Data Collection and Analysis for Contractor Process Controls

DCMA HQ: Joint Strategic Quality Council

14 March 2024

Tracey Lockhart

Head of Quality and Business Improvement Rolls-Royce

Joint Strategic Quality Council (JSQC) – The Joint Strategic Quality Council is a collaborative, non-competitive partnership, improving performance through mutually beneficial quality assurance initiatives.

* IAQG – International Aerospace Quality Group

* AIA – Aerospace Industries Association

* NDIA

***Major Defense Acquisition Program Contractors**

Executive Quality Council (EQC): A test bed for the JSQC projects

Industry Participants

* Images are a small representation of participating companies and other industry contractors

JSQC Sponsored Initiatives – Currently Active

- Selection of projects JSQC is currently working on include:
  - Common Supplier Flow Down: Industry standardization of quality flow down requirements
  - Remote Surveillance (NAS413): Use of Virtual / Remote (V/R) Technologies
  - FOD/FOE Projects (NAS412): DCMA adoption of Industry standard FOD terminology
  - Data Collection and Analysis for Contractor Process Controls
  - GIDEP and Product Acceptance: DCMA GIDEP process standardization (reduce variability)
  - Model Based Quality Assurance: Industry standardization of quality data (parameters) integrated within the digital model throughout the product lifecycle reducing the risk burden contributed by quality

Savings Allows Contractor/Government Work Force to Move to Higher-Value Quality Activities

Data Collection and Analysis for Contractor Process Controls

Project Objective:

- Optimize government oversight by utilizing available capability and quality data, to manage risk enabling informed allocation of resources

Deliverables:

- White paper documenting proposed guidelines for data collection and review
- Select current industry standard for edit or create standard to document process for reducing customer surveillance
- Provide input to government instruction documents (MAN 2303-01 “Surveillance”)
- Verify this work can be done at a site/program level and eliminate the idea that this capability data must be held at a high-level database through DCMA

Conformance doesn’t lead to control but control leads to conformance

How to Participate

- Baseline:
  - Mature QMS (AS9100, or as required by customer) along with strong statistical process control culture
  - Use of metrics to monitor product/process compliance
  - Evidence of data analysis to drive continuous improvement
- Step 1:
  - Guideline/Requirement part of the contract flow-down allowing option to participate (new contracts)
  - Independent request to customer by supplier to participate (for legacy contracts)
- Step 2:
  - Identify candidate product/processes and submit to DCMA during initial assessment or after maturity achieved
- Step 3:
  - Review of process/product data by DCMA
  - Approval of request by DCMA and adjustment of surveillance plan

What this is not?

- DCMA surveillance does not replace the suppliers' planned inspection activities. These are governed by the suppliers' internal procedures and/or industry standards.

- Adjustment of DCMA surveillance activities:
  - Focuses only on the contractual government surveillance (ie: Government Mandatory Inspections Points (GMIP), Critical Safety Item (CSI), DCMA risk-based standard surveillance activities), which occur in addition to the suppliers' inspections.
  - Will be driven by the published guideline/requirement. The supplier cannot use the adjustment in GMIP (or other as seen above), as justification to reduce their internal surveillance levels.

Recommended Monitoring Metrics

- The working group considered several manufacturing metrics across its industry members
- Two common metrics were down-selected to allow for flexibility and adaptation by both high and lower volume applications:
  - First Pass Yield (FPY), and
  - Process Capability Index, Cpk
- The supplier will have the option to propose which of the metrics will be used for monitoring, depending on the process/product
- It is possible that for the same supplier, one metric will be used in one area of the manufacturing flow path, and the other one in a different area

Proposed Guidance on Capability Data Collection

Piece Part / Component Data Collection – How to

- Measurement System Analysis (MSA) to be completed on gages used to collect capability data
- Performance data must represent at least 3 independent batch runs of product
- Performance data must represent at least 30 independent units
- If a program (part number) does not have high enough volume data, part families considerations can be made if manufacturing processes are similar between part numbers
- Although not preferred, other metrics (except FPY, Cpk) could be considered, but must have strong objective evidence available to review where a reasonable decision can be made to reduce inspection Evidence must show:
  - *A reduction in non-conforming material (NCM) or* other non-conformance items
  - Improved control of a process showing a "from / to" position of control data
  - Proven reduction in risk on the process (PFMEA / Control Plan)
  - Reference section 4.1 of RM13006 for the 9 process control methods
    - Error/Mistake Proofing, Control Charts for Variable Data, Run Charts with non-statistical limits, Pre-Control Charts, Life/Usage Control, Attribute Control Charts, Visual Process Check and Checklist, First Piece Check and Test Piece evaluation

Proposed Guidance for Level of Surveillance

Surveillance Levels		Non-Critical Part*	Critical**	NASA (Class A***)
Reduce	Agreed reduction from current oversight, up to no onsite surveillance	FPY>92%, or Cpk>1.33	FPY>95%, or Cpk>1.5	FPY>99%, or Cpk>2.00
Maintain	Proceed with agreed contractual inspection points and cadence	FPY 85%-92%, or Cpk 1.00 to 1.33	FPY 85%-95%, or Cpk 1.00 to 1.5	FPY 99%-95%, or Cpk 1.33 - 2.00
Increase	Increase to 100% inspection	FPY<85%, or Cpk<1.00	FPY<85%, or Cpk<1.00	FPY<95%, or Cpk<1.33

*Non-critical are those items not defined as Critical:
- Inspection points that are assigned not due to product safety / anything not in critical category

**Critical:
- Safety of flight / CSI / Criticality coded features per AS6500 (also seen in AS9145)

***NASA:
- Performance surveillance levels also proposed for Classes B through D (not included here)
- Currently focusing on non-human flights

Proposed Guidance on Capability Data Collection

Data Presentation to Customer

- Supplier to present capability data to DCMA to request a change in surveillance. Performance and MSA data must be provided
- Supplier must continue to provide data in pre-agreed cadence. DCMA has the right to ask for additional data if they find a non-conformance during product inspections or MRB requests.
- When required, DCMA and Supplier (or Prime) will request contractual amendments for reduced Government Mandated Inspection Points (GMIPs) or other contractually required inspection points.
- Surveillance levels to be maintained by continued process data. If a non-conformance is identified but process capability remains within agreed levels and no process risk has changed, increased surveillance shall not be triggered so long as the non-conformance did not escape to the customer.
- For features or processes that are pushing state of the art and centered tight performance is not possible, DCMA and Supplier may agree on values that are different than in the recommended guidance, as multiple 100% inspections do not always provide increased value to the product

* Any mention of DCMA could be replaced with customer

Remaining Work

- Define example guidelines for inspection effort at each of the surveillance levels (baseline, increase, reduce)
- Finalize how a supplier can dispute process in the event of issues during implementation of process
- Publish white paper to introduce new process to industry
- Decide document to publish guidance/requirement. Following are under consideration:
  - Existing Industry Std: ARP9009, ARP9134, AS9100, AS6500, AS9145, MAN2303-01, or
  - New Std: AIA (NAS standard), NASA standard

Questions, or Recommendations?