined in Appendix A.

5.1.2. Multiple items may be used to demonstrate compliance with 5.1.1, provided that such items satisfy the criteria defined in 5.1.1.1 through 5.1.1.3.

5.1.3. The determination of similarity is subject to approval by the Cognizant Engineering Authority.

5.2. The Offeror shall substantiate proof of capability with documentation tailored to the requirements of 5.1 and which satisfies the basic technical data package requirements specified in Paragraph 7.

5.3. Identify all sources of raw material, assembly details, and significant processes used to manufacture the item. Identification shall include the specific operations to be performed by each source, and the address of the plant where operations are to be performed. Processes and assembly details to be performed or produced in-house by the Offeror shall be identified as such for both Category 1 and Category 2 Offerors. Approval shall be restricted to the following conditions:

5.3.1. The Offeror shall substantiate that source(s) for castings and forgings are currently approved by the OEM or CEA or provide a rationale proving to the CEA that the casting or forging source is capable of manufacturing the subject part to the equivalent or better OEM or CEA quality standards.

5.3.2. The Offeror shall substantiate that all source(s) for all detail items, are currently approved by the OEM or CEA or provide a rationale proving to the CEA that the source is capable of manufacturing the subject part to the equivalent or better OEM or CEA quality standards.

5.3.3. The Offeror shall substantiate that source(s) to be employed for each significant process, including themselves, are currently approved by an OEM, NADCAP, or the CEA.

5.3.4. In all instances where substantiation of OEM approval is used, the Offeror shall include a copy of the official OEM process certification and all conditions and restrictions imposed by the OEM.

5.3.5. In all cases where process approval substantiation is based upon approval by an OEM not specified on the drawing or by NADCAP to perform an equivalent process, the equivalence of the specifications must be clearly demonstrated by the Offeror in order to obtain the approval of the Cognizant Engineering Authority. Evidence shall include, but not be limited to, a complete copy of the relevant specifications.

6. QUALITY

6.1. The Offeror shall provide evidence that the quality assurance system and available expertise which currently exists within the Offeror's facility, is capable of establishing and maintaining effective process control, and otherwise ensuring the ongoing quality of all significant processes performed in-house and by subvendors. Evidence shall comply with the following criteria:

6.1.2. The Offeror must provide all documentation required in Paragraph 7 to include a Quality Assurance Manual that accurately portrays their current quality assurance system.

6.1.3. Evidence of implementation, by the Offeror, of the procedures and plans referenced, and additionally: 1) contractual requirements imposed on sub vendors of raw material, significant processes, and laboratory testing (when independent laboratory is used), 2) reports which document the numerical results of testing conducted on incoming material and 3) audits of processes and products conducted in-house and at subvendor facilities. All documentation provided shall pertain to items which are similar to the approval item.

6.2. The Offeror shall provide a quality plan specifically tailored to approval item and documented according to Paragraph 7.

6.3. The following is a list of Quality documents for various processes used on engines. All contractors supplying parts shall comply with the document(s) as applicable to the parts being supplied. In the rare event these documents conflict in any way with the drawing requirement this should be made known to the ESA to resolve. The documents below are available upon request.

6.3.1. LPF-QAR-005 LPFR QUALITY LETTER OF INSTRUCTION FOR F100-100/-200/-220 AUGMENTOR SPRAYRING MANIFOLD ASSEMBLIES

6.3.2. LPF-QPR-001 LPFR QUALITY PLAN REQUIREMENTS FOR FORGED HONEYCOMB RING SEGMENTS AND RING ASSEMBLIES

6.3.3. LPF-QPR-002 LPFR QUALITY PLAN REQUIREMENTS FOR NONROTOR TITANIUM ALLOY STRUCTURAL FORGINGS

6.3.4. LPF-QPR-003 LPFR QUALITY PLAN REQUIREMENTS FOR NONROTOR STRUCTURAL CASTINGS

6.3.5. LPF-QPR-004 LPFR QUALITY PLAN REQUIREMENTS FOR WELDED ASSEMBLIES

6.3.6. LPF-QPR-006 LPFR QUALITY PLAN REQUIREMENTS FOR CARBON FACE SEAL ASSEMBLIES

6.3.7. LPF-QPR-007 LPFR QUALITY PLAN REQUIREMENTS FOR PLASMA SPRAYED COATINGS

6.3.8. LPF-QPR-008 LPFR QUALITY PLAN REQUIREMENTS FOR FORGED ROTATING DURABILITY CRITICAL PARTS

6.3.9. LPF-QPR-009 LPFR QUALITY PLAN REQUIREMENTS FOR VACUUM BRAZED ASSEMBLIES

6.3.10. LPF-QPR-010 LPFR QULAITY PLAN REQUIREMENTS FOR DURABILITY CRITICAL COMPRESSOR BLADES

6.3.11. LPF-QPR-011 LPFR QULAITY PLAN REQUIREMENTS FOR SPUR GEARS AND GEARSHAFTS

6.3.12. LPF-QPR-013 LPFR QUALITY PLAN REQUIREMENTS FOR NONROTOR CORROSION AND HEAT RESISTANT STRUCRTURAL FORGINGS

6.3.13. LPF-QPR-014 LPFR QUALITY PLAN REQUIREMENTS FOR FLAMEHOLDERS

6.3.14. LPF-QPR-015 LPFR QUALITY PLAN REQUIREMENTS FOR FORGED TITANIUM NON-ROTATING AIRFOILS

6.3.15. LPF-QPR-016 LPFR QUALITY PLAN REQUIREMENTS FOR DURABILITY CRITICAL PARTS

6.3.16. LPF-QPR-017 LPFR QUALITY PLAN REQUIREMENTS FOR CAST HONEYCOMB RING SEGMENTS AND RING ASSEMBLIES

6.3.17. LPF-QPR-018 LPFR QUALITY PLAN REQUIREMENTS FOR NONDESTRUCTIVE INSPECTION

7. DOCUMENTATION REQUIREMENTS

7.1. A complete set of legible drawings for all assemblies, details, and sub-components. Drawings shall be the latest revision unless authorized by the CEA. If the drawings are proprietary and they state they are proprietary to other than the offeror then the offeror would need to have the president or equivalent sign a notarized statement that they have the rights to the drawing. If the contractor can get nonproprietary drawings from the Air Force or another source that could be used instead of the proprietary drawings this would resolve the proprietary problem. The government does not supply proprietary drawings, but has nonproprietary drawings that OEM's send to vendors marked as proprietary.

7.2. A complete set of all drawing referenced specifications (top page only for OEM developed specifications) for all materials and manufacturing processes identified on the drawings for the similar parts and sub-components thereof. Documents referenced by drawing referenced specifications that apply to the manufacture of the drawing part, or equivalent documents or procedures approved by the CEA.

7.3. A detailed description of major similarities and differences between the "similar" part(s) and the approval part.

7.4. A specific description of "value added" by the OEM to the approval part or similar part(s). The Offeror shall document his capability to fulfill "value added" by the OEM on the approval part as determined by CEA.

7.5. Copies of purchase orders from purchaser to Offeror and Offeror to sub-vendors that define quantities ordered and all technical conditions or restrictions imposed.

7.6. Copies of documentation verifying acceptance of parts supplied on the applicable purchase orders. For example, shipping documents stamped by the purchaser to indicate full release where on-site acceptance is specified by the purchase order is acceptable.

7.7. A complete set of MPS and IMS to include:

7.7.1. MPS and IMS employed in the production of the actual part for Category 1 offerors or the similar part(s) for Category 2 offerors. Evidence of purchaser approval of the MPS is required. Summary of manufacturing operations sheets, travelers, or routing sheets are not acceptable in lieu of MPS, except for some sheet metal parts. In the case of the latter routing sheets that define process sequence, forming tooling, non-conventional machining schedules, weld schedules, and braze schedules shall be provided. All schedules and technical control documents referenced in the MPS that specify process operating parameters shall be included. MPS shall remain confidential and may be stamped "proprietary" at the discretion of the Offeror.

7.7.2. A summary of manufacturing process sheets, travelers, or routing sheets that identify all significant manufacturing processes to be employed in the fabrication of the approval part for OC-ALC. This documentation is subject to approval by CEA.

7.7.3. Identification of all proposed changes to the MPS and IMS submitted by Category I Offerors, as proof of capability. This requirement applies regardless of whether or not the Offeror considers them significant changes.

7.8. Identify all sub-vendors of significant processes and sub-components employed in the production of the part(s).

7.8.1. For significant processes subcontracted, the Offeror must provide his method for insuring quality control and conformance to specification at

the sub-vendor's plant. This should not only include identification of such procedures in the company Quality Manual but also physical evidence such as audit reports, surveys, and chemical and physical test reports. If receiving inspection cannot verify conformance to specification, then chemical and physical test data along with in-work process control data must accompany each lot.

7.8.2. Certificates of test or conformance provided by sub vendors of significant processes must be provided and supported by copies of the MPS and IMS used by the sub-vendor. Acceptance of incoming material based exclusively upon certificates of test/conformance shall be prohibited. Specific test procedures utilized on engine parts shall be identified.

7.9. Findings and resolution of findings for any external audits conducted by the OEM or NADCAP.

7.10. A summary of quality deficiencies experienced in fabrication part during the last two years of production and actions taken to resolve the deficiencies. The summary shall include all Material Review Board (MRB) actions, Quality Deficiency Reports (QDRs), Laboratory Quality Review Orders (LQROs), Supplier Report of Nonconformance (SRONs), Material Deficiency Reports (MDRs) and any other pertinent documentation as well as the coordination of the President or Facility General Manager, and the Quality Assurance Manager. Coordination of the government quality assurance representative shall be included as well if government source inspection was conducted.

7.11. A Quality Assurance Manual that accurately portrays their current quality assurance system, as follows:

7.11.1. The Offeror's Quality Assurance System must comply with the requirements as described in this document and higher level contract quality requirements (FAR52.246-11) of AS9100, NATO AQAP-2070, ISO 9001:2000, or equivalent. Proof of compliance shall be provided, dated within the last three years, and meet one of the following:

7.11.1.1. Certified to AS9100, NATO AQAP-2070, or ISO 9001:2000 by the American National Standards Institute (ANSI) or the International Standards Organization (ISO) in Geneva, Switzerland, or

7.11.1.2. Approved by an OEM to an equivalent Quality Assurance System standard, or

7.11.1.3. Evidence from Defense Contract Management Agency (DCMA) or other appropriate government Quality Assurance Representative

that Quality System is compliant to AS9100, NATO AQAP-2070, or ISO 9001:2000, or equivalent.

7.11.2. The Offeror must provide a Quality Plan for the approval part which includes procedures/specifications governing the control of significant processes proposed for use in fabrication, to include:

7.11.2.1. Identification of the organization responsible for determining the quality requirements for testing and surveillance conducted on subvendors, testing laboratories used and the specific testing typically performed, subcontract quality requirements, and the specific paragraphs of the quality assurance document(s) that govern such aspects.

7.11.2.2. Control measures to ensure that only CEA approved sources are used for raw material, significant processes, and major sub-components.

7.11.2.3. Control measures to ensure that fabrication performed in-house and by sub-vendors is accomplished in accordance with work instructions specified in the MPS, schedules, and/or technical control plans which define the exact sequence of all production operations and all process variables and all critical parameters of manufacturing operations which may directly affect material structure, mechanical properties, surface finish and/or direction or lay of the cutting action. The procedure shall also assure that work instructions have been approved by the CEA.

7.11.2.4. Control measures to ensure that all inspection of characteristics, which serves as the basis for final acceptance of a characteristic, including in-process inspections, are performed in accordance with IMS which define all characteristics specified on the applicable OEM drawings and include sample size, frequency of inspection, the specific inspection methodology to be utilized, and the required instrumentation. The procedure(s) shall also assure that all IMS have been approved by the purchaser.

7.11.2.5. Control measures to ensure that dedicated equipment is properly maintained and calibrated in accordance with ISO 10012-1 and is capable of adequately performing its intended application.

7.11.2.6. General housekeeping and manufacturing practices shall be addressed in the Plan to ensure they do not adversely affect product quality.

7.11.2.7. Statistical Process Control shall be addressed in the Plan. A clear understanding of Critical and Major Characteristics must be demonstrated. All Statistical Process Control must be correlated to the

Critical and Major Characteristics with the least responding characteristic controlling the process. The Plan shall include responsibility, methods and procedures for identifying variables and parameters to be monitored, developing and approving work instructions, identification of trends that signal process problems, and initiation of corrective actions.

7.11.2.8. Procedures for assuring that certificates of test or conformance provided by sub-vendors of raw material and significant processes are complete and supported by process data and numerical test results from an OEM-approved or CEA-approved laboratory for the requisite testing, are representative of material received, and the material is in conformance with Purchaser requirements.

7.11.2.9. Adequate records are retained for documenting sub-vendor lists, sub-vendor quality ratings, layout inspection reports, all Purchaser and OEM approvals, component traceability, and objective evidence of conformance to product, process, and quality acceptance requirements; and are available to the Purchaser upon request.

7.11.2.10. Evidence of a system for controlling non-conforming material to ensure:

7.11.2.10.1. The classification of all non-conforming characteristics in terms of critical, major, and minor is approved by the Purchaser.

7.11.2.10.2. Use or rework of all non-conforming must be approved by the Purchaser.

7.11.2.10.3. Effective control of non-conforming material at sub-vendor facilities.

8. SAR FORMAT

8.1. Source Approval Requests (SARs) should be submitted in a binder to preclude the loss of contractor data in handling. A notebook (i.e. a three-ring binder or similar product), with a table of contents and tabs corresponding to the table of contents is preferable. This will significantly reduce the turn-around time for engineering evaluation as well as reduce the likelihood of oversight or loss of valuable data that could have a significant bearing on the outcome of the evaluation. The Quality Manual may be submitted on a Compact Disc (CD) in a standard Microsoft Office application or .pdf file format.

8.2. Source Approval Requests (SARs) should be submitted to:

If Expendability Recoverability Reparability Category Code (ERRC) "T":
DLA Aviation at Oklahoma City/SB
3001 Staff Drive, Ste 1AG85A
Tinker AFB, OK 73145-3009

If ERRC "P" or ERRC "N":
OC-ALC/SB
3001 Staff Drive, Ste 1AG85A
Tinker AFB, OK 73145-3009

If in Solicitation:
OC-ALC/SB
ATTN: (*Procurement Official's Name*)
Solicitation Number: (*Solicitation Number*)
3001 Staff Drive, Ste 1AG85A
Tinker AFB, OK 73145-3009

9. SUPPLIER SUBMITTAL DETERMINATION

9.1. The Supplier should consider submitting a Source Approval Request package for evaluation after they have determined that they have a vested interest in any procurement. The supplier should consider the following when making that determination:

9.1.1. Has the United States Air Force listed a requirement in the Federal Business Opportunities (FEDBIZOPPs) at www.fbo.gov or Requirement Projections on the Web (RPOW) at http://rpow.wpafb.af.mil/?

9.1.2. Has the procurement history for the item been researched and determined to be active?

9.1.3. Has the Supplier established that they can conduct business with the Government?

9.2. Many drawings and specifications can be purchased through the Public Sales Office (PSO); Phone: 405-736-5748 or Email: 558CBSS.GBHBA.PSD@tinker.af.mil. Other helpful and Small Business contact information can be found at www.tinker.af.mil/sbo.asp

9.3. The projections contained on RPOW may or may not generate due to variability in customer demands and priorities. The forecast data is for planning purposes only and does not constitute an invitation for bid or request

for proposal, and is not a commitment by the government to purchase the described items.

10. LOSS OF QUALIFICATION APPROVAL (FAR 9.207)

10.1. The Offeror should be aware that qualification approval may be lost per the conditions detailed in FAR 9.207.

11. USE OF PROPRIETARY DATA IN SOURCE APPROVAL REQUESTS

11.1. Potential sources are not to utilize intellectual property of third parties without appropriate authorization of the intellectual property owner. Potential sources are cautioned that no part of the government qualification requirement is intended to endorse or encourage the improper use of intellectual property developed by the Original Equipment Manufacturer or any other third party.

Approved:
Propulsion Lead Systems Engineer
Engineering Support Activity (ESA)

Date 16DEC11
Expires 7 years from Signature Date

APPENDIX A

SIGNIFICANT PROCESSES

The following examples are typical processes considered significant in that they are capable of producing alterations to material structures, mechanical properties, and ultimately, item reliability, if performed improperly, and cannot normally be evaluated without destructive testing.

1. Casting Processes
2. Forging Processes
3. Other Forming Processes
4. Broaching
5. Blending/Reworking
6. Heat Treatment and Surface Hardening Processes
7. Grinding
8. Drilling, Reaming, and Boring
9. Milling
10. Finish Turning
11. Electrochemical Machining Processes (Cavity Sinking, Drilling, Grinding, etc.)
12. Chemical Milling
13. Electro-Discharge Machining
14. Electro-Stream Drilling
15. Laser Beam Metal Removal Processes
16. Electron Beam Processes
17. Peening Processes
18. Welding/Fusion
19. Brazing
20. Soldering
21. Metal Electroplating Processes
22. Coating Processes including, but not limited to, the following:

a. Plasma Spray
b. Thermal Spray,
c. Diffusion Coatings
d. Thermal Barrier Coatings

23. Surface Finishing Processes including, but not limited to, the following:
    a. Honing
    b. Sutton Barrel
24. Blasting Processes including, but not limited to, the following:
    a. Aluminum Oxide
    b. Silicon Carbide
    c. Plastic Bead
    d. Glass Bead
25. Dimensional Inspection/Tolerancing
26. Non-Destructive Inspections, including, but not limited to the following:
    a. Fluorescent Penetrant
    b. Eddy Current
    c. Ultrasonic
    d. Laser Holography
    e. Magnetic Particle Inspection
    f. Visual Inspection
    g. Radiography
27. Water-jet Stripping
28. Assembly Procedures
29. Disassembly Procedures