GE - Aviation, Services
Supplier Quality Specification

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Title: Control of Electrochemical Processes on Critical RPC and Life Limited Parts
Reference: QCWI AA-005
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Description of Changes:

REV #	DATE	DESCRIPTION
00	18 Feb 2000	Original Issue
01	01 Dec 2005	General Revision to meet QCWI AA-005 requirements and changed Author from Dave Bridge and Approved By from Page McGirr.
02	06 Nov 2008	General Revision to update organization names.

I. PURPOSE

To define procedures and controls for Electrochemical Processing of Critical RPC and Life Limited Parts at suppliers/vendors/subcontractors. The repair Critical RPC and Life Limited Parts may include electrochemical processes such as plating or stripping, which contain an inherent risk of damaging parts, e.g. through arc strikes, pitting, embrittlement, etc. This damage in turn may have a detrimental effect on the life of the part. This instruction defines the necessary procedures and process control requirements to reduce the risk of damaging a part.

This instruction is in addition to and in no way limiting, superseding, or abrogating any obligations as required by the applicable manuals or specific part repair documents.

II. SCOPE

This specification shall apply to all contracts in which it is specifically referenced. It is the responsibility of each procurement activity to include this specification in any appropriate contracts at suppliers/subcontracors who perform Electrochemical Processing of Critical RPC and Life Limited Parts.

III. DEFINITIONS

A. **GE - Aviation, Services Quality Representative** - The purchasers agent designated by the purchaser to act on Quality related matters involving suppliers and sub-contractors. This individual is to obtain any required approval from GE - Aviation, Services certifying agent or process owner on behalf of the supplier.

B. **Certify Agent** - Those personnel empowered to act on the certifying agency's behalf to provide approval

and/or certification of technical plans, personnel, processes and/or equipment. Certifying agents may be in any organization at any location.

C. **Critical RPC (Rotating and Pressurized Casing) Parts** - Rotating parts and pressurized casings that could have major impact on engine success in service, particularly from the viewpoint of potential non-containment or single-engine safety events. Generic parts in this category include: engine rotor (i.e., fan, booster, high-pressure compressor, high- pressure turbine, low-pressure turbine) blisks, impellers, disks, spools, cooling plates, spacers, thermal shields, torque couplings, main rotor shafts, and pressurized (i.e., compressor discharge, combustor and high-pressure turbine) casings, etc.

D. **Life-Limited Parts (LLP)** - A part which has an established replacement time, inspection interval, or related procedure specified in the Airworthiness Limitations section under 14 CFR Part 21 § 21.50 or mandatory replacement and/or inspections noted or referenced on the product Type Certificate Data Sheet (TCDS), for products certified before airworthiness limitations were added to 14 CFR. The established replacement time may be defined by operating cylces, hours, calendar time, or any combination thereof. A life limited part must be removed from service when or before its operating limit is reached.

   All aircraft and aircraft powerplants that GE - Aviation, Services facilities repair or overhaul are included, i.e.; commercial, military, large and small aircraft. This includes both GE- Aviation and non GE- Aviation products.

E. **Operation Sheets** - Those written instructions which describe in planned sequence the action necessary to perform an operation to machine, assemble, inspect, process, test or package a product. Such documents are variously titled operation sheet, planning sheet, assembly procedure, assembly build-up procedure, job sheet, process sheet, station procedure or inspection procedure, etc.. This also includes electronically produced and accessed operation sheets. The format and size will be tailored to the needs of the operation being defined.

IV. RESPONSIBILITY AND PROCEDURE

A. Manufacturing Planning

1. Operation Sheets - Operation sheets for the control and operation of the electrochemical process shall be prepared in accordance with the following for each part number or part family and approved by the Special Process Owner or Certifying Agent for the process before the processing of parts. The Operation sheets shall cover, as a minimum, the following elements, if not defined in the applicable manual or specific part repair document:

   a. Part number or part family.

   b. Material identification when unique processing is required (for example, titanium, aluminum). Operation sequence lists containing material identification satisfy this requirement.

   c. Process sequence, key parameters, including approximate duration of each operation and the maximum delays between critical steps (e.g. baking after plating).

   d. Type of power source, (only if multiple sources are available for use).

   e. Fixturing methods including a sketch or photograph which identifies the fixture by P/N, shows electrode placement, if applicable, point/s of contact and attachment to part and fixture, and a description of the lift fixture.

   f. Electrode configuration, placement and material.

g. Tank identification number or size and the number of parts processed simultaneously (not required if conforming anodes used).

h. Masking methods and materials including sketch or photograph.

i. Surface preparation, cleaning methods and solution composition (e.g. 2lbs/gal Turco 4181) for all elements of the process).

Note: Solution composition may be referenced in other procedures.

j. Description and placement of coupons, when applicable.

k. Rinsing and maskant removal methods.

l. Pre-bake and post bake method/s.

m. Inspection methods for required characteristics (e.g. plating thickness, coverage, adhesion, etc.); acceptance criteria for irregularities (**e.g. before and after plating**) such as base metal non-uniformity, expected edge conditions at the maskant interface and electrical contact areas.

n. Control limits shall be specified for all applicable processing operations.

Additionally, the Operation Sheets shall include any other necessary elements which could preclude potential damage to the part.

B. **Process Control**

1. Part Storage - Parts in queue for processing shall not be stored in the vicinity of aggressive chemicals to prevent potentially corrosive contamination from vapors, fumes, splatter, etc. When such exposure is unavoidable, the part(s) shall be suitably protected to minimize such contamination.

2. Electrical Arcing Prevention For Parts Inserted With The Rectifier On - If parts are inserted into the processing tank with the rectifier on, then appropriate masking or other electrical barriers shall be incorporated to prevent contact between the component and the electrode of opposite polarity. These procedures shall be documented in the Operation Sheets.

3. Electrical Arcing Prevention During Processing - To prevent arcing during processing, parts shall not be moved, or removed from the processing tank with the rectifier on, unless the movement is integral to the process and the movement mechanism is designed to preclude contact between oppositely charged elements.

C. **Equipment**

1. Fixtures (General).

a. Fixtures used to make an electrical connection to or used to lift the component to be processed shall be defined in the Operation Sheets. Fixture drawings and/or sketches and fixture material shall be approved by the **GE - Aviation, Services Quality Representative**.

Note: Does not apply to OEM designed fixtures.

b. Fixtures shall be free of distortion, corrosion, loose fit, and worn areas which would affect

proper part fixturing and part contact.

c. Any evidence of corrosion or damage to the fixturing, bus bars, cables or electrode contacts shall be removed prior to processing the parts.

d. Electrode contacts shall be made only on those surfaces permitted by the manual, and if not specified in the manual, the contact surfaces shall be defined in the Operation Sheets and approved by the **GE - Aviation, Services Quality Representative**.

e. Electrodes of polarity opposite to the part shall be designed to prevent part contact.

2. Lifting Fixtures

a. The lifting device shall not be used to make electrical contact to the part.

b. The part shall be electrically isolated from the mechanical handling system.

3. Electrical Contact Points

a. Electrical contact fixtures shall be tightly clamped and of sufficient contact area to prevent damage due to electrical arcing or overheating of the contacted surface.

b. Contact surfaces shall be contoured to mate to the connecting surface of the part, to maximize the surface area contacted.

c. Contact points shall be clean and free of surface irregularities and contamination.

d. The use of spring loaded contact clamps directly to the part is prohibited.

e. Contact tabs bolted through part holes shall use insulation to prevent arcing in the hole inner diameter/surface.

f. Contact to the part under process, shall be made using an electrode that will not be influenced by part/lift fixture movement.

g. Any electrical contact shall be achieved using copper contacts, or a contact material as approved by the **GE - Aviation, Services Quality Representative**.

D. **Quality Assurance**

1. The following Quality Assurance items shall be included as part of the operation planning and must be verified for each part processed.

a. Plating thickness, coverage and adhesion.

b. Condition of Equipment. Fixtures, bus bars, cable and contacts shall exhibit no evidence of corrosion, that might affect the total resistance of the system.

c. Non-Plated Areas. Non-plated areas of parts shall exhibit no staining or maskant residue related to the plating processes when examined visually. Parts which are stained or contain residue shall be subject to rejection. Edge conditions at the maskant interface shall be as approved in the Operation Sheets.

d. Electrical Contact Areas. Electrical contact areas shall be examined at 10X magnification

(minimum) for evidence of corrosion, or electrical arcing. Areas exhibiting corrosion damage, or electrical arc damage shall be cause for rejection of the part.

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