CHI-SQS-01

ENGINE PRODUCTION QUALITY SPECIFICATION

QUALITY SYSTEM REQUIREMENTS FOR SUPPLIERS

This specification is in addition to and in no way limiting, superseding, or abrogating any contractual obligation as required by the applicable procurement document.

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Revision 0

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RECORD OF REVISIONS

With each revision the following content is always updated:

Title Page – Updated revision number and date

Record of Revision – Revision changes listed

List of Effective Pages – Updated page dates and revised pages marked with change bars

Page Footer – Updated to reflect new revision date.

REVISION	DATE	CHANGES
0	Dec 06/19	Initial Release

LIST OF EFFECTIVE PAGES

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SPECIFICATION

1. Purpose
   - A. This document establishes the minimum quality system requirements necessary for T58/CT58 engine Suppliers, who provide material or services to Columbia Helicopters Inc. (hereafter referred to as CHI) and applies when referenced in the CHI procurement document.
2. Responsibilities
   - A. For all processing (work) performed by Suppliers:
     - (1) Suppliers are required to promptly notify CHI of any changes to the Quality System or key personnel that may impact the quality of the CHI product.
       - (a) Upon a move to a new facility or equipment move, contact the CHIQR to determine if re-audit, re-qualification of equipment, etc., is necessary.
       - (b) Suppliers must have prior approval for use of Non-US sub-tier suppliers when processing CHI hardware.
3. Requirements
   - A. All Suppliers must meet the requirements listed below. In case of requirement conflicts, this document takes precedence.
     - (1) The Supplier is responsible to make sure that all CHI requirements applicable to the processes, characteristics, or material contracted to the Sub-tier Supplier are specified in the purchasing document.
     - (2) By accepting a purchase order with this document called out, the Supplier is acknowledging that they must allow CHI, the FAA, or any customer or other regulatory authority access to conduct any inspections necessary while producing articles for CHI.
     - (3) Suppliers and their Sub-tier Suppliers must report any nonconforming product that was inadvertently released.
     - (4) Suppliers are also required to flow down to its Sub-tier Suppliers, all applicable purchase order requirements from CHI, and establish a similar reporting process.
     - (5) Suppliers must maintain a counterfeit parts avoidance and prevention program when providing new materials or hardware intended for CHI end use.
     - (6) Supplier's acceptance of Purchase Orders from CHI is acknowledgment that the Supplier and its employees are aware of: their contributions to produce or service conformity, their contribution to product safety, and the importance of ethical behavior.
     - (7) Suppliers must make sure:
       - (a) Personnel performing activities affecting quality are suitably trained and competent,
       - (b) Personnel performing assigned tasks are qualified on the basis of appropriate education, training, and/or experience, and
       - (c) All personnel are given the appropriate authority to carry out their allocated tasks.
       - (d) Evidence of competence is appropriately documented and retained.
   - B. Suppliers (excluding material Suppliers, processors, ground support equipment Suppliers, distributors, and warehouses) must be certified to AS/EN/JISQ 9100 *Quality Management Systems - Requirements for Aviation, Space, and Defense Organizations*, as well as the requirements specified in this document. In case of requirement conflicts, this document takes precedence.

(1) The Supplier is responsible to flow down any changes in CHI requirements that have an effect on the processing performed by a Sub-tier Supplier. This includes making sure that Sub-tier Suppliers have the appropriate revision (stated on the PO) of the necessary drawings and specifications, which includes this specification.

(2) The purchasing document must define CHI as the end user for applicable GE-A design part numbers.

(3) When GE-A drawings identify Source Control or Vendor Item Control in the title block, the requirement is to use only the source(s) and cage code(s) identified when supplying hardware intended for CHI end use.

(a) Both types of drawings contain a table of sources:

1: Approved Sources of Supply (Source Control)

2: Suggested Sources of Supply (Vendor Item Control)

C. Material Suppliers, Processors, Ground Support Equipment Suppliers, Distributors, and Warehouses

(1) Material Suppliers, as identified by CHI, that provide raw material or applied material must meet the applicable requirements of ISO 9001 *Quality Management Systems - Requirements*, as well as the requirements specified in this document. In case of requirement conflicts, this document takes precedence

(2) Processors, as identified by CHI, must meet requirements of AS/EN/JISQ 9100 or AC7004 *Quality Management System Requirements for NADCAP Accreditation*, as well as the requirements specified in this document. Those processors performing only NDE and/or lab analysis processes may meet this requirement with ISO/IEC 17025 - *Testing and Calibration Laboratories Certification*. In case of requirement conflicts, this document takes precedence.

(3) Distributors and warehouses (Non-CHI facilities that acquire material from other Suppliers for delivery to CHI) must be certified to AS/EN/JISQ 9120 - *Quality Management Systems - Requirements for Aviation, Space and Defense Distributors* and/or applicable portions of AS/EN/JISQ 9100 - *Quality Management Systems - Requirements for Aviation, Space and Defense Organizations*, as well as the requirements specified in this document. In case of requirement conflicts, this document takes precedence. Contractual requirements for the completion of this approval process are listed in Appendix F.

(4) When CHI, or a CHI Supplier/processor is used to provide product or processing to fulfill a contract to which this document applies, a Certificate of Conformance must be issued by the site, which attests that work was performed as specified in the CHI approved Quality System procedures and processes. This certificate must meet all requirements specified in Appendix A.

(5) Suppliers must follow additional requirements, as outlined in Specification documents listed on the PO.

4. Reference Documents

A. The following documents form a part of this document to the extent specified herein.

Document Number	Title
CHI SPECIFICATIONS	
CHI-SQS-02	*Supplier Verification Process*
CHI-SQS-03	*Supplier Requirements for Characteristic Accountability, Verification and Quality Planning*

Document Number	Title
FEDERAL AVIATION ADMINISTRATION	
Title 14 Code of Federal Regulations (14 CFR) Part 21, Subpart G	
GE AVIATION SPECIFICATIONS	
P1TF101	*Machined Features*
P1TF111	*General Requirements for Rotating Parts*
P1TF17	*Source Substantiation Administrative Requirements*
P1FT9	*Machined Features – Shop-Run Tolerances*
P3TF45 CL-A	*Types of Records to be retained for NDE (Non-Destructive Evaluation)*
SOCIETY OF AUTOMOTIVE ENGINEERS AEROSPACE STANDARDS	
AC7004	*Quality Management System Requirements for NADCAP Accreditation*
AS13000	*Problem Solving Requirements for Suppliers*
AS/EN/JISQ 9100/ 9120	*Quality Management Systems – Requirements for Aviation, Space, and Defense Organizations*
ISO/IEC 17025	*Testing and Calibration Laboratories*
ISO 19011	*Auditing Management Systems*
ISO 9001	*Quality Management Systems – Requirements*

5. Acronyms

Acronym	Full Description
ACID	Advanced Change in Design
AS	Aerospace Standard
CB	Certifying Body
CHI	Columbia Helicopters, Inc.
CHIQR	Columbia Helicopters Inc. Quality Representative
CID	Change In Design
CMM	Coordinate Measurement Machine
CNC	Computer Numerical Control
DSQR	Designated Supplier Quality Representative
FAI	First Article Inspection
FOD	Foreign Object Damage
GE-A	General Electric Aviation
ISO	International Standards Organization
IEC	International Electrotechnical Commission
NDT	Non-Destructive Test
PCD	Process Control Document
PFMEA	Process Failure Mode and Effects Analysis
PO	Purchase Order
SGR	Supplier General Requirements
SPC	Statistical Process Control

Acronym	Full Description
SPS	Significant Process Substantiation
SVL	Supplier Verification Listing
SVP	Supplier Verification Process

6. Special Instructions

A. In the event of conflict in CHI quality system requirements, order of precedence must be:

1st – Applicable GE-A drawing (including specifications referenced on drawing)

2nd – Procurement Document (excluding this document)

3rd – This Document

4th – All specifications referenced in this document

NOTE: This order of precedence applies to the purchase order (PO) holder to make sure the PO does not take exception to a drawing requirement for a finished part.

B. When supplier substantiated parts are called out on the GE-A drawings as Vendor Substantiation Engineering (VSE), Source Substantiation Process (SSP) or Significant Process Substantiation (SPS), the Supplier must use the CHI Supplier Verification Process (SVP) as stated on the Purchase Order (PO).

NOTE: For all applicable references to GE Aviation Vendor Substantiation Engineering (VSE), Source Substantiation Process (SSP) or Significant Process Substantiation (SPS), refer to (CHI-SQS-02 – Supplier Verification Process).

GE-A Processes	CHI Process
Vendor Substantiation Engineering (VSE)	
Source Substantiation Process (SSP)	Supplier Verification Process (SVP)
Significant Process Substantiation (SPS)	

7. Design Controls

A. The Supplier must manufacture parts to the drawing revision in effect on the date of the Purchase order (PO). When the Supplier incorporates any additional Changes in Design (CID), they must manufacture parts to the drawing revision in place at the date of the PO, plus those CIDs that are incorporated.

(1) Drawings, specifications and related documents, including referenced specifications and instructions contained in the Purchase Order or revisions mutually agreed upon by both parties, must be applicable to the purchase order, Electronic Data Interchange, or other legal contractual conveyance document.

(2) Supplier-designed Components

(a) The Supplier must have a system where:

1: All Class I and Class II design changes are submitted to CHI for Change in Design issuance (if Class I) or for classification approval (if Class II).

2: Design changes rejected are not incorporated into the drawing of the Supplier and into hardware shipped to CHI.

(b) All Requested Design Changes are to be kept on file (accepted and rejected) per administrative record retention requirements.

8. Document Controls

A. The Supplier must have a document control process that maintains revision control on all documents used in the processing of articles for CHI.

(1) For all controlled processes that require CHI approval the Supplier must maintain a database that makes sure the Supplier is only using the appropriately approved documents.

9. Purchased Raw Material, and Special Processes

A. The material and special process control system of the Supplier must make sure that:

(1) Material and Special Process Test Reports (i.e., material certifications, certificate of tests) are available and maintained on file for all material received. Testing must be performed by a certified testing lab for parts requiring Supplier Verification (CHI-SQS-02 and P1TF17).

(2) Material and Special Process Test results reflect all requirements of the drawing and/or specification and conform to drawing and/or specification limits. Documented evidence of this conformity must include a listing of each material element or test result in the applicable test report. The applicable test report, which must be signed by a cognizant test laboratory person, must clearly describe whichever of the following is correct:

(a) All tests and inspections were performed and the results meet all the drawing and/or specification requirements, or

(b) All tests and inspections were performed and the results meet all the drawing and/or specification requirements, except _______, which does not meet requirements, or

(c) All tests and inspections were performed and the results meet all drawing and/or specification requirements, except test(s) _________, which was not performed per the drawing and/or specification requirements.

(3) Material received is the material represented by the Material or Special Process Test Report, and correctly identified per drawing and/or specification.

(4) Material must remain identified until its identity is obliterated by processing.

(5) Excess processing material must not be returned to storage until its correct identification is re-established and restored.

(6) Material shipped as the final product meets all purchase order, drawing, and/or specification requirements as determined by evaluation of test reports and subsequent processing, as applicable.

(7) Personnel responsible for the review of material and special process test reports must be trained to read, interpret, and evaluate test results for the purpose of making sure that all drawing and/or specification requirements of the final product are met.

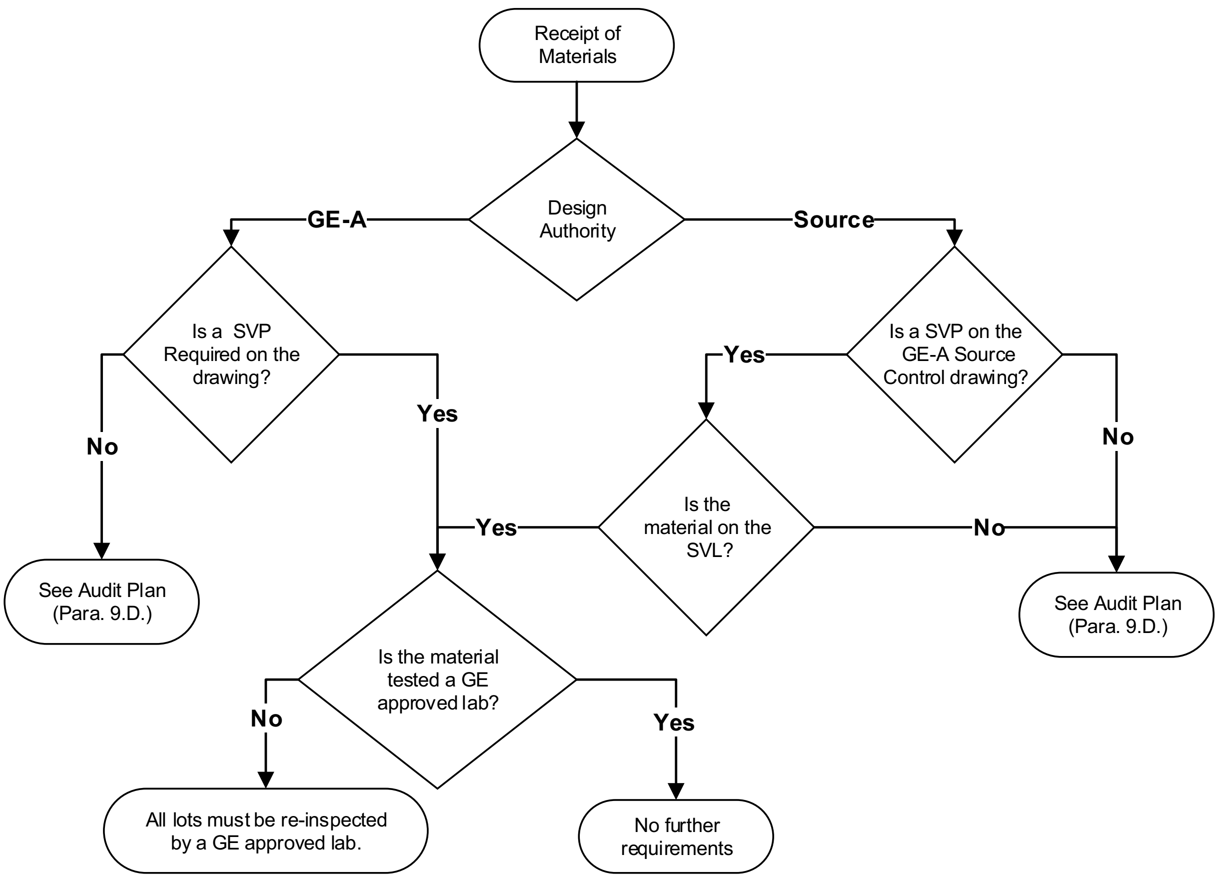
(8) The method employed to evaluate material and special process test report results must be documented and must provide for the review of each test as required per the applicable drawing and/or specification. The methodology employed must be subject to CHI approval.

B. When material or special process services are subcontracted, the Supplier must provide the sub-contractor with a procurement document that reflects the applicable drawing and/or specification number and revision, test requirements to be performed, and a request for a certified report of all tests performed.

C. When the material test report received from the material source was generated by a GE certified metallic materials testing laboratory or a GE certified non-metallic materials testing laboratory,, no initial or subsequent audit testing of purchased product is required. Refer to the Material Certification Requirements Process Map in Figure 1.

D. Suppliers must institute an audit testing plan for material not tested by a GE certified materials testing laboratory to make sure the data received are representative of the raw material and the material is in conformance with requirements. The plan is subject to CHI approval and must include the following minimum requirements:

- Initial testing requirements to qualify for auditing (qualification must be by material specification and material source).
- Subsequent auditing requirements.
- Criteria for disqualification to audit and for re-qualification.
- Incorporation of specific acceptance testing requirements when defined through the procurement document.



Material Certification Requirements Process Map
Figure 1

(1) Audit testing must be performed by a testing laboratory other than the one used by the material source. Any testing laboratory may be used for non-Supplier verification parts.

(a) When audit tests are performed for the alloy types listed below, full testing to the specification may not be required. The following guidelines may be used:

1: Nickel & Cobalt: Elevated and/or room temperature tensile, chemistry and micro-structure.

2: Titanium, Iron & Aluminum: Room temperature tensile, chemistry and micro-structure.

(b) All other raw materials (not listed above) must be tested to the extent required to make sure of full compliance with the material specification.

(2) When a material test report received from the material source is not generated by a GE certified materials testing laboratory (for parts that require Supplier Verification) testing must be performed on each raw material lot, as defined by the applicable specification, by a GE certified materials testing laboratory.

(3) When raw material is procured from a source other than the raw material manufacturer (i.e., from a distributor, etc.) identification testing is required on each lot of raw material if it is not subject to more complete testing.

(a) Such material that still has the original raw material marking (roll stamp, punch stamp, etc.) and is directly traceable to the certified testing laboratory material certificates does not require the identification testing.

(b) If material identification is lost, the material cannot be used on items that have a traceability requirement (i.e., serial number or lot number) without the prior approval of CHI. This material may be used on items without traceability requirement, if subjected to full specification testing.

(c) When specifically indicated by the procurement document or when the note “Class B Material Release” is on the drawing, the certificate of test received from the material Supplier may, providing all test requirements are met, be the basis for release of raw material in lieu of material audit testing.

(4) CHI-Supplied Material

(a) When material is supplied directly from CHI, the Supplier must make sure that the material arrived in good condition. No other inspection or certificates are required. However, evidence is required that the material was shipped from a CHI facility (i.e., a Shipping Document).

(5) When a CHI Supplier uses a CHI process drawing for any part of production, the Supplier is responsible to make sure that all engineering drawing requirements are satisfied.

(6) Parts that do not have the SVP requirement on the drawing, approved special process Suppliers are not required to be used. CHI recommends that Suppliers working on non-SVP parts use a GE certified laboratory.

(a) Exceptions for testing of some material are listed in CHI-SQS-02, Para. 6.B.(4)(b).

10. Quality Assurance Planning

A. Sampling of nondestructive testing (NDT) is not permitted when the NDT is performed to fulfill a drawing or specification requirement. This does not apply to in-process NDT used to increase yield.

B. All characteristics on all parts must be accounted for and confirmed on products and services provided to CHI. Requirements for characteristic accountability, verification and product acceptance are defined in CHI Quality Specification CHI-SQS-03 – *Supplier Requirements for Characteristic Accountability, Verification and Quality Planning*.

C. When requested by CHI, Suppliers must complete a Process Failure Mode and Effects Analysis (PFMEA) training and submit PFMEA documentation on requested parts.

(1) Supplier must provide documented evidence of completion of PFMEA training to the CHIQR upon request.

D. The Supplier must have a process to handle foreign object damage (FOD) prevention and control.

E. The Supplier must comply with CHI-SQS-03 and any additional requirements outlined in related CHI Specification documents.

(1) For support equipment product acceptance, the Supplier is required to account for all critical and major drawing characteristics, and drawing notes, for assemblies or parts. Unless required by the purchase order, CHI-SQS-03 is not applicable.

F. In addition to the requirements of this document, CNC program changes, including administrative changes, must be confirmed on the processes before and after the program changes.

G. Incorporate safe guards that stop errors in manual off sets (i.e., creating a window or verification step in the program that would identify extreme offset errors.)

H. When requested by CHI, Suppliers must collect and submit Statistical Process Control (SPC) or capability index (Cpk) data.

I. When required by CHI engineering specification, the Supplier must generate a Process Control Document (PCD).

11. Traceability

A. Traceability Identification

(1) The purpose of requiring serial number or lot number control of items is to make sure of the traceability of certain parts or assemblies to related to the records that are generated during processing of raw material, manufacture, assembly, test, and ultimate use of these items. This traceability is necessary for the investigation of problems related to the performance or life of an item. Serial number and lot number control is described as follows:

(a) Acceptance records must be traceable to each other. If serialized or lot numbered parts are manufactured from serialized or lot numbered material, then traceability must be maintained to those details and their product acceptance records.

(b) Serialized or Lot Numbered Assemblies: Each serialized assembly must be traceable to the product acceptance records that are related to the overall assembly. The assembly must also be traceable to each serialized or lot numbered sub-assembly or part and their product acceptance records. If serialized or lot numbered sub-assemblies contain serialized or lot numbered parts, then traceability must by maintained to those details and their product acceptance records.

(c) Lot Numbered Items: The lot product acceptance records must be traceable to the parts/assemblies in the lot.

B. Cross-Referencing

(1) Traceability is accomplished by cross-referencing records to individual parts for serial numbered parts or lots (batches) for lot-controlled parts. When serial number or lot control is required, the following cross-reference information must be included in the records:

(a) CHI Purchase Order Number

(b) Part Identification Number

(c) Serial Number, if required by drawing, specification or purchase order

(d) Part Name

(e) Material Specifications and Revision Designation

(f) Heat Number or Batch Number

(g) Heat Treat Number

(h) Heat Treat Designation

(i) Casting or forging Supplier and serial number, when marked on the part

(j) Raw material Supplier when required by drawing, specification or purchase order

(k) Manufacturer's identification on finished parts

C. Serial Numbers

(1) Requirements

(a) Each GE-A drawing that specifies the marking of serial number requires that the item be marked as specified in the marking specification identified in the drawing, with a unique serial number applied at the drawing level only, and be assigned from the Supplier block of serial numbers.

NOTE: CHI serial numbers that were required by a lower level drawing must not be removed or remarked unless so required by the drawing.

(2) CHI Serial Numbers

(a) When producing items that require the marking of serial number, refer to the PO for the approved Supplier identification code.

(b) All serial numbers must have eight (8) alphanumeric characters:

1: The first three characters of the serial number are always the unique Supplier identification code.

2: The Supplier is then responsible for the assignment of the remaining five characters of the eight-character serial number.

3: The last 5 digits may be alphanumeric except that these eight letters B, I, O, Q, S, V, X and Z must not be used.

(c) Serial numbers must not be duplicated for any reason regardless of the part or assembly identification number, design, function or usage (i.e., engine or other product application) of the item being manufactured.

(d) Serial numbers must be assigned using a logical method that is documented in an issued procedure. This procedure is subject to review and approval by CHI. Serial numbers may be subdivided for use at different facilities or for different product lines.

(e) Once a serial number is used to identify an item (i.e., either a unique piece of hardware or related paperwork), it must only be changed under controlled conditions and when there is a clear, documented process that maintains the correct traceability, which includes the original serial number, newly assigned serial number, and reason for change.

(f) Upon notification by CHI, the Supplier must digitally transmit data for serialized part numbers specified by CHI. Shipping data consists of part number, serial number, and date of shipment to CHI. Data transmittal is accomplished by a CHI approved method and occurs on the date of the shipment.

(3) Lot Number Requirements

(a) When a GE-A drawing, or a GE-A specification referenced on a drawing, requires the application of a lot number, that lot must contain the following information:

1: Lots must be formed by grouping items that have the same part number, are manufactured under essentially the same conditions, and at essentially the same time. Typical lots would be formed from a single heat, a single melt, or single heat-treat batch.

2: Once a specific lot number is assigned to a lot, that lot number must not be re-assigned. This applies even if the parts involved are dissimilar in identification, design or function.

3: Once a lot number is used to identify manufacturing or inspection records, it must not be changed at any time or for any reason, even if the items are reworked and re-identified.

4: Lot numbers must be limited to a maximum of eight (8) alphanumeric characters. When lot numbers are included as part marking, these eight letters B, I, O, Q, S, V, X and Z must not be used.

(4) Date Code (Table 1)

(a) If the applicable GE-A drawing or CHI specification requires the marking of a date code, the code for year and month must be selected from Table 1. When it is required to be more precise than month and year, a third and fourth numeric character representing the day of the month can be added. Thus, the date code, “NE18”, designates January 18, 1990.

YEAR	PRIOR YEARS		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2007	1965	1923	AA	BA	CA	DA	EA	FA	GA	HA	JA	KA	LA	MA
2008	1966	1924	AB	BB	CB	DB	EB	FB	GB	HB	JB	KB	LB	MB
2009	1967	1925	AC	BC	CC	DC	EC	FC	GC	HC	JC	KC	LC	MC
2010	1968	1926	AD	BD	CD	DD	ED	FD	GD	HD	JD	KD	LD	MD
2011	1969	1927	AE	BE	CE	DE	EE	FE	GE	HE	JE	KE	LE	ME
2012	1970	1928	AF	BF	CF	DF	EF	FF	GF	HF	JF	KF	LF	MF
2013	1971	1929	AG	BG	CG	DG	EG	FG	GG	HG	JG	KG	LG	MG
2014	1972	1930	AH	BH	CH	DH	EH	FH	GH	HH	JH	KH	LH	MH
2015	1973	1931	AJ	BJ	CJ	DJ	EJ	FJ	GJ	HJ	JJ	KJ	LJ	MJ
2016	1974	1932	AK	BK	CK	DK	EK	FK	GK	HK	JK	KK	LK	MK
2017	1975	1933	AL	BL	CL	DL	EL	FL	GL	HL	JL	KL	LL	ML
2018	1976	1934	AM	BM	CM	DM	EM	FM	GM	HM	JM	KM	LM	MM
2019	1977	1935	AN	BN	CN	DN	EN	FN	GN	HN	JN	KN	LN	MN
2020	1978	1936	AP	BP	CP	DP	EP	FP	GP	HP	JP	KP	LP	MP
2021	1979	1937	AR	BR	CR	DR	ER	FR	GR	HR	JR	KR	LR	MR
2022	1980	1938	AS	BS	CS	DS	ES	FS	GS	HS	JS	KS	LS	MS
2023	1981	1939	AT	BT	CT	DT	ET	FT	GT	HT	JT	KT	LT	MT
2024	1982	1940	AU	BU	CU	DU	EU	FU	GU	HU	JU	KU	LU	MU
2025	1983	1941	AW	BW	CW	DW	EW	FW	GW	HW	JW	KW	LW	MW
2026	1984	1942	AX	BX	CX	DX	EX	FX	GX	HX	JX	KX	LX	MX
2027	1985	1943	AY	BY	CY	DY	EY	FY	GY	HY	JY	KY	LY	MY
2028	1986	1944	NA	OA	PA	RA	SA	TA	UA	VA	WA	XA	YA	ZA
2029	1987	1945	NB	OB	PB	RB	SB	TB	UB	VB	WB	XB	YB	ZB

Date Code
Table 1 (Sheet 1 of 2)

YEAR	PRIOR YEARS		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2030	1988	1946	NC	OC	PC	RC	SC	TC	UC	VC	WC	XC	YC	ZC
2031	1989	1947	ND	OD	PD	RD	SD	TD	UD	VD	WD	XD	YD	ZD
2032	1990	1948	NE	OE	PE	RE	SE	TE	UE	VE	WE	XE	YE	ZE
2033	1991	1949	NF	OF	PF	RF	SF	TF	UF	VF	WF	XF	YF	ZF
2034	1992	1950	NG	OG	PG	RG	SG	TG	UG	VG	WG	XG	YG	ZG
2035	1993	1951	NH	OH	PH	RH	SH	TH	UH	VH	WH	XH	YH	ZH
2036	1994	1952	NJ	OJ	PJ	RJ	SJ	TJ	UJ	VJ	WJ	XJ	YJ	ZJ
2037	1995	1953	NK	OK	PK	RK	SK	TK	UK	VK	WK	XK	YK	ZK
2038	1996	1954	NL	OL	PL	RL	SL	TL	UL	VL	WL	XL	YL	ZL
2039	1997	1955	NM	OM	PM	RM	SM	TM	UM	VM	WM	XM	YM	ZM
2040	1998	1956	NN	ON	PN	RN	SN	TN	UN	VN	WN	XN	YN	ZN
2041	1999	1957	NP	OP	PP	RP	SP	TP	UP	VP	WP	XP	YP	ZP
2042	2000	1958	NR	OR	PR	RR	SR	TR	UR	VR	WR	XR	YR	ZR
2043	2001	1959	NS	OS	PS	RS	SS	TS	US	VS	WS	XS	YS	ZS
2044	2002	1960	NT	OT	PT	RT	ST	TT	UT	VT	WT	XT	YT	ZT
2045	2003	1961	NV	OV	PV	RV	SV	TV	UV	VV	WV	XV	YV	ZV
2046	2004	1962	NW	OW	PW	RW	SW	TW	UW	VW	WW	XW	YW	ZW
2047	2005	1963	NX	OX	PX	RX	SX	TX	UX	VX	WX	XX	YX	ZX
2048	2006	1964	NY	OY	PY	RY	SY	TY	UY	VY	WY	XY	YY	ZY

Date Code
Table 1 (Sheet 2 of 2)

12. Manufacturing Controls

A. Suppliers must have a process to verify correct raw material before the start of the first operational step. Raw material is defined as metallic sheet, plate, bar, and similar forms. This includes pre-blanks, pucks, etc., but does not include hardware, standard components, etc. For powder metal applications, testing must be confirmed after forming at the earliest possible point. Hand-held spectrometer devices must be used to verify 100% of material or a sampling plan approved by CHIQR.

B. CMM programs must have verification via an independent inspection method (i.e. flat plate) for all program changes, unless otherwise approved by the CHIQR

C. Raw material and in-process material must be physically isolated and controlled at all times, such that the risk of intermixing is minimized.

D. Functional gages (go/no-go gages, thread, etc.) must be used in all areas where possible (i.e., hole diameters), in addition to standard hand tools and CMMs.

E. Bracket Suppliers must use pattern gages or optical inspection systems (i.e., blue light) to make sure of part orientation, assembly, and location of features.

13. Supplier Orientation

A. The Quality Manager at a new CHI Supplier or a new Quality Manager at an approved CHI Supplier, must complete Supplier training.

B. The training should be completed within 6 months of Supplier approval, or in the case of a new Manager, within 6 months of being on the job.

C. All Designated Supplier Quality Representatives (DSQR) making air worthiness determinations on CHI parts must complete the supplier training, within 6 months of being on the job.

D. Document the training using the internal forms of the Supplier and send it to your CHIQR.

14. Controls for Fastener Suppliers, Distributors, and Warehouses

A. Distributors and Warehouses must make sure of traceability and flow down of requirements on all purchased products to the source of manufacture and their related acceptance documents.

(1) The actual source of all material must be identified.

(2) Material from different manufacturing sources must be stored in a manner such that the material does not become intermixed and the manufacturing source identity and material identity is maintained.

B. Distributors and Warehouses must not modify, rework, or repair material in-house or by subcontracting, unless approval is obtained from CHI or the work is performed by the actual manufacturing source of the material.

C. Distributors and Warehouses may employ sampling plans, provided their use makes sure of fulfillment of the requirements of CHI. Acceptance sampling of critical characteristics is not acceptable under any circumstances. However, demonstration of process control through the use of SPC and an assurance of a capability index (Cpk) greater or equal to 1.33 is an acceptable means of conformance of critical characteristics verification.

(1) All attribute lot-by-lot sampling plans must conform to zero acceptance number (C=0 - the number of rejects permitted in an acceptable lot).

(2) When nonconforming characteristics are found in the lot sample, the sampled lot requires 100 percent inspection of the nonconforming characteristic(s) in the lot. Results of the 100 percent inspection of the nonconformance must be submitted to your CHIQR or the return of the hardware to the manufacturer.

(3) The following must be used in selecting the correct acceptance plan to be used to make sure the acceptance of a product that meets the established Acceptable Quality Level:

Classification of Characteristics	Drawing Symbol	Accept Quality Levels	Number
Critical	⊕	0%	0
Major	⊖	0.65%	0
Minor	No Symbol	4%	0
Unclassified	No Symbol	—	—

NOTE: The classification of the characteristics is a means of communication by Design Engineering of the relative functional importance on product performance (i.e., usability, durability, reliability, life, etc.) if the characteristic is beyond drawing limits.

D. Fastener Suppliers (including distributors that repackage fasteners) must use optical inspection systems on 100% of all fasteners shipped to CHI. Systems inspect form, color, mark, and size at a minimum. (Refer to Definitions, Section 26) If there are any questions regarding part designation, contact the CHIQR for clarification.

(1) An Inspection Plan for nuts (internally threaded) must include the following: external features, crimp and thread detection, and part marking detection/verification, as applicable. Nuts used in assemblies (i.e., nut plates, gang channels) can be inspected before assembly.

(2) An Inspection Plan for bolts (externally threaded) must include the following: external features, thread detection, and part marking detection/verification, as applicable.

E. Inserts must be inspected before key installation, as specified in Para 14.D. requirements for both internally and externally threaded items.

15. Class Y Hardware

   A. New Class Y hardware is the full equivalent of production hardware and may be used as such in all applications.

16. PMA (Parts Manufacturer Approval) Parts

   A. Parts ordered under a CHI purchase order for delivery to a CHI production facility must not be marked “FAA-PMA”.

17. Quarantine, Serial/Lot Number, and Full Release

   A. A Quarantine Release must be used whenever all the requirements are not met (i.e., First Article not signed off, SVP not signed off, Advanced Change in Design (ACID), Nonconformance Document not closed, etc.) Refer to Appendix C, Para. 9., Request for Shipment With Open Nonconformance. A Quarantine Release Memo is required by the CHIQR prior to release of hardware.

   B. Approval of selected Serial or Lot numbered parts may only be used when the requirements of CHI-SQS-02 6.C.(2) are satisfied.

   C. A Full Release must be used when all requirements are met.

18. Unusual Visual Appearance

   A. An unusual visual appearance can exist when a CHI product contains a technically acceptable visual condition, which could result in unfavorable reaction or questions when seen by a customer.

   B. Examples include, but are not limited to, the following:

      (1) Discoloration

      (2) Uneven surface condition

      (3) Evidence of rework/repair

      (4) Result of a process change that alters the appearance of the part from parts shipped before the process change

   C. If the visual appearance violates an engineering requirement or is the result of a repair, refer to Appendix C, Para. 4. for documentation instructions.

   D. If the visual appearance does not violate engineering requirements, but is considered an “Unusual Visual Appearance”, the manufacturing source must contact the responsible CHIQR.

19. Nonconforming Material

   A. Nonconformances must be documented as specified in Appendix C.

   B. Suppliers must use the AS13000 – *Problem Solving Requirements for Suppliers* process when responding to a CHI request for corrective and preventive action.

   C. Escape Notification

      (1) GE-A Design: When it is determined nonconforming product was inadvertently released, the Supplier must notify the CHIQR by phone or email within 72 hours of escape discovery. (Appendix C, Para. 12.)

20. Source Inspection (Additional Controls)

   A. There are 2 types of Source Inspection (SI):

      (1) Source Inspection I (SI I) is performed at the supplier location by CHI for new Suppliers of SVP parts. This Source Inspection process is an additional inspection and must be performed in a controlled area of the plant. SI I inspection data/results

must be collected, inspected product must be certified by the inspector, and the data/ results provided to CHI with the shipped product.

(2) Source Inspection II (SI II) is implemented when CHI determines that a supplier does not have the necessary safeguards and controls in place preventing nonconforming products from reaching CHI manufacturing locations or its customers.

B. The CHIQR authorizes implementation of and removal of the Source Inspection in writing.

21. Preparation for Shipment

A. The Supplier must make sure the material is packaged as specified in the applicable requirements and is accompanied by the required shipping and technical documents. Refer to Appendix D.

22. Records and Retention

A. Records must be maintained as specified in Appendix B.

23. Software

A. Software must be controlled as specified in Appendix E.

24. Conformance Audits

A. In accordance with AS/EN/JISQ 9100, the Supplier must have documented procedures for planning and implementing their internal Quality Audit Program. (Refer to ISO 19011 – *Auditing Management Systems*).

NOTE: Internal, registrar, or customer (other than CHI) quality system conformance audit findings that have a potential or direct impact on the product being produced for delivery to CHI must be promptly reported to your CHIQR.

B. Workstation audits must be planned and performed at regular intervals to make sure of compliance with overall quality system related activities. Workstations include, but are not limited to, machining, assembly, processing, testing, and inspection. All workstations within the facility of the Supplier must be audited at least every three years except in those instances where characteristics generated at that workstation cannot be confirmed at final inspection. Any workstation where the characteristic(s) generated at that workstation cannot be confirmed at final inspection, must be audited at least annually. Examples of such workstations include, but are not limited to, airflow and pressure testing workstations. At a minimum, the following elements must be included in the workstation audit:

(1) Routing/Traveler Control

(2) Process/Planning Control

(3) Work Instruction Compliance

(4) Measurement and Test Equipment Control

(5) Material Identification and Handling

(6) Housekeeping and Safety

(7) Nonconforming Material Control

25. Priority Parts Review

A. Suppliers must participate in the Priority Parts Review when so requested by CHI.

26. Compliance Policy

A. The seller must implement and enforce a compliance policy that includes tracking and collecting objective evidence of adherence by the Seller to all quality system requirements that are applicable to the Seller, including this document and relevant purchase order remarks.

27. Definitions

ACCEPT – A disposition provided by CHI when it is determined that the nonconforming product meets the definition of a minor nonconformance in its existing condition, without any special handling, tooling, or procedures.

ADMINISTRATIVE CHANGE – A change to a process document, which is clerical in nature and does not change the chemical, electrical, physical properties, or performance of the component or any of its parts or materials. The following are examples of changes to significant processes/ sequences that are not considered significant.

- A change made for clarification only (i.e., clerical or adding a sketch or note).
- A change to a process requirement/parameter that stays within the currently approved SV process limits.
- A change to a portion of a process or sequence that was previously identified as not significant.
- A change in sequence where two significant non-conventional machining operations that are performed in sequence (back to back), using the same process, are interchanged.

APPROVAL BY SERIAL/LOT NUMBER – The Supplier Verification approval of specific serial/lot numbers that initially satisfies engineering requirements, but requires further development of significant processes.

ATTRIBUTE – Measurement of a characteristic or property to determine whether or not it conforms to a given requirement (PASS or FAIL, GO, NO/GO, ACCEPT/REJECT, etc.)

BRACKET – A metal support, often triangular or L-shaped.

CERTIFICATION BODY (CB) – A third party organization who conducts certification conformity.

CERTIFIED – The initial and periodic qualifications of Suppliers who are subjected to an on-site evaluation of special process facilities, procedures, personnel, and controls and have satisfactorily demonstrated their ability to meet the applicable specification requirements.

CERTIFIED/APPROVED – CHI has certified a Supplier to perform a particular Special Process.

CERTIFYING AGENT – A group of Aviation special process experts with authority to approve technical plans and repair procedures.

CHARACTERISTIC – Dimensional, visual, functional, electrical, chemical, mechanical, and material features or properties that describe and constitute the design of the item and can be measured, observed, and identified to determine conformance to the requirements.

CHI QUALITY REPRESENTATIVE (CHIQR) – A CHI employee or authorized representative with the authority to represent CHI Production Quality.

CLASS Y CERTIFICATION HARDWARE – Engineering parts that meet existing or proposed Type Design and are fully capable of being used for FAA Certification, without additional requirements.

COMMERCIALLY AVAILABLE SOFTWARE – Deliverable or non-deliverable software that is developed for general use and is supplied in an “off the shelf” manner.

COUNTERFEIT PART – An unauthorized copy, imitation, substitute, or modified part (e.g., material, part, component), which is knowingly misrepresented as a specified genuine part of an original or authorized manufacturer.

NOTE: Examples of a counterfeit part can include, but are not limited to, the false identification of marking or labeling, grade, serial number, date code, documentation, or performance characteristics.

CORRECTIVE ACTION – The action taken to eliminate the cause of a noncompliance or nonconformance in order to prevent recurrence. The corrective action may be containment—short term actions taken to:

- Prevent escapes of nonconforming hardware (for example: through nonconformance document and purges).
- Address the immediate cause of the nonconformance or noncompliance (For example: replace the bad tools/gage, correct documentation, etc.)
- Fix - long term action taken to prevent or reduce the likelihood of recurrence by addressing the root cause of nonconformance or noncompliance (for example: through process and/or procedural change, error-proofing)

CRITICAL CHARACTERISTIC – A characteristic of an item, which if nonconforming, may result in a hazardous or unsafe condition for personnel using, maintaining, or depending on the unit-of-product or that may prevent or seriously have an effect on the satisfactory operation or functioning of the unit-of-product.

DESIGNATED SUPPLIER QUALITY REPRESENTATIVE (DSQR) – the permanent employee of a supplier with quality control responsibility, who has successfully completed the DSQR training program and is approved by CHI to perform designated tasks on its behalf, as defined herein.

DEVIATION – A specific written authorization, granted before the manufacture of an item, to temporarily depart from a particular performance or design requirement of a specification, drawing, or other document for a specific number of units or a specific period of time. A deviation differs from an engineering change in that an approved engineering change requires a corresponding revision of the documentation that defines the item, whereas a deviation does not normally contemplate revision of the applicable specification or drawing.

NOTE: Before the manufacture of an item means before the implementation of all the planned process related elements necessary to produce the item. These elements may include, but are not limited to, material, tools, dies, molds, processes, procedures, etc.

DISTRIBUTOR – A Supplier that acquires material and parts from other Suppliers for delivery to CHI or other customers.

ELECTRONIC DATA INTERCHANGE (EDI) – The electronic transfer of purchase orders or certification data between CHI and their Suppliers.

FASTENER – A hardware device that mechanically joins or affixes two or more objects together. For this requirement, a fastener is typically six inches or less in length or diameter and it may or may not be self-locking. Examples of fasteners are nuts, bolts, inserts, etc.

GROUND SUPPORT EQUIPMENT SUPPLIER – A Supplier that only supplies tooling, test equipment, process equipment, and repair tools necessary for the development, production, and maintenance of CHI aircraft engines.

HARD PARTICLE – Abrasive materials such as aluminum oxide, silicon carbide, other oxides, carbides, and nitrides.

IDENTIFICATION TESTING – Those raw material acceptance tests necessary to qualitatively make sure of correct material and correct condition.

IN-PROCESS CHARACTERISTIC – An intermediate characteristic that meets or will meet the engineering requirement before final delivery or use. Examples are machining stock, intermediate welds, engineering characteristics held to reduced tolerances, and characteristics that meet engineering requirements as a result of further processing.

LCP/EMCP PARTS – Parts with either a “Life Controlled Part” or an “Enhanced Manufacturing Control Part CL-A (or CL-B)” note on the drawing.

LIBRARY CONTROL – The collection and control of software and related documentation designed to aid in software development, use, or maintenance.

LIFE OF DIE – The time period during which a die/tool/mold or combination thereof, used to produce a component, remains unchanged. A change is defined as the modification of an existing die/tool/mold, procurement of a new die/tool/mold (even if it is the same nominal design), or use of a combination of dies/tools/molds that is not previously used

LIFE OF DIE (LoD) WAIVER – A written authorization to accept material or items that are found to depart from specified requirements, but nevertheless are considered suitable for use “as is”. This specific authorization applies to items that are generated from a specific die/tool/mold or combination thereof, which cannot be changed without modification to the die/tool/mold or combination.

LONG TERM AGREEMENT (LTA) – A generic term used to describe a contract between CHI and a Supplier for an ordering period stating an estimated quantity for the period.

LOT NUMBER – A unique identifier used to control and identify a definite number of items that are produced by the same manufacturing cycle and usually submitted for acceptance at one time or place (i.e., acceptance lot). Typically, lot numbers are heat lot number, heat treat lot number, and melt lot number, which are usually related to raw material, castings, or forgings.

MAJOR CHARACTERISTIC – A drawing or specification feature, which if nonconforming, may result in operational or functional failure of the item, or may materially reduce the usability, physical or functional interchangeability, or durability of the CHI end product for its intended purpose.

MAJOR/MINOR – This definition refers to changes to the design and is also known as Class I/II. A minor change (Class II) is defined as a change that has no appreciable effect on the weight, balance, structural strength, reliability, operational characteristics or other characteristics that effect the airworthiness of the product. All other changes to the design are major (Class I).

MANUFACTURER – A Supplier that makes parts complete or assembles parts into a sub-assembly (including Suppliers of castings and forgings).

MATERIAL – Raw material, parts, or assemblies.

MATERIALS SUPPLIER – A Supplier that only supplies materials used in the manufacture of components (This includes Suppliers of weld wire, braze and thermal powders, chemicals, dry film lube, paint, plating materials, bar stock, sheet metal, non-metallic/composite material, melters and converters, and the like.)

MINOR CHARACTERISTIC (No Symbol) – A drawing or specification feature, which if non-conforming, does not materially reduce the usability, physical or functional interchangeability, or durability of the product, or are departures from established standards that have no significant bearing on the effective use or operation of the product.

MINOR NONCONFORMANCE – A nonconformance that must not have an effect on the usability of a CHI product or material for its intended purpose. Minor nonconformances do not have an adverse effect on health or safety, performance, interchangeability, reliability, or maintainability, effective use or operation, weight, or appearance (when a factor).

MRB (Material Review Board) – A board that consists of a Chairperson and an Engineering representative responsible for reviewing, evaluating, and determining or recommending disposition of nonconforming the CHI product referred to it.

NONCONFORMANCE – A failure of a characteristic to conform to the requirements specified in the contract, drawings, specifications, or other approved CHI product description. The failure to perform all material tests and inspections required by the approved CHI product description and/or the failure to perform tests and inspections required in the approved product description.

NONCONFORMANCE DOCUMENTATION – A record of a nonconformance either documented on a form or entered into a computerized system, which is capable of containing all pertinent information related to the nonconformance.

NONCONFORMING MATERIAL – Any CHI product containing one or more nonconformances.

NONCONFORMANCE DOCUMENT LOT IDENTIFICATION CARD (NDLIC) – A document used by CHI to record the reason for the open nonconformance document and to authorize shipment to CHI before final disposition.

OPEN NONCONFORMANCE DOCUMENT – A nonconformance document is considered “Open” when material and/or additional documentation is required to be sent to CHI for review prior to final disposition.

PRELIMINARY REVIEW (PR) - An initial evaluation of a nonconformance (or a departure to a process characteristic) to determine the appropriate disposition.

PRIORITY PARTS – A high energy rotating part, a high-pressure casing, or a single-element mount structure in an approved engine design that, if it were to fail, could have a major impact on the airworthiness of an aircraft in service from the viewpoint of potential non-containment, engine structural problems, or mount integrity events. Generic parts in this category include: engine rotor (for example; fan, booster, high-pressure compressor, high-pressure turbine, low-pressure turbine) disks, blisks, impellers, spools, cooling plates, spacers, thermal shields, and pressurized casings (i.e., casings subject to compressor discharge pressure, combustor and high-pressure turbine flow path pressure), and engine mount system hardware, which contain single-element structural members (i.e., non-redundant structural mount systems).

PROCESS FAILURE MODE AND EFFECTS ANALYSIS (PFMEA) – A process for analysis of potential failure modes within a system for classification by severity or determination of the effect of failures on the system and related risk abatement actions.

PROCESSOR – A Supplier that performs operations or processes on hardware owned by other companies (including special processes and machining), but does not make any complete parts for CHI.

PURCHASE ORDER (PO) – The formal legal contract between CHI and a Supplier that covers the purchase of materials and services. POs are typically hard copies with approval signatures, but some POs are transmitted electronically (EDI) or may take the form of a legal contractual conveyance document.

RAW MATERIAL – Metallic or non-metallic material in its basic form (i.e., sheet, bar, wire, powder, etc.), which includes castings and forgings used to fabricate CHI products and which remains present in whole or in part, in the finished product.

REPAIR – A procedure that may be applied to CHI product with one or more nonconformances when it is determined that the product does not meet the definition of a minor nonconformance in its existing condition without any special handling, tooling, or procedures. The purpose of the repair is to bring nonconforming product into an acceptable condition.

NOTE: Repair is distinguished from rework in that the item, after repair, does not completely conform to the applicable engineering requirements.

REWORK – A procedure applied to a nonconformance that completely eliminates it and results in a characteristic that conforms completely to engineering requirements (i.e., drawings, specifications, etc.).

SCRAP – Nonconforming material that is not usable for its intended purpose and cannot be economically reworked or repaired.

SERVICES – Processing operations performed on material (i.e., inspection, heat treat, joining, plating, forming, machining, etc.).

SIGNIFICANT PROCESS – A process or process sequence that, if changed, could have an effect on design intent, might have an effect on material structure, mechanical, chemical, or electrical properties, and cannot normally be evaluated without destructive testing. Applies to parts and assemblies that require Supplier verification only.

SOFTWARE – Computer programs, related internal data, and related documentation.

SOFTWARE CONFIGURATION MANAGEMENT – The process of identifying and defining the functional and physical characteristics of software items, controlling the release and change of these items throughout the life cycle, recording and reporting the status of these items and change requests, and verification of the completeness and correctness of the items.

SOFTWARE QUALITY ASSURANCE – A planned and systematic pattern of all actions necessary to provide adequate confidence that software conforms to established requirements and standards, and that it achieves satisfactory performance over the entire life cycle.

SUPPLIER VERIFICATION (SV) – The verification and approval of a source and/or alternative source/process to manufacture parts and assemblies equivalent to parts originally qualified (as defined by the Supplier verification requirements, engineering drawings, and applicable specifications).

SPECIAL PROCESSES – Those processes that modify or change the inherent physical, chemical, electrical, or metallurgical properties of an item, or non-conventional methods that remove or deposit material on an item during or after fabrication that cannot be fully evaluated by nondestructive means, or those used to maintain process control, such as nondestructive testing. These processes may require a demonstration of operator or equipment capability or proficiency and require special controls for monitoring per specification. Means for compliance are contained in individual specifications.

STANDARD REPAIR PROCEDURE – A repair demonstrated to be technically adequate and cost effective, which may be applied to a nonconforming CHI product under defined conditions. Defined conditions must include an expiration date or a finite limit on the number of application, or both.

SUB-TIER SUPPLIER – Any Supplier performing operations, processes, or providing raw material for a manufacturer.

SUPPLIER – Organization that provides a product or service (refer to ISO 9001).

SUPPLIER VERIFICATION LISTING – A list used for Supplier-designed hardware that provides significant processes, procedures, verification testing, and the approved Source for each significant process.

TRACEABILITY (COMPONENT) – The term used herein for components with full traceability back to the original manufacturer. This traceability means that every Supplier in the supply chain is prepared to legally declare in writing that they know and can identify their source of supply, which goes back to the original manufacturer, and can confirm that the components are brand new and were handled with appropriate ESD (electrostatic sensitive device) and MSD (moisture sensitive device) handling precautions. This authenticates that the components supplied are unused, brand new components with no ESD, MSD, or other damage. Traceability makes sure that components are protected by manufacturer warranties, have all of their useful life remaining, and function according to published data of the manufacturer, exhibit the expected component life in the application for the reliability predictions and product warranties of the OEM.

UNCLASSIFIED CHARACTERISTIC – The feature of a part that was not considered for classification as critical, major, or minor. Examples of unclassified characteristics/features are:

- Drawing note referencing a specification Identification marking
- Manufacturing processes (results may be classified)
- NDE inspection processes or their output
- Physical properties (e.g., round, hexagon)
- Foreign material
- Missing parts or visual (e.g., corrosion, damage)

NOTE: Since neither minor or unclassified characteristics are identified with a symbol, it is impossible to distinguish between them by looking at a drawing.

WAIVER – A written authorization to accept a configuration item or other designated items that, during production or after submittal for inspection, are found to depart from specified requirements, but nevertheless are considered suitable for use “as is” or after repair by an approved method.

APPENDIX A

MATERIAL AND SPECIAL PROCESS TEST REPORTS – RECOMMENDED FLOW DOWN REQUIREMENTS

1. Scope

   This appendix provides a listing of recommended procurement flow down requirements used by a Supplier when purchasing raw material(s) or special processes from a Sub-tier Supplier. The following requirements are designed to make sure that adequate information is contained in test reports for raw material or special process shipments that are received from Sub-tier Suppliers for end product that is shipped to CHI.

2. General Information

   - Purchase order number and revision
   - Job number
   - Quantity of parts
   - CHI specification number and issue number and/or drawing number, revision letter and drawing note number.
   - Heat lot number
   - Part number
   - Serial numbers (applicable to serialized parts only)
   - Billet locations for each forging
   - Forging lot number (applicable to forged parts only)
   - Heat treat lot number
   - Specific heat treat cycle used
   - As shipped condition of material (e.g., solution treated; solution and aged)
   - Test specimen machining source (CHI code, name and address for Supplier-verified material)
   - Test specimen testing source (CHI code, name and address for Supplier-verified material)
   - Inspection source (CHI code, name and address for Supplier-verified material) – Pages must be identified as “Page ___ of ___”

3. Data/Test Results Information

   - Clear identification that each test result conforms to specification or drawing requirements
   - Clear identification of any test or inspection required by specification or drawing but not performed
   - Numerical results for all chemical tests (including tramp/trace elements) required by specification or drawing
   - Numerical results for all mechanical tests required by specification or drawing
   - Results of other tests required by specification or drawing (e.g., beta transus, grain flow direction)
   - All results must be stated in the required units of measure (e.g., English vs. Metric, Rockwell vs. Brinell)
   - All results must use the same terminology as in the specification or drawing (e.g., Ni3cb vs. Delta Phase)
   - Conversions must be noted (e.g., hardness conversions)

- Test conditions must be noted (e.g., temperature, stress rupture load, method of determining beta transus)
- When numerical tests are not applicable, a certificate of conformance or certificate of analysis must be provided
- For drawing and/or specification requirements (test or inspections), which are "capability tests", a statement of capability must be included

APPENDIX B

RECORDS

1. Scope

   This appendix establishes the requirements for identifying and maintaining quality-related records.

2. Requirements

   A. General

      (1) These requirements apply to records of the types listed herein, which are generated in the manufacture of the item. These requirements also apply to all other records that are generated in compliance with the purchase order, the drawing, and related documents.

      (2) All records are required to be documented in the English language and recorded in U.S. Customary Units (US Units) unless the drawing or PO specifies International System of Metric Units (SI Units) as prime.

   B. Records are documented in a manner or medium that, if altered, would be obvious that changes were made. Permanent ink must be used, preferably blue or black. Changes to records must be made by drawing a single line through the old data, entering the correct data, then initialed (or signed) and dated by authorized personnel. No erasures or "white-out" allowed.

   C. The following is required for documents sent to CHI:

      (1) Document Completion – Unless specifically directed otherwise by the documentation requiring the completion of a form or log, all blocks, lines, spaces, identifying information that require completion must be entered (i.e., an entry of some form).

      (2) Manual forms – Acceptable entries include:

         (a) Specific data/information, as specifically required

         (b) N/A (indicating not applicable)

         (c) N/R (indicating not required)

         NOTE: If specific restrictions exist relative to acceptable entries, they must be clearly defined in the documentation that requires form completion.

      (3) Manual logs – Unless specified on the log (i.e., instructions for completion) all lines require individual entries. The use of “ditto” marks, lines drawn through specific entry fields, etc., are not recognized as acceptable logging of information. Unless otherwise prohibited, entries as identified as acceptable in Manual forms [Para. (2)] apply.

      (4) Electronic/on-line form completion – The requirement for entry into any particular field is identified and controlled by the specific electronic application.

         (a) If a specific entry format is required, the application makes sure of a correct entry.

         (b) If the entry format is not specified, entries identified as acceptable in Manual forms, specific data/information apply [Para 2.C.(2)(a)].

      (5) Product Acceptance Records that provide the objective evidence of hardware acceptance are as follows:

         (a) Certificates of test and other laboratory results that are required to establish product acceptance.

         (b) Inspection and test results

         (c) Manufacturing, assembly, and inspection operation sheets.

(d) Records of the completion of manufacturing, assembly, and inspection operations.

(e) Inspection and statistical acceptance procedures.

(f) Nondestructive Testing (NDT) records that provide values or results for product acceptance.

(g) Material Review Board (MRB) disposition documents and repair procedures.

(h) Supplier Verification records that reflect CHI approval status of the part number and any subsequent significant operation changes that were incorporated into the part processing parameters.

(6) Serial and Lot Number Assignment – Records of the assignment of individual serial numbers and lot numbers, identification number of the part or assembly, and the date of assignment. These records are only required when serial numbers and/or lot numbers are a drawing requirement.

(7) Administrative Records related to the administrative control of the quality system, are as follows:

(a) System, process and hardware audit results (including audit laboratory tests and metallographic mounts)

(b) Corrective action

(c) Certification and processes and personnel

(d) Tool, gage and instrument control records

(e) NDT maintenance records

(f) MRB administration

(g) Employee inspection and process stamp assignment records

(h) RDC – Request for Design Change

D. Availability

(1) General

(a) Records must be readily available for on-site CHI representatives, CHI customer and/or Regulatory Agency review [within one (1) day]. If CHI requests records to be furnished for review, these records must be made available for delivery within three (3) working days after notification.

(b) Maintenance and storage of records must be such that when requested for review, they are legible, and interpretable. If records are documented on a medium that can deteriorate over time or can become irretrievable due to obsolescence of an electronic system (i.e. faxed copies, strip charts on thermal paper, electronic records, etc.), it is the responsibility of the Supplier to make sure that there is technology available to recreate the records, such that they are maintained in an environment that eliminates deterioration and/or provides for timely retrievability.

(2) Retention Period

(a) The requirements of Para 2.D.(1) must continue in effect for the time periods specified below from the date that the document was generated unless otherwise stated in Table 1.

1: Engine Assembly Operations Sheets, Operation Sheet Revisions, History Logs, and Quality Plans for Production Engines – Fifty (50) years. If a contract is open, all records must be retained. If the contract is closed, then it is a candidate for disposition in accordance with retention schedule requirements. If there are questions related to this requirement, contact your assigned CHIQR.

2: Manufacturing Operation Sheets for Components and Manufactured Items – Retained per the requirements specified in the table below with the exception of records that are supporting U.S. Government contracts. If a contract is open, all records must be retained. If the contract is closed, then it is a candidate for disposition in accordance with retention schedule requirements. If there are questions related to this requirement, contact your assigned CHIQR.

3: When a retention period is stated as Life of Program, the intention is that a specific part for specific engine application(s) is no longer in production and there are no long-term production orders in place. There should be a joint effort between the Supplier and CHI Supply Chain and CHI Production Quality personnel to make this determination.

Description of Part	Record Type	Examples	Official Record Holder	Retention Period
Component Parts: i.e., Vanes, Fan, Compressor & Turbine Blades, Pumps, Gear Boxes, Valves, Configuration Hardware, Engine Bearings	Inspections, Evaluations & Verification Records	Examples are, but not limited to: Inspection Stamp Records, Incoming Material Certifications, Non-destructive testing (NDT logs, Maintenance Records), Special Process Logs, Process and Inspection Stamp Records, Tape Approvals, Furnace strip charts (paper) or electronic/digital, Out of Tolerance (OOTs) records, Calibration/ Metrology records, Manufacturing Process Data, Scrap Tickets and Records, Debris Samples.	Manufacturing facility that created the record	Retain for 5 years, after a part number is out of production. Out of production is defined as no current or long term production orders.
Component Parts: i.e., Vanes, Fan, Compressor & Turbine Blades, Pumps, Gear Boxes, Valves, Configuration Hardware, Engine Bearings	Inspections, Evaluations & Verification Records	Examples are, but not limited to: Routers, Manufacturing/Inspection Planning, work instructions, including temporary planning, Dispatch Order Cards (DO) Cards.	Manufacturing facility that created the record	Retain for 5 years, after a part number is out of production. Out of production is defined as no current or long term production orders.
Component Parts: i.e.. Vanes, Fan, Compressor & Turbine Blades, Pumps, Gear Boxes, Valves, Configuration Hardware, Engine Bearings	Supplier Verification	Examples of this record type are, but not limited to, Characteristic Verification Process (CVP) First Article Data (FAI) Retention periods listed are for the time lapse after a part number is out of production. Out of production is defined as no current or long term production orders.	Manufacturing facility that created the record	Retain for 5 years, after a part number is out of production. Out of production is defined as no current or long term production orders.
Component Parts: i.e., Vanes, Fan, Compressor & Turbine Blades, Pumps, Gear Boxes, Valves, Configuration Hardware, Engine Bearings	Quality System Records	Examples are, but not limited to, Material Review Board Documents, Non-conformance documentation and records (Back of Router/ODO GT6337 and Continuation Sheets), QPRs/MDRs/ QEM/CQE documentation, Corrective/Preventive Actions, Product Audit Data, Audit logs, audit records, audit results, Self Audits, Special process assessment records.	Manufacturing facility that created the record	Retain for 5 years

Retention Table
Table 1 (Sheet 1 of 2)

Description of Part	Record Type	Examples	Official Record Holder	Retention Period
Life Limited Parts: i.e., Rotating Parts (Discs, Spools, Seals & Torque Rings)	Inspections, Evaluations & Verification Records	Examples are, but not limited to: Inspection Stamp Records, Incoming Material Certifications, Non-destructive testing (NDT logs, Maintenance Records), Special Process Logs, Process and Inspection Stamp Records, Tape Approvals, Furnace strip charts (paper) or electronic/digital, Out of Tolerance (OOTs) records, Calibration/ Metrology records, Manufacturing Process Data, Scrap Tickets and Records, Debris Samples.	Manufacturing facility that created the record	Retain for 10 years, after a part number is out of production. Out of production is defined as no current or long term production orders.
Life Limited Parts: i.e., Rotating Parts (Discs, Spools, Seals & Torque Rings)	Inspections, Evaluations & Verification Records	Examples are, but not limited to: Routers, Manufacturing / Inspection Planning, work instructions, including temporary planning, Dispatch Order Cards (DO) Cards.	Manufacturing facility that created the record	Retain for 10 years, after a part number is out of production. Out of production is defined as no current or long term production orders.
Life Limited Parts: i.e., Rotating Parts (Discs, Spools, Seals & Torque Rings)	Supplier Verification	Examples of this record type are, but not limited to, Characteristic Verification Process (CVP) First Article Data (FAI) Retention periods listed are for the time lapse after a part number is out of production. Out of production is defined as no current or long term production orders.	Manufacturing facility that created the record	Retain for 10 years, after a part number is out of production. Out of production is defined as no current or long term production orders.
Life Limited Parts: i.e., Rotating Parts (Discs, Spools, Seals & Torque Rings)	Quality System Records	Examples are, but not limited to, Material Review Board Documents, Non-conformance documentation and records (Back of Router/ODO GT6337 and Continuation Sheets), QPRs/MDRs/ QEM/CQE documentation, Corrective/Preventive Actions, Product Audit Data, Audit logs, Audit records, Audit results, Self-Audits, Special Process assessment records.	Manufacturing facility that created the record	Retain for 5 years

Retention Table
Table 1 (Sheet 2 of 2)

(3) Delivery of Data

(a) The delivery of data to CHI does not release the Supplier from any requirements herein with respect to that data except as agreed to in writing by CHI.

(4) Termination

(a) A Supplier who ceases operations (i.e., goes out of business) must contact CHI to make arrangements for the transfer of all quality records to the Aurora, Oregon location for storage.

(b) A Supplier who discontinues acceptance of CHI purchase orders, but whose business remains intact, must be responsible for the archival of all quality-related records for the time periods specified.

(5) Records

(a) Serial Number Assignment – The system for assigning serial numbers must provide the following information:

1: CHI part or assembly identification numbers

2: Date of assignment

3: Explanation for deviations from expected sequence or practice

4: Record of serial numbers assigned to rejected items

E. Microfilming

(1) Microfilming of records must comply with the following controls:

(a) All microfiche/microfilm must be stored in a fireproof container or an equivalent method, such as redundant storage at an independent storehouse facility, etc.

(b) A system must guarantee the film accurately reproduces the original document and makes sure of legible retrievability throughout the duration of the retention period.

(c) A referencing system must indicate what documents are stored.

(d) A system must provide for retrieval and reproduction of the data and control of log in/log out of the film.

F. Computer Generated Records (Including Laser Storage)

(1) Information Resources Physical Security Requirements – Computer centers that retain quality-related records must establish the responsibilities and requirements for the physical security necessary to provide adequate protection for information resource.

(2) Control of computer Systems Access and Data Access Requirements – Computer centers that retain quality-related records must establish the responsibilities and requirements for computer system access and computer data access.

(3) Disaster Recovery Planning Requirements – Computer centers that retain quality-related records must establish a Disaster Recovery Planning Program or a similar sub-tier document.

APPENDIX C

SUPPLIER NONCONFORMING MATERIAL – REVIEW AND DISPOSITION

1. Scope

   This appendix establishes requirements for identification, documentation, evaluation of corrective action, control, disposition, rework, and repair of nonconforming material.

2. Nonconformance Documentation

   A. Initial Documentation – When any departure to requirements (i.e., nonconformance or departure to an in-process characteristic) is initially identified, it must be documented. Documentation may be via an electronic system or may be included as part of a shop router, traveler, or Dispatch Order, a receiving report, a build-up record, a test fault sheet or similar documentation. Nonconformance records are an element of the historical records traceable to the product.

   B. Transferring to Other Documentation – When necessary, a nonconformance (or departure to an in process characteristic) may be transferred from one document to another by entering all pertinent information from the original document to the new document. The original document must be traceable to the new document and vice versa.

   C. Alert CHI via email within 72 hours of discovering the nonconformance. Complete an internal Supplier NC form and email it to the CHIQR.

   D. General requirements for nonconformance documentation, initial and otherwise, must be prepared as specified in this document.

      (1) Documentation may be either typed, handwritten in permanent ink, or an electronic entry.

      (2) Documentation must be Attributable, Accurate, Contemporaneous, Original and Legible by an independent third party.

      (3) The Supplier is responsible for maintaining traceability of all nonconforming records. Nonconformance records must be retained as specified in Appendix B.

   E. Minimum Requirements for Documentation:

      (1) Initiator of the document

      (2) Date of initiation

      (3) Identification of the document for traceability purposes (For example: nonconformance document number)

      (4) Serial number traceability as specified in Para 11.

      (5) Total quantity of nonconforming items

      (6) A detailed description of the nonconformance

         (a) A departure from a dimensional characteristic must include the characteristic and must specify the extent of the departure (For example: 0.990" - 1.000" dimension actually checks 1.005"). A visual write-up must be described by flaw type (For example: nick, scratch, dent), size (length, width and (or) depth) and where physically located on the part (or material).

      (7) Identification of the affected specification, drawing, or other document if different than the part number.

      (8) A detailed disposition

      (9) Identification of the personnel making such disposition

F. Documentation Requirements:

(1) The Supplier must make sure that all information entered into their internal form is accurate and complete.

(2) Only violations to engineering drawing/specification requirements are submitted on the form.

(3) Departures from in-process characteristics, which do not impact any subsequent engineering drawing or specifications requirements, must be submitted for CHI review and disposition on a Supplier Non-Conforming Report (SNCR) available upon request from your CHIQR. In-process characteristics are generally identified as such on the drawing or in the specification.

NOTE: When the engineering drawing is unknown to the Supplier, the Supplier must contact the CHIQR and obtain the correct drawing number and other pertinent information for form submittal.

(4) After the nonconformance document is accurately fill out, email the document to the appropriate CHIQR.

(5) Changes to Nonconformance Documents – When a change to a nonconformance document is necessary, which does not contain any signatures on the document, the change change must be controlled by the Supplier document management system. If there are signatures on the nonconformance document, the change must be coordinated through the CHI MRB.

(6) Attachments – Photographs, sketches, or other information may be attached to the nonconformance document to clarify the description of the nonconformance(s).

(7) The Material Review Board must not be used to accept a part that is inadvertently installed into an assembly (inseparable or otherwise). A design change rather than a waiver must always be used to introduce a new part number to a product model.

(8) Nonconforming hardware shipped before issuance of a CID must be documented on the internal forms of the Supplier, if all affected hardware has shipped.

NOTE: Shipment of hardware will require prior written approval from the CHIQR.

(9) In cases where a Sub-tier Supplier has a nonconformance on an export-controlled feature that a Supplier does not have an export license to view, the sub-tier Supplier must inform the Supplier that they have a nonconformance on an export-controlled feature and submit the nonconformance directly to CHI. In all other cases, the sub-tier Supplier must submit the nonconformance to the Supplier for submittal to CHI for review.

3. Physical Control of Nonconforming Material

A. Identification – Nonconforming material must be conspicuously marked, tagged, or referenced on the product paperwork.

B. Material Control – Nonconforming material pending PR/MRB disposition must be controlled to preclude its unauthorized processing or use.

C. Scrap Material:

(1) Product dispositioned for scrap must be conspicuously and permanently marked, or positively controlled, until physically rendered unusable.

(2) Mutilation may be performed internally or by an external source.

(3) Scrap may be shipped to other internal locations for accumulation before mutilation.

(4) When mutilation is performed externally, the Supplier submits for approval to the responsible CHIQR a procedure, which outlines the requirements for mutilation and makes sure that scrap requiring mutilation is not sold for any other purpose.

4. Special Consideration

A. Unusual Visual Appearance

(1) Nonconforming Hardware – To preclude unfavorable CHI customer reaction, the Unusual Visual Condition box is checked or clearly stated on the internal document of the Supplier and concurrence must be obtained through the MRB.

(2) Conforming Hardware – If the part conforms to a GE-A blueprint or specification requirement, but is considered "Unusual Visual Appearance", the manufacturing source must contact the responsible CHIQR, who works with the Aviation Solution Representative for concurrence before the part is shipped

B. Parts with Special Cleaning Requirements – Special consideration must be given to rework and repair activities carried out on “oil-wetted” and “sump pressurization circuit” parts. It is very important to keep these parts free of hard particles that could eventually reach a bearing and cause damage. For parts with cleaning requirements noted on the drawing, the rework/repair procedure must adhere to those requirements. Cleaning steps must be documented on the repair procedure.

C. EMCP/LCP Parts – Rework for parts initially found with a nonconforming condition, which is not dimensionally described and may degrade the material properties, are only permitted within the parameters of P1TF111, P1TF101 and P1TF9.

D. Life of Die Waiver – If waiver is for Life of Die/Mold/Tool, the nonconformance record must identify it as a life of Die/Mold/Tool document. Life of Die Waiver is applicable to hardware and the following applies:

(1) The quantity block must be left blank and the “Life of Tool” block must be checked to identify the document as a Life of Die/Mold/Tool Waiver.

(2) The waiver is not required to be limited by quantity or specified time period, but applies directly to the life of the identified die/tool/mold or combination.

(3) The specific die/tool/mold identification number(s) must be documented in the nonconformance description.

(4) Any change to the die/tool/mold or combination requires re-evaluation of the characteristics affected. Any new nonconformances identified as a result of the change requires a new waiver.

(5) All parts produced and/or shipped under a LoD waiver must be traceable to the specific die/tool/mold or combination listed on the waiver.

5. Approval of Preliminary Review (PR) Personnel

A. Requirements – Before a PR function is performed, Supplier personnel must have at least six months of working experience in either quality or manufacturing, must be knowledgeable of the manufacturing processes, and complete required training.

B. PR Training – The Supplier is responsible to prepare the PR training package, which includes training and administration of the PR process. The training package must include, as a minimum:

(1) Documentation and control of nonconforming material.

(2) PR review, evaluation, and disposition.

(3) CHI contractual requirements (i.e., specifications, nonstandard remarks, remarks, or special instructions) that are part of the purchase order.

(4) PR issues that have an effect on raw materials and special processes.

C. Maintaining PR Approval – PR personnel must complete periodic refresher training to maintain PR authorization. Training must be completed every two years at a minimum.

D. The Supplier is responsible for authorization of PR personnel at their facility and must maintain documentation of those authorized to perform PR, which includes their status (i.e.,active, inactive) per the retention requirements.

6. Preliminary Review Responsibility

A. Special processes and significant processes, when affected, must be considered before providing the appropriate disposition. The appropriate Certifying Agent, for special processes or Material and Processing Engineering (M&P) for significant processes, must be contacted by the PR person for guidance.

B. Authorized Personnel – The disposition must be documented and signed/stamped by an approved PR person before the action is taken.

C. Authorized Dispositions – The following are dispositions that a PR person is authorized to make on nonconformances:

(1) Rework – This disposition must be used when it is economically feasible to perform the rework. The rework disposition must:

(a) Specify processing instructions.

(b) Include the method used to make sure of the acceptability of part after its completion.

(c) Be approved by the appropriate Certifying Agent, if rework instructions include special processes different than required for normal processing. (For example: not a planned operation on the approved sequence list.)

(d) Be evaluated and approved per the requirements of CHI-SQS-02 – *Supplier Verification Process* before the rework is performed. If the rework involves significant processes or approved sequencing of significant processes.

NOTE: The use of rework notes included on older drawings requires PR disposition.

The use of repair notes included on older drawings or specifications requires MRB disposition or as directed via a standard repair procedure.

Rework performed in conjunction with a repair procedure does not require re-submission to MRB.

(2) Scrap – This disposition must be used when nonconforming product is not usable for its intended purpose and cannot be economically reworked, or cannot be repaired in a manner acceptable to MRB. Material, when given a “scrap” disposition, must be processed as specified in Para. 3.C.

(3) Return – This disposition must be used when it is more practical to return the product to the Sub-tier Supplier from which it came.

(4) Submit Nonconformance Document to CHI/MRB – When none of the afore-mentioned dispositions are applicable, the nonconformance must be documented on the Suppliers internal NC form and submitted to CHI for review and disposition as specified in Para. 2.C.

(5) Not Nonconforming – When a departure to requirements (i.e., nonconformance/ noncompliance, or departure to an in-process characteristic) is initially identified, documented, and reviewed by the PR and the PR has determined that the documented departure/characteristic conforms to the requirements (specified in the contract, drawings, specifications, or other approved CHI product description), the PR

documents how the departure meets the requirement and that the departure is not nonconforming. Example drawing requirements is 1.0- 2.0 and part checks 1.5.

D. MRB Directed Disposition – The PR person, when directed by MRB, must document MRB dispositions as specified in Para. 7.A.

(1) If PR personnel use the MRB directed disposition, it must be controlled to meet the documented limits of the directed disposition.

(2) The use of the MRB directed disposition must be logged each time in the internal forms of the Supplier when the MRB directed disposition is applied. An alternative method may be permitted by CHIQR in which Suppliers are responsible to track usage, retain documentation, and make sure approved quantity or time is not exceeded.

E. Continue to Process – At times, it can be more practical to continue processing a part with a documented nonconformance (or departure from an in-process characteristic) to a later point in the manufacturing process before initiating the appropriate action. The “continue to process” determination can only be applied by approved PR personnel and only so long as the nonconformance (or departure from an in-process characteristic) is not altered or covered up to preclude its correct review and/or action. The PR person must document how far to continue and the appropriate action.

(1) This provision does not permit the initiation of a repair of a nonconformance before MRB authorization.

(2) Product history should be considered to make sure the manufacturing risk to process further is low or nonexistent.

(3) As an alternative to submitting the nonconformance to MRB for disposition, the PR person can contact CHIQR when a Change in Design (CID) is processed. An issued CID, which causes the part to fully conform to the new limits, must be used to determine that the previously identified nonconformance is no longer nonconforming and referenced on the nonconformance record.

(4) Nonconforming product shipped to CHI before issuance of a CID must be documented and processed as a nonconformance. This documents the existence of the condition and indicates engineering acceptance of the condition of parts shipped to CHI.

(5) The issuance of a CID after the completion date of manufacture does not retroactively bring previously manufactured nonconforming material into conformance.

F. Corrective Action – Consideration must be given during the PR process relative to the appropriate corrective action related to the nonconformance(s) (Para 11.)

G. This provision does not permit deviation from GE-A design requirements unless a deviation is authorized by CHI.

7. CHI Review/MRB Dispositions

A. Dispositions – The following are the types of dispositions used by the MRB. If sufficient information is not available on the documentation provided, additional information, inspections, etc., as necessary, must be requested. Make sure that any additional information is added to the nonconformance document to permit future review. The disposition must be documented and signed by the all required review board members before action is taken.

NOTE: Alternative disposition/status terms may be used when it is clear the intent is within the scope of this instruction. (For example: Multi [when more than one disposition applies to sub-groups of parts], Void, etc.)

(1) Accept – Use as is

(2) Rework

(3) Repair (Para 8.)

(4) Reject – CHI rejects the nonconformance when an accept or repair disposition cannot be made. Once the nonconformance is rejected, other actions may be considered by the Supplier, such as:

(a) Return the nonconformance record to preliminary review for disposition.

(b) Develop a repair method and re-submit the nonconformance to CHI.

B. Accept Disposition Based on Sample Inspection Data – In certain cases (for example: processes are in control, large quantities are produced, etc.), it is permitted for the MRB to accept material based on inspection of a sample that represents those parts. Any number of parts may be sampled provided the parts are selected without bias from the available parts. The following procedure must be used in such circumstances:

(1) Statistical Analysis – Based on a sample greater than 30 parts, selected without bias from the available and inspectable parts, and representative of the process that produced the nonconformance, a statistical analysis may be completed to generate ±3 sigma tolerance intervals. For instances where 30 or less parts are available, a statistical analysis may be performed that produces tolerance intervals with 95% confidence that at least 99% of all values are included. Use of analysis tools (e.g., Minitab) may be used.

Samples of greater than 100 parts must use alternative methods. The acceptable analysis must indicate when the data is distributed normally. If the data is not distributed normally, then a statistician must be consulted for alternative analysis.

The statistical analysis must include the number of parts used for the analysis and how those parts were selected. All documents must clearly indicate when statistical analysis is used to determine the nonconformance condition. The statistical analysis must be attached to, or referenced within, the nonconformance document and retained as a permanent part of the record.

(2) Nonconformance Quantity – When a statistical analysis is correctly completed, the assumed nonconforming population quantity must be calculated based on a 95% upper confidence limit on the percentage of the suspect population that was calculated to be defective, call this value p(d)*. The predicted nonconformance quantity that must be submitted to MRB is p(d) times the total quantity of suspect parts still within CHI/Supplier control.

Use Minitab or an equivalent tool to calculate the predicted nonconformance quantity. When it is clear that all parts are nonconforming, the total suspect quantity is submitted to MRB. The analysis worksheet or equivalent must be included with the MRB by attachment, linkage, or remark and include the total suspect population count, the predicted nonconforming quantity, and evidence of the formula used for calculation.

(a) If n = the sample size and d = the number nonconforming in sample, then:

$p(d) = d/n + (1.645)((d/n(1-d/n))/n)1/2$

C. Directed Acceptance/ Directed Disposition – CHI may document dispositions for implementation by Supplier PR personnel when the disposition is always the same for a certain nonconformance. The following details the types of MRB-directed dispositions available and the respective requirements.

D. Consideration for Use – When nonconforming product is submitted for disposition and meets the criteria as a minor nonconformance, MRB may consider acceptance of additional nonconforming product that is expected to be nonconforming as a result of a pre-existing condition caused by an error during manufacture: For example: the existing tooling or process is found to be incapable of producing material to the specified requirements, the existing process planning is found to depart from the specified requirements.

(1) Direct Acceptance

(a) Authorization – All directed acceptance approvals must be clearly documented. Such approval must authorize PR personnel to accept future nonconformances, subject to the documented limits of the approval. The directed acceptance recorded must clearly state:

1: That it is an MRB directed disposition

2: The extent of the allowance:

a. Nonconformance limits

b. Time period or quantity

c. Any special requirements related to the nonconformance

(b) Approvals must not exceed a six-month (6) period or the equivalent production quantity. All reasonable efforts should be made to reduce or eliminate the occurrence of such nonconformances.

1: If additional time or quantity is necessary, any subsequent NCMR administrator directed acceptance requires the documented approvals:

a. Of the responsible Quality Leader, before approval. The Quality Leader must make sure that reference to this approval is noted in the MRB record by remark, linkage, or attachment.

b. Of the Chief Engineer, before approval. The MRB ENG must make sure that reference to this approval is noted in the MRB record by remark, linkage, or attachment.

(c) Implementation – The PR person implements the MRB directed acceptance and references the approved nonconformance record that established the MRB directed acceptance on the initial nonconformance record (For example: router, D.O. card, etc.).

1: The Supplier implements this allowance by applying the quantity of parts to the active directed disposition/acceptance for the nonconforming characteristics before shipping the hardware, notify your CHIQR of the quantity, and serial and/or lot numbers.

2: The Supplier is responsible to document each use of the directed disposition before shipping the hardware, make sure of compliance to quantity and time limits, and make sure that no unapproved nonconformances are shipped. Nonconformances not approved by authorized, directed dispositions must be submitted to CHI MRB for review.

(2) Directed Disposition Standard Repair

(a) Authorization – All standard repair approvals must be clearly documented on the Supplier's Nonconforming Material Report. Such approvals must authorize PR personnel to repair future nonconformances, subject to the documented limits of the approval.

(b) The Standard repair acceptance record must clearly state:

1: That it is an MRB standard repair disposition

2: The extent of the approval

a. Nonconformance limits (part number and characteristic limits)

b. Any special limitations related to the nonconformance

(c) Approvals must not exceed a twelve (12) month period or the equivalent production quantity. If additional time or quantity is necessary, a new standard repair authorization by MRB must be required. Any subsequent directed disposition Standard Repair requires the documented approval of the responsible CHI Quality Leader or Production Quality Commodity Leader, before approval. The MRB Chair must make sure that reference to this approval is noted in the MRB record by remark, linkage, or attachment.

(d) Implementation – Once the standard repair is approved for use, PR personnel must authorize (For example: "Repair per standard repair procedure 23001") its use, for nonconformances within the scope of the approved standard repair procedure, on the initial nonconformance record (For example: router, D.O. card, etc.).

(e) The Supplier must make sure each use of the standard repair is added to existing MRB data and attached to the repair documents of the Supplier.

1: The Supplier implements this allowance by applying the quantity of parts to the active directed disposition/standard repair for the nonconforming characteristics within the quality management system of the Supplier.

2: The Supplier is responsible to document each use of the directed disposition before shipping the hardware, make sure of compliance to quantity and time limits, and make sure that no unapproved nonconformances are shipped. Nonconformances not approved by authorized directed dispositions must be submitted to CHI MRB for review.

8. Repair of Nonconforming Material

A. Repair procedure documentation must be provided for all applicable approvals.

(1) Repair Approvals – Nonconforming items on GE-A designed material must not be repaired by any method without approval by CHI Material Review Board. Authorization to begin the repair consists of the repair status of "Approved" and must consist of an approved repair sign off in the nonconformance document, for a specific number of parts, defining a repair method from a CHIQR.

(a) Approvals

1: MRB Engineering representative

2: MRB Chairperson

3: FAA representative, when applicable

4: Certifying Agent for repair procedures that include special processes different than those necessary for normal processing (For example: not a planned operation on the approved sequence list). Certifying Agent signatures on repairs are only valid for one (1) year.

NOTE: Listing the source on the repair procedure does not automatically make them a certified/approved source. Refer to CHI-SQS-02, Para 6.B.(6) Certification of Special Processes and Para. 9 of this document.

For non-SVP hardware, although not required, using a certified/approved source is recommended. Refer to Para. 9.D.(6) for requirements if a certified/approved source is not used.

a. All repair procedures (submitted by a Supplier participant) that have an effect on part chemistry, physical properties, or include processing through special process(es) must be directed through the CHIQR. The Supplier participant quality MRB representative is responsible to make sure compliance to this requirement.

b. Repairs containing special process(es) – Make sure the facility performing this process is a certified/approved source for SVP hardware. This is the responsibility of the Supplier to make sure that the facility is approved.

(2) Annual Review of Repair Forms – Repairs forms, which contain dated approval signatures and are over one year old, are reviewed and re-approved by all required approvers, including Certifying agents, before MRB repair approval.

(3) Repair Procedure Content – The repair procedure documents, in detail, the exact method followed during the repair process (i.e., restrictions or limitations on use of the repair, related characteristics that may have an effect during the repair process, tooling, special processes, inspection or test requirements, and any other special requirements or considerations).

B. Nonconformance in Conjunction with Repairs – When another nonconforming characteristic requires MRB disposition in conjunction with a repair, it may be added to the affected nonconformance record (or cross referenced) for traceability. Nonconformances caused by the repair process must be submitted to MRB for disposition, unless authorized by the repair procedure.

C. Repair Completion

(1) The repair must be completed as soon as possible.

(2) If more than six (6) months are required to complete the repair, a note must be added on the nonconformance document giving the reason why it will take more than six (6) months. CHI reserves the right to reject parts not repaired within six (6) months.

(3) CHI reserves the right to request evidence of repair completion.

(4) Review before acceptance or after repair – The CHIQR must make sure of the preparation of Form “Nonconformance Document Lot Identification Card” (NDLIC) to authorize Supplier release of product pending MRB disposition when a part(s) of the Supplier requires physical review before final disposition.

D. Repair Procedures on Drawing – GE-A has discontinued the practice of specifying repair procedures on the drawing. However, there are still drawings in the system with repair procedures. In these instances, a nonconformance document must be prepared, along with a proposed repair procedure or standard repair procedure, after which it is handled in the same manner as all other repair procedures.

9. Request for Shipment with Open Nonconformance

A. When CHI requests a shipment of material with open nonconformance in their system. The Supplier must:

(1) Make sure the material and/or the requested documentation is forwarded to CHI on or before the date identified on the NCMR disposition.

(2) Make sure a Quarantine Release stamp is used on the shipping document/bar code label as specified in Appendix D.

(3) Ship the nonconforming material separate

(4) Notify CHI when the material on an open nonconformance document is being scrapped or no longer requires CHI disposition/review.

10. Deviation

A. Documentation – A request for minor deviation must be submitted to CHIQR. A copy of this form may be obtained from the CHIQR. The form must be typed to facilitate processing. Symbols (i.e., critical/major characteristics, geometric tolerances, etc.) may be hand printed.

B. CHI Approval – Upon receipt of approval, the Supplier may begin to manufacture. The affected material or items meeting the deviation acceptance limits must be handled as conforming material and no further CHI disposition is necessary.

C. Deviation Limits – Characteristic accountability requirements (e.g. inspection, sampling) must be adequate, documented, and monitored in order to make sure that product covered by deviations and waivers are within the specified acceptance limits. Manufacture beyond the scope (quantity or time period) of a deviation must be requested from your CHIQR.

NOTE: If a material or item manufactured using the approved deviation does not fully comply with the limits, as documented, the material or item is nonconforming and must be processed as specified in Para 3.

D. Deviation Versus Waiver – This paragraph details conditions under which either a minor deviation or a minor waiver (not both) is necessary to authorize acceptance of items that are nonconforming or will be nonconforming after manufacture. This paragraph also defines the point at which manufacture of an item begins, a key concept in making the deviation/ waiver decision.

(1) Deviation Situations – A deviation must be used in the following situations:

(a) A temporary departure from specified requirements is necessary to meet customer commitments. A design change must be processed if the temporary departure will become permanent.

(b) A temporary departure from specified requirements is necessary to permit data gathering for verification of the need for a permanent change in requirements to improve the design or producibility of an item.

(c) A deviation must not be used during manufacture to address a known error in the process, procedure, or tooling.

(d) Temporary use of an alternative material.

(e) Temporary use of alternative tooling.

(f) Temporary use of an alternative process.

(2) Waiver Situations – A waiver must be used in the following situations:

(a) Acceptance of a characteristic that was generated and then is determined to be nonconforming.

(b) Acceptance of a characteristic that is expected to be made nonconforming as a result of a pre-existing condition caused by an error during manufacture (e.g., the existing tooling or process is found to be incapable of producing material to the specified requirements, the existing process planning is found to depart from the specified requirements).

11. Evaluation of Corrective Action

A. Responsibility – The Supplier has the responsibility to develop, document, and maintain a corrective action system to reduce the amount of nonconforming product. Suppliers must use the AS13000 – *Problem Solving Requirements for Suppliers* process when responding to a CHI request for corrective and preventive action.

B. Consideration – Every nonconformance requires consideration for corrective action. The final decision as to the appropriateness of the Supplier corrective action decision and plan, relative to the nonconformances submitted to CHI for review and disposition, must rest with CHI.

C. Effectivity – The Supplier must follow up on corrective action to make sure of effective implementation.

D. CHI Authority – When the corrective action program of the Supplier is ineffective in reducing or eliminating the correctable root causes of nonconformance, CHI may elect to reject items or lots that contain non-conforming material.

E. Nonconformance Trending – Supplier nonconformance trends must be monitored by CHI. If an adverse trend is detected, the data must be evaluated and, if deemed appropriate, CHI must issue a request for corrective action.

(1) This trending responsibility applies only to part numbers of those specific engine programs for which the Supplier is qualified as a participant. Adverse trends require internal investigation and issuance of corrective actions.

12. Disposition and Notification of Nonconforming Product that was Inadvertently Shipped

A. The following paragraphs provide a means for CHI disposition of nonconforming material shipped without prior disposition by CHI.

(1) Notification – Alert CHI via email within 72 hours of discovery.

(2) Documentation – The internal form of the Supplier for nonconforming material must be prepared as normal and as specified in Para. 2.F.

(3) Nonconformance – When documenting the nonconformance, it may be necessary to determine the nonconformance magnitude by either:

(a) Sample inspection data to establish the specific nonconformance magnitude.

(b) Determining the nonconformance magnitude by an alternative method, such as analysis of historical data, that is capable of representing the nonconformance magnitude.

(c) Conducting a controlled experiment capable of simulating the nonconformance magnitude.

APPENDIX D

PREPARATION AND IDENTIFICATION OF SUPPLIES FOR SHIPMENT

1. Scope

   This appendix provides direction for preparation and identification of supplies for shipment.

2. Responsibilities

   A. A Certificate of Conformance (C of C) must be provided with each lot. The C of C must include a statement that the items meet the requirements of the purchase order and specifications referenced on the drawing and/or purchase order. C of Cs must include, as a minimum, the following information:

      (1) CHI purchase order number

      (2) Quantity of parts in shipment

      (3) Part number on purchase order

      (4) Statement certifying product compliance

      (5) Applicable Specifications including revision

      (6) Part revision

      (7) Signature or stamp of authorizing agent

      (8) Date code(s) or lot number(s), if applicable

      (9) Original Manufacturer name and country of origin

      (10) Date of C of C

      (11) Shelf life, if applicable

      (12) Description

      (13) CHI approved supplier nonconforming material report forms.

   B. A Certificate of Analysis (C of A) or “Mill Cert” must be included with the shipment when the product is raw material such as bar and sheet stock or when the end product or its constituent parts are manufactured from basic raw material. Required C of A or Mill Cert information includes:

      (1) Original lot, batch or heat numbers.

      (2) Chemical analysis including constituent elements & percentages.

      (3) Physical analysis (i.e., stress strain data, and temper).

      (4) Exceptions: The following items do not require C of As:

         (a) Catalog items

         (b) Items purchased to AN, MS or NAS specifications

         (c) Nameplates

         (d) Bearings

   C. Special Process Certification: A certificate of compliance or test report for each special process performed must be included with the shipment. Required Cert information includes:

      (1) Name and address of the processor.

      (2) Processing date.

      (3) Supplier’s PO number to the processor, if an outside source.

(4) Part number, revision and nomenclature listed on the PO. (If PO lists the Supplier and GE Aviation part numbers, list the GE Aviation number.)

(5) Signature and title of the certifying person.

(6) Statement of conformance to the specifications and requirements referenced on the PO. Avoid statements like “to the best of our knowledge and belief.”

(7) Quantity (Special process certs are permitted to have larger quantities on them than the shipment lot size.)

(8) For NDT inspections, the results and the Level II inspector’s name.

3. Packaging Recommendation/Guidelines

A. Serialized Parts – Serialized parts must include the S/N of the hardware on the outside of the container. The S/N could either be documented on the outside of the container or as a list attached to the outside of the container marked “S/N List”.

B. Package Quantities – Package quantity requirements can be found on the purchase order.

C. Questions regarding packaging requirements can be directed to the CHI Supply Chain Representative.

4. Environmentally Friendly Packaging

A. Before packaging is ordered, sign the next contract for packaging, or change a packaging process line, consider the following:

(1) Use returnable or multi-trip containers.

(2) Use packaging made from recycled materials.

(3) With multi-component packaging (i.e., cardboard/wood/plastic), use designs that permit ready separation and recycling of the individual materials.

(4) Minimize additional packaging materials used solely for cosmetic rather than functional reasons.

(5) Avoid packaging materials that cannot be recycled or reused.

(6) Use unbleached paper and cardboard packaging

(7) Avoid printing inks that contain heavy metals or are difficult to bleach from recycled paper.

(8) Avoid packaging materials that may contain toxic stabilizers or additives.

(9) Whenever possible, directly reuse the packaging in which the material is shipped.

(10) Print specific instructions for recycling the packaging on the outside of the container.

(11) For efficient shipment to recycling centers, avoid overly bulky materials or other packaging that is difficult to break down.

(12) Investigate legislative trends to determine if your current packaging is potentially vulnerable to regional packaging bans, specially before making long-term contract or process commitments.

APPENDIX E

REQUIREMENTS FOR SUPPLIER SOFTWARE QUALITY ASSURANCE PROGRAMS

1. Scope

   The purpose of this appendix is to set forth the minimum requirements for a Software Quality Assurance (SQA) Program that a Supplier must implement for CHI product software or software developed or used in the design, manufacture, inspection, or test of CHI products.

2. Applicability

   A. This appendix applies to software that is generated and/or used in fulfillment of purchase order requirements.

   B. This appendix covers the following Classes of source software:

      (1) Class I: Software that comprises all or part of a product that is delivered to CHI or a CHI customer.

      (2) Class II: Software used to create/control/inspect/test characteristics on CHI product, which is validated by virtue that the software is under an approval and change control system.

      For both Class I and Class II software, the Supplier is responsible to notify CHI in writing of proprietary right claims, before execution of the purchase order.

3. Requirements

   A. These requirements are in addition to other purchase order requirements.

4. General Requirements

   A. The objective of the software quality program must be to make sure of the quality of:

      (1) Software and its documentation.

      (2) The process used to produce software.

   B. Supplier personnel responsible to make sure of compliance with the software quality program requirements must have the resources, responsibility, authority, and organizational freedom to permit objective evaluations and to initiate and verify corrective actions. The persons who conduct software quality evaluations of a product or activity must not be the same persons who developed the product, performed the activity, or are responsible for the product or activity, (this does not preclude members of the development team from participating in these evaluations). The Supplier must assign responsibility for the fulfillment of, and for making sure of compliance with the software quality program requirements.

   C. The software quality program, which includes procedures, processes, and products, must be documented. The software quality program is subject to review by CHI, and may be disapproved by CHI whenever the program does not meet the requirements of the purchase order.

   D. A complete review of the purchase order to identify and make timely provision for acquisition of or development of the resources and skills necessary for implementing the software quality program must be conducted. The product/process source must prepare plans for application of the documented software quality program to the purchase order. These plans must be documented in a CHI format, when so specified in the purchase order. Authorized personnel must issue plans with the revision history maintained.

   E. The software quality program must be implemented as specified in the documented software quality plans and must adhere to the program for the duration of the purchase order. The software quality program must be fully integrated with the activities required by the purchase order.

F. The Supplier must conduct on-going evaluations of the processes used in software development and the resulting software and related documentation to make sure that all Supplier requirements are met and that internal coordination is conducted as specified in the software plans.

G. The Supplier must prepare and maintain the records of the software quality program activities required by the purchase order.

(1) A software quality evaluation record must be prepared for each evaluation required by the purchase order. These records must be in the product/process format of the source and must contain the following items as a minimum:

(a) Evaluation date

(b) Evaluation participants

(c) Evaluation criteria

(d) Evaluation results, including detected problems, with reference to the applicable software problem reports.

(e) Recommended corrective action (generally, this type of record is maintained for Class I software).

(2) All other software quality records must be prepared in the format of the Supplier (generally, this type of record is maintained for Class II software).

H. When a software-related problem or nonconformance is detected, it must be documented and must serve as input for software corrective action. The Supplier must:

(1) Make sure that action is initiated to correct the defect and the cause of the defect, and that adverse trends are identified and reversed.

(2) Monitor and track the software corrective actions to make sure of timely and positive corrective action.

(3) Management must review the software quality program at the intervals specified in the software quality program.

(4) Make sure that applicable subcontracted software meets the requirement of this specification, as well as additional purchase order requirements.

(5) Before the introduction of new or revised support software (e.g., compilers, operating systems), which is used for the computation, interpretation, assembly, linkage, or working environment of Class I or Class II software, a documented evaluation to determine the impact on the Class I or Class II software must be conducted.

(6) Software and software quality records must be maintained as specified in this appendix.

5. Class I Software Requirements

A. A Software Quality Assurance program for all Class I software covered by the purchase order must be documented and maintained in the form of a Software Quality Assurance Program Plan. This plan may be in the Supplier format, unless otherwise specified in the purchase order.

B. The software quality assurance program must provide for the performance of the following activities by the personnel specified in Para 4.B.:

(1) The performance of both scheduled and non-scheduled evaluations of the software development, library control, corrective action, testing, and software configuration management activities to make sure of compliance with all applicable requirements, plans, procedures, and programming standards and conventions.

(2) The independent review, before release to CHI, of all contractually or regulatory required software plans, procedures, code, and documentation for:

(a) Completeness

(b) Compliance with applicable standards and conventions

(c) Assurance that all approved and only approved changes are implemented

(d) Traceability of requirements from one document to another

(e) All necessary approvals

(f) Compliance to additional purchase order requirements

(g) Action items must be documented and verification of the disposition for all identified discrepancies

(3) The participation in any scheduled software design reviews. All identified problems from these reviews must be documented and have corrective action disposition, before the approval of the design.

(4) The assurance that an analysis of software requirements for testability was performed.

(5) The review of test plans, specifications, and procedures for compliance with design requirements, and to make sure that all approved, and only approved, changes are incorporated.

(6) The monitoring or participation in the testing activities to make sure of adherence to approved plans and procedures, to make sure that the identification of the software version is documented, and to make sure that the test results are accurately documented. The test results must be reviewed for compliance to the test criteria.

(7) The assurance that test related media and documentation are maintained.

(8) The assurance that all software and software documentation released to CHI conforms to all software related purchase order requirements.

(9) The participation in any scheduled software configuration audits. All identified problems from these audits must be documented and have corrective action disposition before production release of the software to CHI.

(10) The assurance of software integrity during handling, storage, preservation, packaging, marking, and shipping.

6. Class II Software Requirements

A. A Software Quality Assurance program for all Class II software must be documented and maintained. This program must include:

(1) Software Requirements Definition – Before designing and coding, the quality assurance program must make sure that an approved requirements definition document exists, (i.e., drawings/specifications).

(2) Design Code Instructions/Documentation – The Software Quality Assurance program must make sure of correctly structured and adequately documented software. This may be done through documented software development standards.

(3) Test Program Validation – The quality assurance program must make sure that the software performs as intended. Objective evidence of the validation process must be maintained for new and revised software. For revised software, re-validation must be performed to the portion of the code that is modified. Records must be maintained of the test program validation activity, which includes approval to release for use.

(4) Software Identification/Change Control – The quality assurance program must make sure that the software is uniquely identified. All software changes must be appropriately

reviewed. The change control procedure for the software must be documented and a revision history maintained.

(5) Identification of Software at Operations – The quality assurance program must make sure that the software is uniquely identified in the applicable work instructions.

(6) Software Media Control – The quality assurance program must protect the software media from unauthorized changes. Protection methods could include, but are not limited to, password protection, write protect labels, checksums, quality audits, object-only code releases, or floppy disk without a read/write notch. Access to obsolete software for design, manufacture, inspection, or test of CHI products must be prevented.

APPENDIX F

CONTRACTUAL REQUIREMENTS FOR BASIC QUALITY SYSTEM ACCREDITATION

1. AS 9100, AS 9120, or ISO 9001 Accreditation (as applicable)
   - A. Contact Certifying Bodies (CBs) approved that are listed on the OASIS database. The URL is http://www.iaqg.sae.org/servlets/index?PORTAL_CODE=IAQG. A free registration is necessary.
   - B. Schedule the assessment to allow adequate time to address findings: investigate root cause, develop corrective action plan, implement corrective action, and have findings closed by CB. This must be completed before the due date of the systems approval in the CHI audit schedule.
   - C. Make sure that the CB meets the requirements as listed below in completion of the AS 9100, AS 9120, or ISO 9001 assessment.
   - D. Send copies of all relevant data to CHI upon receiving certification, as objective evidence of compliance to the CHI requirements
     - (1) Certificate of certification to AS 9100, AS 9120, or ISO 9001
     - (2) All findings from the assessment including corrective action as approved by the CB
     - (3) CB audit report
     - (4) Any other referenced documentation
     - (5) This documentation must be provided for initial approval and when requested by CHI for periodic re-approval of the quality system. Alternatively, the Supplier may provide access to the appropriate data in OASIS.
     - (6) This data must be submitted to the CHIQR via email.
2. Nadcap Accreditation
   - A. The Nadcap program is administered by the Performance Review Institute (PRI), a division of SAE. PRI may be contacted at https://shop.sae.org/servlets/index?PORTAL_CODE=PRI or https://p-r-i.org/nadcap/
   - B. Scheduling of the audit should follow the same timing consideration as the AS 9100, AS 9120, or ISO 9001 audits.
   - C. As all audit results are maintained in the Nadcap database, no data submittal is necessary.

APPENDIX G

RECOMMENDED BEST PRACTICES FOR SUPPLIERS

1. Recommendations

A. CHI has solutions for common issues that have caused escapes in the past. As a result, CHI is setting the bar that Suppliers should implement the practices listed below. Note that these best practices do not replace or void any existing requirements of the purchase order, drawing, or specifications.

(1) Part marking is checked by optical scanning systems and compared to make sure that it matches the shipping label and purchase order.

(2) Suppliers of heat treated parts or material may perform a CHI-authorized means of testing to validate the correct heat treat condition before shipment.

(3) Edge break, steps, radii, and similar features are checked with a method of inspection capable of providing a variable result as required by CHI-SQS-03 for FAI data collection. Technical-based verification methods (i.e., Laser measurement device or “gap gun”) are best practice recommendations. FAI results stating Conforms, Accept, etc., are not acceptable.

(4) In addition to an established control plan, use inspection technology (i.e. Blue light) on parts after the FAI to make comparisons to the master model (i.e., part 20 is inspected).

(5) Final characteristics are generated using automated control systems. Use of manual machines for generating final characteristics is discouraged. Manual machines are defined as operator direct control of feed rates, such as lathes and mills.

(6) Use scanning CMM probes and techniques (i.e., Revo head) to measure surface profile across the entire feature called out on the drawing. The expectation and need is to identify/detect all variation in the manufacturing process. For example, for complex contours, use the Revo head to drag across the entire surface to make sure any undulations and changes in surface contour are identified.

(7) After Initial FAI approval, an additional physical inspection (i.e., overlay) is performed as specified in the approved quality plan on all areas that are shot peened or coated. This inspection must make sure that the process is confined to the identified areas.

(8) Material Handling and Part Protection:

(a) Hardware, gages, and fixtures handled during transit, storage, processing, assembly, inspection, testing, and packaging in manner that prevents damage and contamination.

(b) Ports and lines are capped or otherwise closed to protect against the possibility of Foreign Object Damage (FOD).

(c) No metal-to-metal contact of finished surfaces during transit and storage except when:

1: The weight of the components is minimal enough, such that damage does not occur to finished surfaces

2: A manufacturing or assembly process cannot be performed correctly if the parts are separated.