TITLE:

Process Certification Requirements

INTRODUCTION

Process Certification is United Technologies Corporation's (UTC) methodology to achieve and sustain statistically controlled and capable processes for manufacturing, business, support, maintenance (i.e. overhaul, repair, modification), assembly, and test.

Achieving a successful process control system requires every organization within the corporation to use those producers and implement the changes required that will result in the capability to consistently meet or exceed the following requirements.

Sustaining any process control system requires the foundation of a continuous improvement process. This requirement defines the minimum criteria to establish an acceptable process control system.

All processes inclusive of business, support, engineering, manufacturing, maintenance, assembly, and test are potential candidates for process certification.

This requirement defines the Process Certification criteria as agreed upon by the UTC Process Certification Council. To obtain the best possible results refer to the process steps defined in paragraph 5.2.1.

The UTC Aerospace and Commercial business entities are herein referred to as "UTC member".

UTC AEROSPACE MEMBERS		UTC COMMERCIAL MEMBERS	
Aftermarket Operations	AO	Carrier	CA
Hamilton Sundstrand	HS	UTC Fire & Security	UTCFS
Pratt & Whitney	PW	Otis Elevator	OE
Pratt & Whitney Canada	PWC	UTC Corporate	UTCC
Sikorsky Aircraft	SAC		
UTC Power	UTCP		

NATURE OF CHANGE

This requirement has been completely revised, major changes include the following:

- Added UTC Fire & Security (UTCFS) and UTC Corporate (UTCC) as Commercial UTC Members and updated UTC Fuel Cells name to UTC Power.
- Industry standards have been introduced for use by UTC Aerospace and Commercial members.
- The Glossary Section has been deleted and all definitions have been moved to Section 3 (Definitions).
    - Many definitions have been revised to clarify intent.
    - New definitions added: Certified Process, Business & Support Processes, Process, and Turnback.
    - Industry Common definitions deleted: Cp, Statistically Capable, Statistical Control, Variation, Common Cause and Assignable Cause.
- Para 5. series – revised to clarify intent of General System Requirements to include Process mapping requirements. Process Control, Business, and Support Process information as well as Criteria for Compliance, Control & Continuous Improvement.
- Para 6 Added Figure 1 Flow Chart: Process Certification ”Industry” Requirement Flow Diagram.

1. SCOPE:

This requirement applies to any process, process input, or characteristic that influences the ability of producers to meet or exceed customer requirements.

1.1 Purpose:

To establish the minimum requirements for the implementation of a successful process certification system.

Supplementary materials are available on the United Technologies Process Certification web site or producers may contact their responsible UTC member for reference material.

The Process Certification Flow Diagram (Reference: Figure 2) depicts process certification implementation and shall not be used exclusive of paragraph requirements.

2. REFERENCES:

UTC Aerospace Members:

ASQR–01	Supplier Quality System Requirements
SAE AS 9103	Variation Management of Key Characteristics
UTCQR Form 2	Process Certification Assessment / Audit Form

UTC Commercial Members:

ISO / TS 16949	Quality Management Systems Particular requirements for the application of ISO 9001:2000
	UTC Supplier Quality Manual
	Automotive Industry Action Group (AIAG)
UTCQR Form 2	Process Certification Assessment / Audit Form or equivalent

3. DEFINITIONS:

The definitions below are not considered "common" to industry process control standards. For process control definitions, please refer to common industry standards (e.g., AS9103, ISO, AIAG, etc.)

3.1 Business and Support Processes:

The product of a business, engineering, and support process is usually information and the value added steps to facilitate delivery of goods or services

- Business Processes: (e.g., a design, contract, purchase order, plan, schedule, instructions, delivery process, etc.)

Note: *For Business Processes only, the UTC member will identify, as needed, those requiring Process Certification.*

- Support Processes: (e.g., maintenance, assembly & test, inspection, distributors, etc.).

Often, accuracy, timeliness, and costs are critical to both efficient operations and meeting customer requirements.

3.2 Certified Process:

A statistically controlled and capable process that has demonstrated the required level of process control and capability as defined by this procedure.

3.3 Key Characteristic (KC):

A characteristic or feature of a material, process, part, assembly, or test, whose variation within or outside the specified requirement has a significant influence on product fit, performance, service life, manufacturability, information, service, or other expected deliverable.

A high level KC begins with the system end item, assembly, or sub–assembly, and flows back to lower level KCs, rooted at the manufacturing, maintenance, or business process, based on a cause–and–effect relationship.

A key characteristic may be traceable to an upstream process controlled by a supplier.

For Business & Support processes, it is a characteristic, feature, process, customer requirement, or function that requires Process Certification.

An industry recognized Risk Analysis methodology is recommended to define product KCs.

3.4 **Key Process Input (KPI):**

Any process element that has a significant effect on KCs (e.g., upstream process monitoring of locating datum's, process parameters, information / control required for downstream business, support, or manufacturing processes, measurement variation, shape variation, set up, tool wear, coolant concentration, preventive maintenance, etc.).

3.5 **Process:**

The combination of people, material, machines, environment, measurement, test equipment, and methods necessary to produce a product or service.

3.6 **Producers:**

Manufacturing facilities, suppliers, distributors, maintenance (i.e., overhaul, repair, modification), assembly, test, business, and support organizations that provide goods and services.

3.7 **Turnback:**

Anything that impedes the flow of material or information along its intended path.

4. APPLICABILITY:

All UTC members, producers, and their sub–tier suppliers that provide goods, services, and KCs or processes identified for certification by the UTC members shall implement a process control system that satisfies this requirement.

The UTC members are responsible for the application of this requirement as they deem necessary to Non–Product Producers (e.g., cutting tools & fixtures, etc.), Contract Services, and Business, processes. Non–Product producers and Business processes selected should directly support product and customer requirements.

The UTC members and their producers shall develop and execute process certification implementation schedules that will satisfy UTC business, customer and industry requirements.

5. GENERAL REQUIREMENTS:

System Requirements

When industry and customer standards / requirements exist the UTC members may invoke that standard (Refer to Figure 1) as their primary method to satisfy the System, Process Control Plan, and Audit requirements defined in paragraphs (5., 5.1, & 5.3). To consider a process certified, the process must meet the process capability requirements defined in paragraph (5.2), or equivalent industry standard, or higher as defined by the UTC member.

UTC Commercial members and commercial units within UTC Power and Hamilton Sundstrand Industrial can use UTC's Supplier Quality Manual (SQM) as their primary process control requirement.

UTC Aerospace members will use the Industry Standard for Variation Management of Key Characteristics, (SAE AS 9103) as their primary process control requirement for aerospace products in addition to the requirements of this specification.

Additional paragraph 5 – System Requirements that are not specified in AS 9103, include the following:

- Paragraph 5. – System Requirements
- Paragraph 5.1 – Process Control Plans
- Paragraph 5.2 – Process Certification
- Paragraph 5.3 – Criteria for Compliance, Control & Continuous Improvement

As a minimum, the Producer shall develop and document a Process Certification or Control System that includes the following:

- An appropriate organizational structure, reporting process, necessary procedures, and roles & responsibilities to ensure implementation and continuous improvement of processes.
- Process Certification or Process Control training in procedures, methodology and tools.
- Variation management in design, (where applicable).
- Process mapping that illustrates the progression of the upstream through the downstream process flow and identifies the applicable KPIs and KCs.
- A Self–Audit Plan for Control Plans and the Producers Process Certification System.
- A monitoring system for up–stream processes, KPIs, process KCs, and UTC member identified KCs.
- A Method to communicate KCs to **producers** and sub–tier suppliers.

- When the UTC member has not identified KCs, the Producer shall have a methodology for selecting processes and KCs with priority based on their internal requirements (i.e., quality, capability, process, and delivery performance).

Note: *Alternate Process Control Systems that satisfy the requirements of UTCQR–09.1 shall be considered acceptable.*

5.1 Process Control Plans

The Producer shall develop and maintain a process control plan. This control plan collects all relevant information used to control KPIs and KCs that are determined to be significant sources of variation to the KCs and processes being certified. The need for standardization, consistency, and simplicity should be considered.

5.1.1 The Process Control Plan shall contain as a minimum:

- Processes to be monitored or generic process identification.
- KC description and requirement.
- KPIs settings and control method.
- Expected process capability of defined KCs.
- Process steps where measurements are taken.
- Type of control method used to monitor the process and KCs (e.g. control chart, etc.).
- Subgroup size used for process control / monitoring (if required).
- Frequency of measurements / monitoring.
- Method of measurement, or gaging, (gage capability requirement may be included).
- Actions required when capability levels are not maintained.
- Self Audit frequency based on process / KC capability performance cannot exceed a twelve month period.

5.1.2 Producers are required to maintain instructions in English and the Producer's language.

Note: *If the above items are available in the process operation (e.g., work instructions, manuals, etc.), they do not need to be documented in a stand alone process control plan.*

5.2 Process Certification

The following requirements shall be achieved to consider a process / KC certified.

Note 1: UTC members reserve the right to identify a capability index type and capability value higher than that defined above to satisfy downstream process or UTC member requirements (e.g., Ppk, Cp, Cpu, Cpl, Cr, DPM, PPM, Percent of Tolerance used, etc.).

Note 2: When the UTC member or producer KC is not currently in process for Mfg processes, data from similar parts and features with the same tolerance produced in the same cells or machines may be used to monitor the process. For business / support processes similar processes with the same requirements may be used.

5.2.1 Sequential steps to implement Process Certification:

- Process Mapping the current process steps / elements to identify KPIs and the process KCs that impact the process and/or KCs identified by the UTC member that must be controlled, monitored, and continuously improved.
- Identify current process performance or output for each process step.
- Determine customer, requirements, schedules, or demands, for each process step.
- Identify process elements not meeting customer or downstream requirements.
- Verify and document that the measurement processes used for all variable and attribute KPIs & KCs are capable (i.e., repeatability, reproducibility, correlation studies, and total process capability).

  Note: *For Business / Support processes, complete repeatability and reproducibility studies as required to ensure the accuracy of the information, service, or deliverable.*

- Identify controlling actions to maintain process capability and re–action plans for out of control conditions as they occur at the workstation. If work instructions do not exist, documented control plans are required.
- Implement a process monitoring method.
- Preventive Maintenance Plan.
- Business Processes must Incorporate a customer feedback system.
- Perform self audits.

  Note: *The UTC member, as they deem necessary, will communicate those Business processes that will be subject to this requirement.*

5.2.1.1 Variable Measured Characteristics

A process is considered certified when:

- Assignable causes have been identified, documented, and removed.
- Process inputs and KCs are identified, monitored, and controlled.
- A minimum of twenty–five (25) consecutive observations or thirty (30) days of output whichever is greater, capturing variability associated with step to step, piece to piece, set up to set up, time to time, and lot to lot variation, with no nonconformances detected.
- KCs are under statistical control and Cpk of 1.33, or better is demonstrated.
- When the UTC member or producer identified KC is not currently in process, continuous monitoring of the process and sample observations are required to demonstrate stability and ensure Process Control Plan requirements are being maintained. (Reference paragraph 5.2.1.3, Note 2)

5.2.1.2 Attribute Measured Characteristics

A process is considered certified when:

- Assignable causes have been identified, documented and removed.
- Process inputs and KCs are identified, monitored and controlled.
- A minimum of forty–five (45) consecutive observations (90% confidence) or (30) days of output whichever is greater, capturing variability associated with step to step, piece to piece, set up to set up, time to time, and lot to lot variation, with no nonconformances detected.
- When the UTC member or producer identified KC is not currently in process, continuous monitoring of the process and sample observations are required to demonstrate stability and ensure Process Control Plan requirements are being maintained. (Reference paragraph 5.2.1.3, Note 2)

5.2.1.3 Certification Of Business and Support Processes

If the process utilizes variable data (e.g., Cpk, etc.) to measure process capability, the certification requirements as stated in paragraph 5.2.1.1 apply.

If the process does not utilize variable data, then certification shall be based upon:

Option 1: A minimum of (45) consecutive observations with no non–conformances or Turnbacks detected that would impact 100% compliance to customer / downstream process requirements.

AND / OR

Option 2: Six (6) consecutive months of 100% compliance to customer and downstream process requirements that must be continually monitored.

5.3 Criteria for Compliance, Control & Continuous Improvement

5.3.1 After initial certification Mfg. Processes (using industry standard rules for SPC) must continually meet the capability requirements. Business or Support processes must be monitored as required to ensure the process capability will consistently meet requirements.

5.3.2 UTC members may monitor compliance using the Process Certification Assessment / Audit Form, UTCQR Form 2.

For Business processes only, those identified by the UTC member will be subject to audit.

5.3.3 The Producer shall perform and document periodic self–audits of the process control system and their compliance to the process control plans.

Frequency of audits shall be completed at least once every twelve (12) months. Additional or more frequent audits may be necessary depending on the ability of the process / KC to consistently meet this requirement.

Documentation is subject to UTC member review.

5.3.4 The producers identified KC, process control data and capability levels as required by this requirement, must be maintained and available to the UTC member upon request.

5.3.5 Producers shall notify the responsible UTC member if any UTC members identified process or KCs cannot meet the requirements of Para 5.2.

5.3.6 Equivalent Process Certification, Control Systems, and Control Plans that satisfy this requirement will be evaluated using Process Certification Assessment / Audit Form, UTCQR Form 2 or equivalent.

6. PROCESS MODEL AND OUTPUTS:

FIGURE 1: Process Certification "Industry" Requirement Flow Diagram

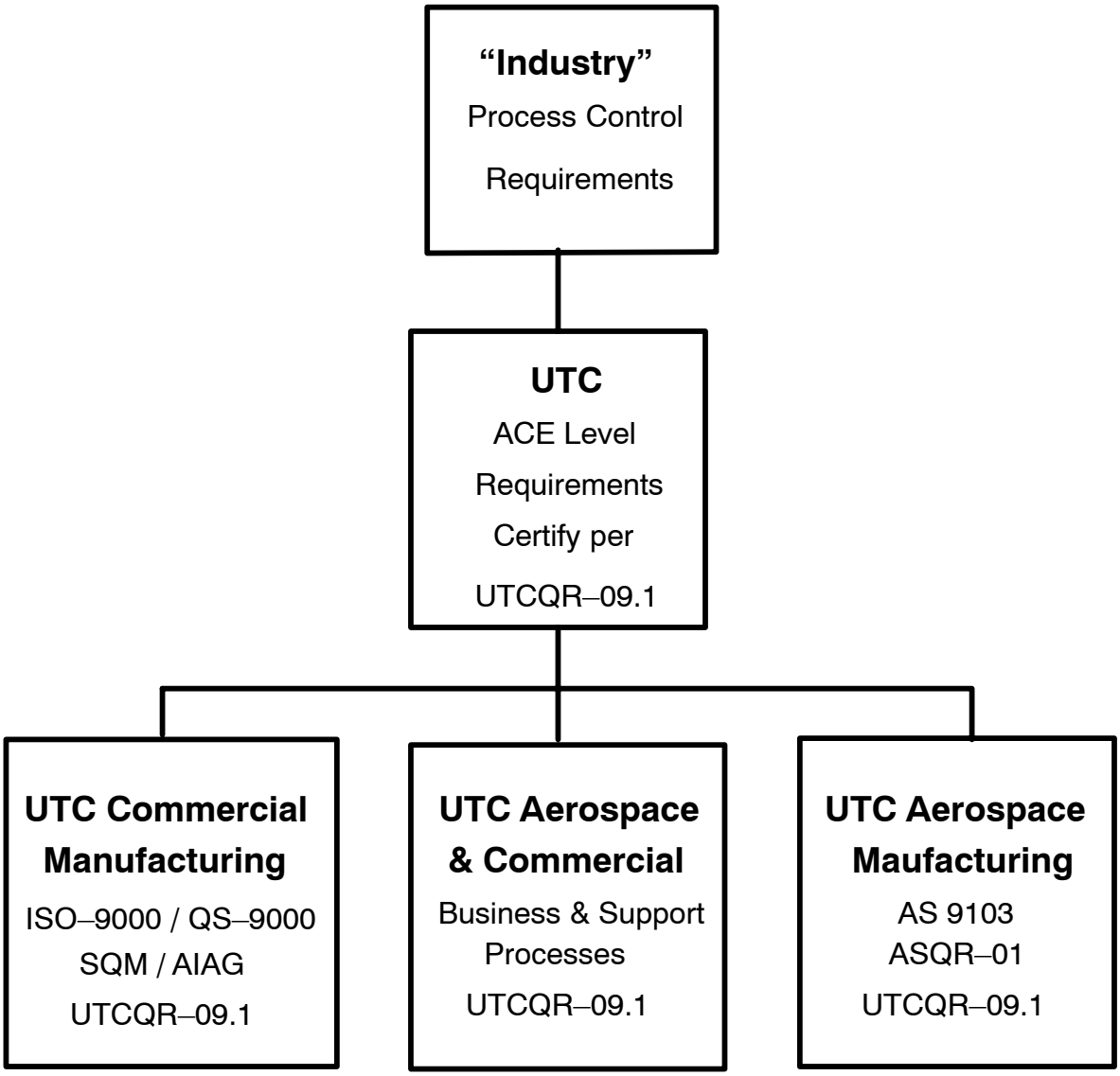
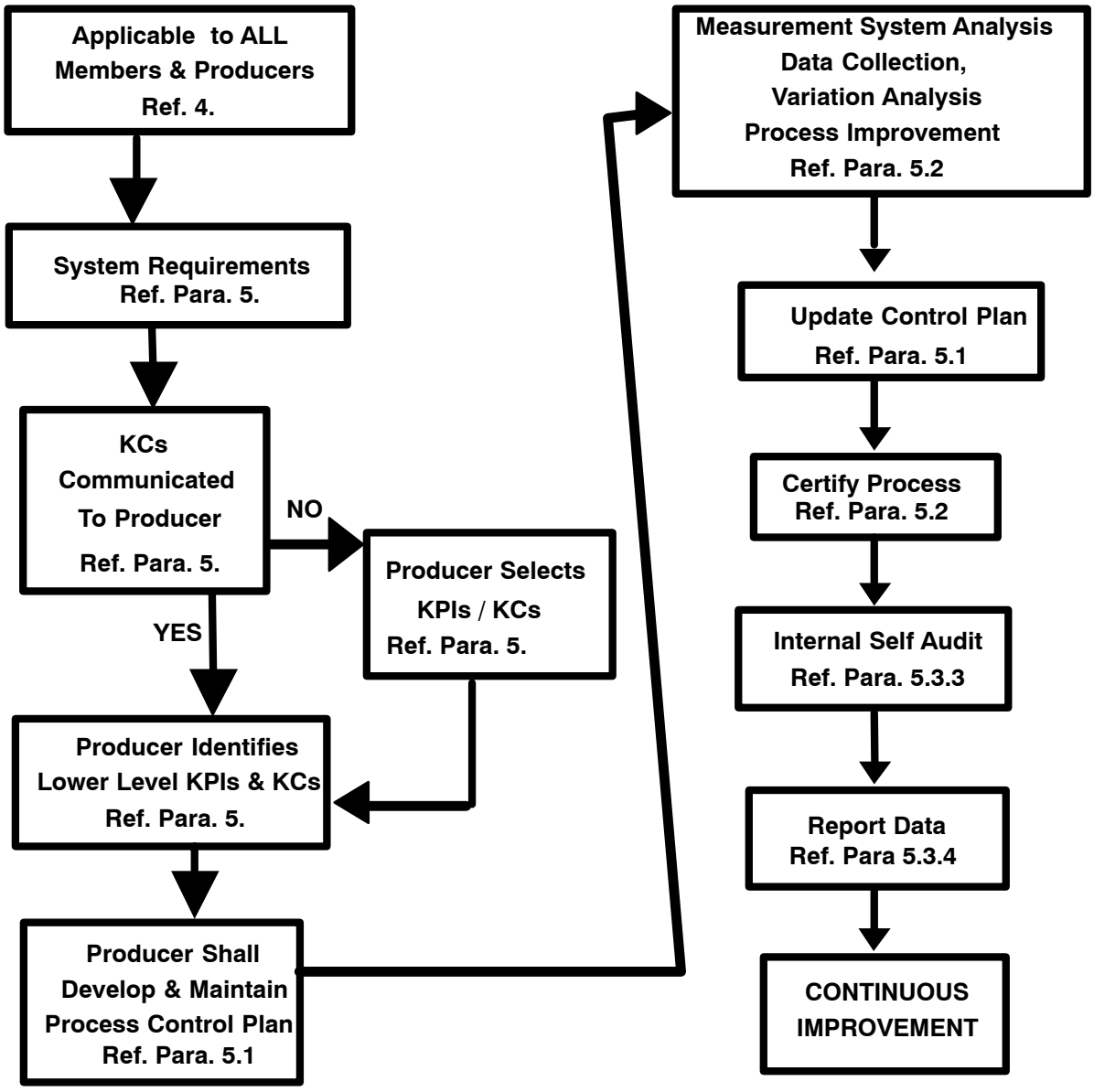


FIGURE 2: Process Certification Flow Diagram



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