Aearo Technologies LLC – a 3M company

Supplier Quality Requirements Manual

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Section 1: Introduction

Dear Supplier:

This Aearo Technologies LLC – a 3M Company (hereafter referred to as Aearo) Supplier Quality Requirements Manual has been developed to provide the foundation for the business process necessary for the achievement of competitive performance and business results. We view your relationship with Aearo as a “Performance Based Partnership.” As our supplier, we ask you to focus on pre-determined performance objectives. These objectives deal with Quality, Cost, Delivery, and Partnership. This manual is structured around these objectives.

We believe that the implementation of the requirements in this manual will aid suppliers in the realization of processes that will mutually contribute to the future competitiveness of both Aearo and its supply base.

Sincerely,

Matt Gualdoni
Director, Quality & Regulatory

Changes in this Revision:

Revision 3 flows down requirements compliant with updates to current organizational requirements and those required by current versions of ISO 9001, AS9100, and IATF 16949, including requirements of interested parties, as applicable.

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Section 1: Scope

This document establishes Aearo's quality system requirements for suppliers who design, manufacture and control respective parts and assemblies as well as suppliers who manufacture products, materials, or perform services in accordance with Aearo's designs and requirements. These quality requirements, include product safety, statutory, and regulatory, as applicable, and apply to Manufacturers, Distributors, and Special Processors providing parts/services for Aearo when this document is specified by inclusion on Purchase Orders, Engineering Drawings, or contracts issued by Aearo.

Aearo's Director of Quality & Regulatory or the appropriate Industry specific representative must approve deviations to the requirements included herein. Requests for deviation must be submitted in written form.

NOTE: Refer to appendix B at the end of this manual for the appropriate contact information.

Section 2: Aearo's Quality Policy & Customer Commitment

2.1 Quality Policy

To meet our customers' needs by:

- - Meeting all applicable requirements; and
- - Continual improvement of the quality management system

2.2 Commitment to Customers

Our commitment to our customers is to:

- provide value-added service on a competitive basis;
- do it right the first time; and
- respond to their needs in a timely manner.

Aearo desires to partner with suppliers who are committed to the same level of Quality and Customer Satisfaction. We cannot achieve our commitments without the support of our supply partners. We believe in building this performance based partnership through communication of these shared goals and periodic reviews of performance to them. It is important that, as a partner, you recognize that your contribution is a key component to the effectiveness of Aearo's Quality Management System. Your input in providing conforming products and/or services, along with continual improvements, is an integral part of our ability to achieve customer satisfaction. Your commitment to ensuring no counterfeit materials, product safety, where applicable, and ethical behavior are an expectation of this partnership.

Section 3: Quality

3.1: Becoming a Qualified Partner

3.1.1: Supplier Certification:

Aearo has adopted an approved supplier program for its suppliers. The driving force behind this supplier approval program is to recognize suppliers who demonstrate the ability to meet Aearo's requirements in terms of quality, delivery, cost, and service. This program is used as a basis for selection of suppliers when awarding new business.

Supplier performance is reviewed on a quarterly basis. Performance ratings are communicated, at a minimum, to those suppliers whose performance requires corrective action.

Suppliers who demonstrate unacceptable performance or are unable to demonstrate continued improvement may be disapproved and removed from the approved list. Should this occur, the supplier will have to submit a corrective action plan and begin the certification process again to become requalified prior to sharing in lost or additional business opportunities.

3.1.2: Supplier Survey:

Prior to becoming an approved supplier, the supplier must obtain, complete, and return a Supplier Quality System Survey form. This self-assessment will be used to determine receiving inspection levels and to determine if there is a need to audit the supplier's facilities prior to approval.

Note: The Supplier Quality System Survey form can be obtained from the Aearo Purchasing or Quality Dept. Refer to Appendix B at the end of this manual.

3.1.3: Quality System Requirements:

Suppliers who hold design authority and who also manufacture materials, components, or assemblies must employ a documented quality system that is compliant with the requirements outlined in this document, and be registered to a current quality management system standard, unless otherwise waived. Design control requirements will apply.

Suppliers who do not hold design authority but who only manufacture materials, components, or assemblies in accordance with Aearo design documents must meet the same requirements. However, design control requirements will not apply.

> **Note:** Maintaining a current registration to AS9100, ISO 9001 or IATF 16949 meets the quality management system registration requirement of this section.

3.2 Product Qualification Requirements:

3.2.1 Material Approval Requirements:

An approved supplier must submit the following to secure approval for use of a new material:

- Appropriate Technical Literature and Sales Specifications;
- A Certificate of Compliance or Certificate of Analysis, as requested;
- A signed acknowledgement of the applicable material specification, if required;
- A completed Restricted Substances Survey. A copy of this form can be obtained by contacting Aearo's Purchasing Manager (refer to appendix B).
- A Safety Data Sheet (SDS), including TSCA (Toxic Substances Control Act) data, if appropriate;
- For materials going into an automotive or commercial vehicle application, a supplier may be required to provide an appropriate material release within the International Material Database System (IMDS), as well as a bulk material PPAP when appropriate.

3.2.2 Part Approval Requirements:

Part approval may be required at 3 different stages of product development:

- Prototype;
- Prelaunch (also known as "Preproduction");
- Product Launch (also known as "Commercialization" or "Mass Production")

Refer to section 4.9 for additional process and product change notification and/or approval requirements.

The processes that should be followed are described in sections 3.2.2.1 through 3.2.2.2. Contact Aearo's Quality Department for electronic copies of forms associated with the FAIR submission process (refer to appendix B).

3.2.2.1 Prototype / Prelaunch Tooling & Part Development/Approval Process:

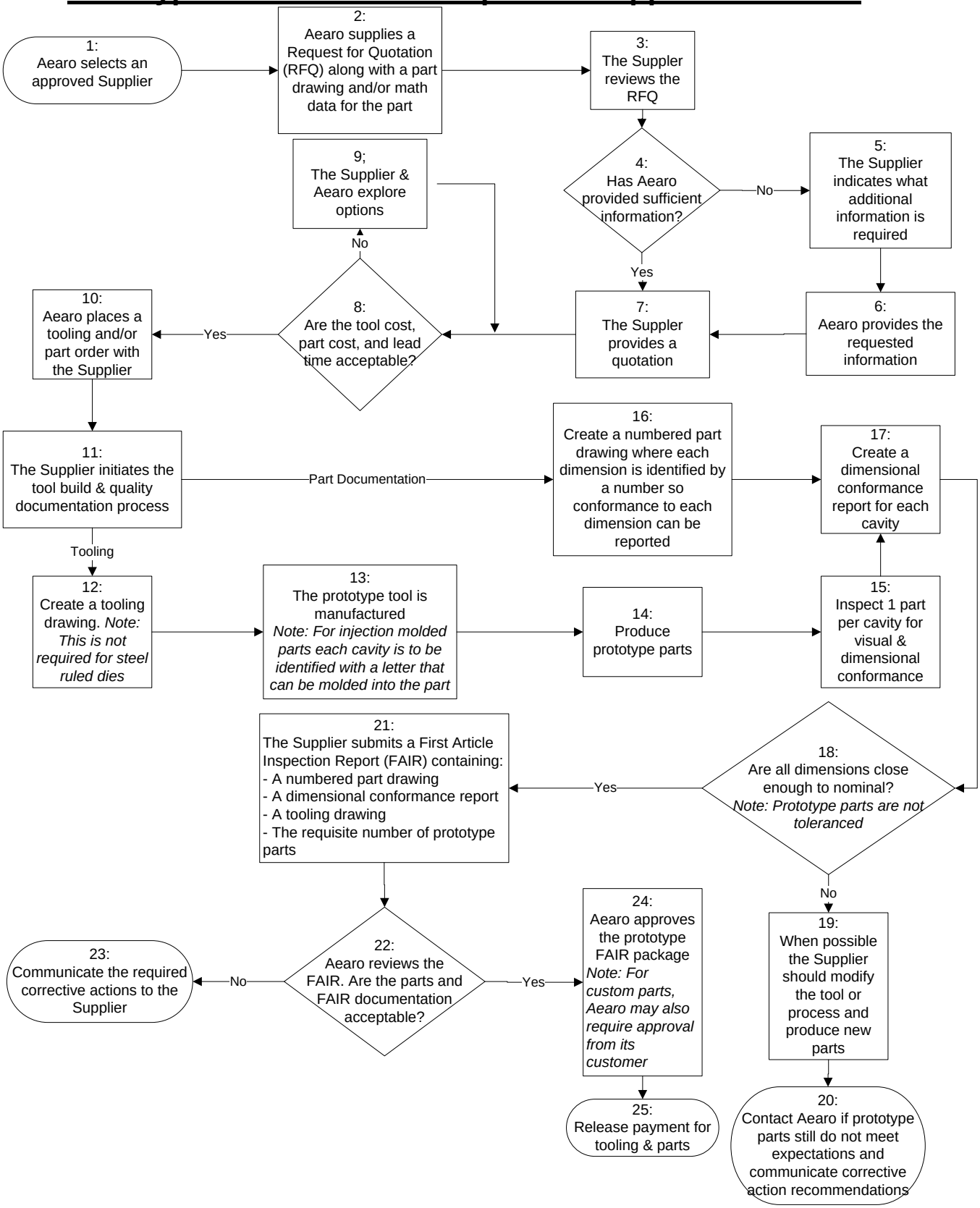
First article submission requirements for prototype and prelaunch parts are as follows unless otherwise requested:

- If a drawing was used to create the parts, submit a copy with each dimension uniquely identified e.g. – by numbers or letters;
- Submit a dimensional report indicating how closely the parts match the nominal dimensions indicated in the drawing;
- Submit a tooling drawing (for molding tooling);
- Submit the requested number of sample parts;

- Submit any additional test data requested (e.g.- RoHS compliance or flammability test compliance results).

The following process flow should be followed to develop prototype tooling and parts.

Prototype / Prelaunch Development & Approval Process



3.2.2.2 Production Tooling & Part Development/Approval Process:

The development and approval process for Production Tooling and parts is more detailed. The flow chart at the end of this section illustrates the process.

First article submission requirements for production parts are as follows. Depending on the market the product is intended for, the packet of information that makes up the First Article Inspection Report (FAIR) may be requested in different formats.

- For the automotive or commercial vehicle markets, the FAIR information may be requested in a Production Part Approval Process (PPAP) format. If not otherwise specified, the default submission level is 3.

- For the aerospace and defense markets, the FAIR information may be requested in an AS9102 format.

- For other markets, Aearo's customers may require their own customer specific format for custom parts. The specific format required will be communicated by the Aearo Project Engineer communicating the purchase order requirements to the Supplier.

If a PPAP or AS9102 FAIR submission format is not requested, the following documents should be included in the FAIR submission.

3.2.2.2.1 Part Submission Warrant (PSW):

The PSW is the essentially the cover page of a FAIR submission packet. It communicates why the FAIR is being submitted. It also communicates that the FAIR fully meets requirements, or the supplier cannot, it identifies what issues the supplier has had in meeting all requirements and proposed corrective actions.

3.2.2.2.2 Part History:

The Part History page is intended to maintain a history of the changes over the life of the tool or part. Examples of what to add are:

- New Tool;
- Additional Tooling;
- Modified tooling;
- Part Revision, e.g. – New material being qualified on an existing tool;
- Etc.

3.2.2.2.3 Process Flow Diagram:

Flow diagrams (also called maps) depict the process steps and inspection sequences required by the supplier to produce the product. Sub-tier suppliers that are feeding the process by providing material, hardware, manufacturing and special processing may be required to be depicted on the flow map upon request.

3.2.2.2.4 Design and/or Process Failure Modes and Effects Analyses (when requested by Aearo):

Failure Mode and Effects Analysis (FMEA) is utilized to identify all potential failure modes associated with the design, manufacturing, processing, installation, and performance associated with the product.

3.2.2.2.5 Control Plan:

A control plan is a document that addresses the methods used for process control in the steps indicated on the process flow diagram. The Control Plan should also address controls in place to address the high risk priority number issues identified in the PFMEA as well as Key Control Characteristics where applicable.

3.2.2.2.6 Numbered Drawing (When supplying dimensional conformance data to a drawing):

A numbered drawing should be created and submitted to clearly indicate which feature on the part was verified against the part drawing. Each feature of the part design must be identified.

3.2.2.2.4 Dimensional Conformance Report:

The supplier shall perform first article inspection measurements on new/revised parts, assemblies, or kits to verify compliance with all engineering characteristics identified. This includes not only dimensional conformance verification but also verification to additional requirements such as drawing notes. For multi-cavity tooling, clearly indicate which cavity of the tool the measured part result comes from.

In the case of an assembly or kit, the supplier shall perform a first article inspection on each geometric shape contained in the assembly or kit.

3.2.2.2.5 Statistical Process Control (SPC) Requirements:

SPC is required for production volume tooling approval and for ongoing process control when a Key Control Characteristic (KCC) requiring SPC is identified on the part drawing. The KCC dimension should exhibit a Cpk $\geq$ 1.33 for initial production tooling / part approval and for ongoing process control, unless otherwise specified.

3.2.2.2.6 Gage Acceptance Criteria:

It is expected that the supplier will use measurement devices appropriate for the tolerances specified. Gages used to measure KCC dimensions shall exhibit a % Repeatability and Reproducibility of Specification that does not exceed 30%. A Gage Repeatability and Reproducibility chart shall be submitted as part of a Production FAIR.

3.2.2.2.7 Packaging Plan:

A Packaging Plan may be created and submitted to ensure that conforming parts are not damaged in post production storage and shipment activities. Refer to clause 6.2.

3.2.2.2.8 Tooling Drawing (When the tooling is owned by either Aearo or its customer):

A tooling drawing should be submitted for molding tooling. This is not required for processes where parts are created via steel ruled dies or with CNC part creation processes, e.g. CNC controlled waterjet or dieless cutting processes.

3.2.2.2.9 Tooling Identification (When the tooling is owned by either Aearo or its customer):

Tooling must be clearly identified to communicate ownership. Unless otherwise directed, tooling shall be identified with:

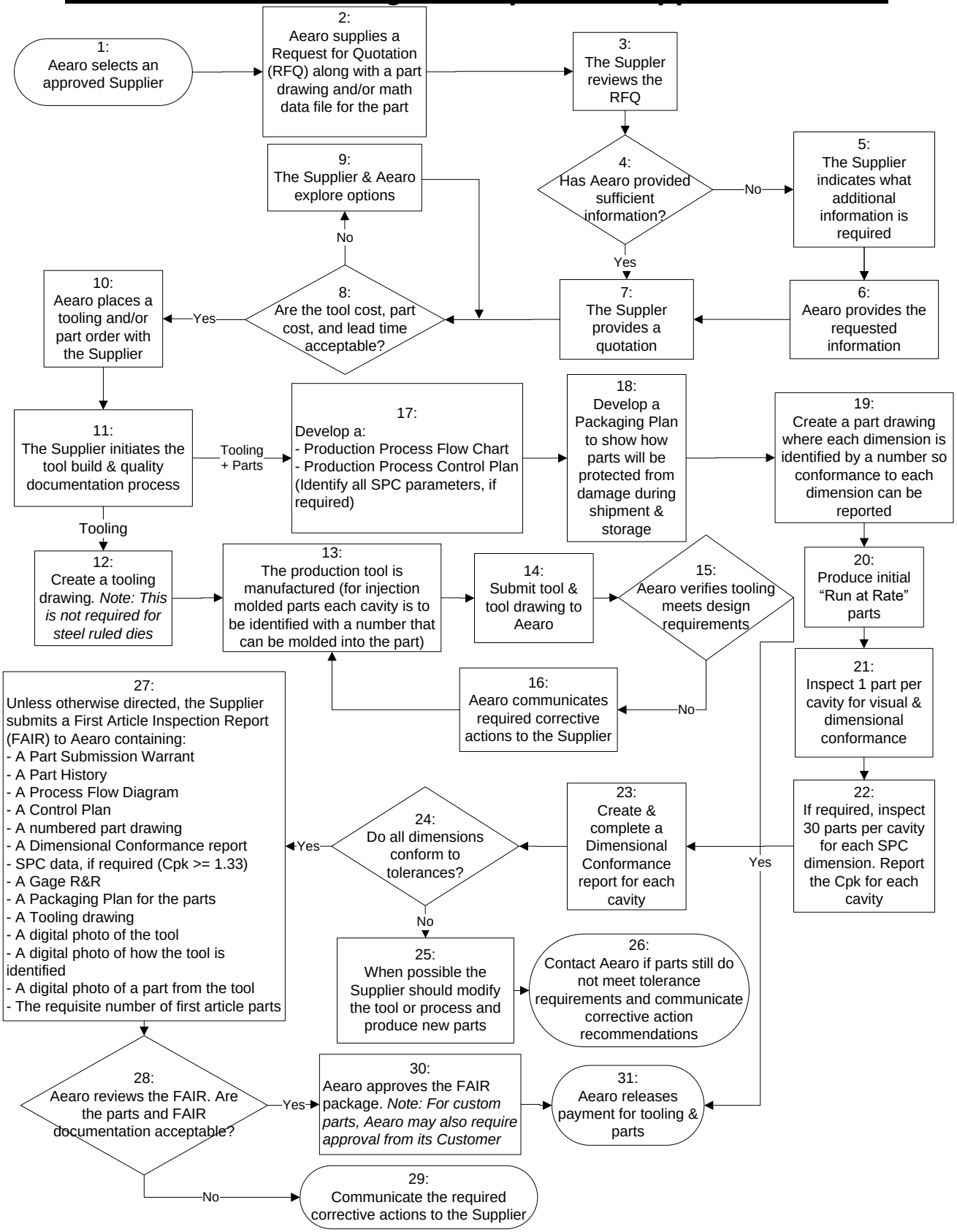
- Proof of ownership, e.g. - “Property of _____”
- The tools relationship to the part being qualified, e.g. - “Part Number _____, Revision _____”
- Cavity Numbers contained in the tool, if appropriate, e.g. – “Cavities ___ through ___”

Submit a digital photo of the tool itself and also a photo that clearly shows the tool’s identification.

3.2.2.2.10: Submit a digital photo of a part as well.

3.2.2.2.11: Submit the requested number of FAIR parts associated with the tool/part qualification order.

Production Part/Tooling Development & Approval Process



3.3 FAIR Submission:

The FAIR shall be retained as a Quality Record at the supplier's facility and a copy shall be submitted to Aearo prior to, or along with, the first production or experimental lot shipment. The sequence of submission should be agreed upon with Aearo's project engineering representative in advance.

Submission of a FAIR is required for approval of both prototype and production tooling. FAIR submission requirements differ for prototype versus production volume tooling. Refer to the appropriate flow chart for specific details.

- The FAIR should be submitted to Aearo's Quality Department (See Appendix B for contact information).
- The FAIR should be clearly marked as either "Prototype FAIR" or "Production FAIR".

Note: The FAIR forms referenced in this manual can be obtained as Microsoft Excel forms from the Aearo Quality Department. A list of contacts is attached in appendix B

3.4 Production Requirements:

PRODUCT KNOWN TO BE OUT OF SPECIFICATION, OR HAVING LESS THAN THE REQUIRED Cpk LEVEL MUST NOT BE SHIPPED TO AEARO WITHOUT FORMAL APPROVAL IN WRITING FROM AEARO'S QUALITY DEPARTMENT.

Section 4: Aearo Supplemental Quality Requirements

This section contains additional or clarifying Quality Requirements, and they are considered equal to the requirements in Section 3. If there is a conflict with the requirements in Section 3, the requirements in Section 4 take precedence.

4.1 Traceability:

The supplier shall maintain the ability to trace their product from the lot identification, as shipped to Aearo, back through their manufacturing system to the raw material source, unless otherwise agreed to in writing.

4.2: Configuration (Design & Document Control) Requirements for Aerospace & Defense Applications:

It is the supplier's responsibility to produce materials that meet all engineering drawings and specifications. Suppliers shall have a system to control review, updating, re-approval, distribution, storage and removal of engineering drawings, specifications, flow charts, control plans, FAIRs, procedures, and work instructions. It shall also ensure that changes and the current revision status of these documents are identified.

The Supplier shall be responsible for controlling / tracking the actual configuration of the parts and components to the approved requirements and/or changes to ensure that the end product meets specified functional and physical requirements of the contract. This includes any part or component manufactured to the Aearo's (including Aearo's customers) or the supplier's drawings, specifications, or special process procedures. The supplier and the customer shall document agreements as to the extent of customer involvement in configuration management to be applied to the contract / purchase order.

Suppliers shall notify the Aearo purchaser when the engineering data in the supplier's possession does not agree with the latest revision data reflected on the Purchase Order or applicable Drawing.

4.3: Record Retention:

It is the supplier's responsibility to produce materials that meet all engineering drawings and specifications and to maintain records demonstrating conformance to requirements.

Suppliers shall have a system to control updating, distribution, storage and removal of engineering drawings, specifications, flow charts, control plans, FAIRs, procedures, and work instructions.

Aearo's record retention requirements for its suppliers are dependent upon the market(s) for which the materials and products purchased are designated.

- Aerospace & Defense Markets: For materials and products being purchased for these markets, the supplier shall establish and maintain a record system to retain quality records for a minimum of ten (10) years after product shipment, unless otherwise specified in a purchase order or contract.

- Automotive & Commercial Vehicle Markets: For materials and products being purchased for these markets, the supplier shall establish and maintain a record of the PPAP for as long as the part remains active plus 1 calendar year. For parts with no customer-owned tooling or situations where multiple parts are made from the same tool, written authorization is required from Aearo's (or its customer's) purchasing group to deactivate the part.

  NOTE: An "Active Part" is one currently being supplied to Aearo for original equipment or service applications. The part remains active until tooling scrap authorization is given by Aearo or its customer. For bulk materials, "Active Part" refers to the bulk material contracted, not the parts that are subsequently produced from that material.

- If market specific record retention requirements are not communicated, the default requirements shall be to establish and maintain a record system to retain quality records for a minimum of three (3) years after product shipment, unless otherwise specified in a purchase order or contract.

4.4: Right of Access:

Aearo, its customers, and/or airworthiness authority's representatives shall have the right to conduct QMS, process, and product audits at the supplier's (including sub-tiers) facilities in order to verify the compliance with the Supplier Quality Requirements, contracts, drawings, and/or purchase order requirements.

4.5 Flow Down of Requirements:

In some cases, Aearo or its customers will have requirements which are also applicable to products purchased from your suppliers. If this happens, the supplier is responsible for passing these requirements down through the supply chain. An example of this type of requirement could be a Restriction of Hazardous Substances (RoHS) compliance clause for materials used to manufacture product.

4.6 Hierarchy of Requirements:

In some cases, this manual will not sufficiently describe all of the specific requirements of Aearo or its customers. Requirements called out on the engineering drawings, Purchase Orders, or related documentation will supersede those in this manual.

4.7 Tooling Management:

The supplier shall establish and maintain a system for tool control. Formal procedures should be in place addressing handling, storage, modification, setup, design, approval, and preventive maintenance for tooling (also refer to automotive and commercial vehicle requirements in clause 4.3). All tooling purchased by Aearo or its customers shall remain the property of Aearo or its designee.

4.8 Age Control:

The supplier shall have an effective system for age control for items whose acceptability is limited by age of the item. The system should include a method of identifying the age of such items and provision for rotation of stock.

4.9 Process and Product Change Notification / Approval:

Once a process and product have been qualified, Aearo's project engineering and quality groups shall be notified of any proposed changes to process or product. Depending on the change, requalification and approval by Aearo and/or its customers of the product may be required in the following circumstances:

- Configuration changes (including form, fit, function or interchangeability). Examples are:

    a) Product Design changes, e.g. – Engineering Changes;

b) Composition changes, e.g. - When a different material is used to make the product other than that previously approved.

- Manufacturing Location changes, e.g. - When the tooling and/or processing equipment is transferred to a different manufacturing location;

- Manufacturing process changes, when the change to the manufacturing processes differs from the process described in a previously submitted control plan. Examples are;

  a) Fabrication process changes, e.g. - When new or modified tools, dies, molds, etc. are used in production (Note – This requirement does not apply when re-ruling steel ruled dies. This requirement also does not apply to perishable tools. Perishable tools are tools which are consumed in the process of producing a product, and are usually a cost item, I.e., drill bits, cutters, sockets, driver tips, inserts, etc);
  b) When a new subcontractor is used for parts, materials, and/or services described in the control plan;
  c) When the tooling, used for production parts, has been inactive for 12 or more months;
  d) When requalification of the tooling and/or process is required due to poor quality issues.

- Packaging Design changes;

- Shipping method changes.

4.10 Non-Conforming Product:

Aearo's and/or its customer's approval is required when the supplier wishes to provide material that is found to depart from Purchase Order or contractual (e.g. - technical document) requirements. To request and obtain Aearo Material Review Board (MRB) disposition, the following steps are required:

- The Supplier shall initiate a Nonconformance Report and report the nonconformity along with the requested disposition to Aearo's Quality Department (refer to appendix B).

- Aearo and/or its customers will review the request and communicate its disposition back to the supplier as follows:

  a) Use as Is: The supplier is authorized to ship the material or parts in question. Special identification of parts and/or packaging may be required, or;
     i) Rework/repair: In accordance with instructions communicated by Aearo on the dispositioned Nonconformance Report;
  b) The supplier shall inspect the reworked/repaired articles in accordance with documented procedures, or;
  c) Scrap: If product is deemed unacceptable by Aearo, the product must be permanently tagged as non-conforming and must be disposed of (scrapped) as quickly as possible to preclude inadvertent shipment to Aearo.

Note 1: This requirement applies to parts that are in full production. Materials and part conformance exceptions identified during the First Article submission process may not require MRB action as separate pre-approval requirements are usually already in effect.

Note 2: The supplier's nonconformance records shall contain traceability records documenting the actions taken as part of Aearo's MRB disposition process.

Note 3: Prevention of the use of counterfeit parts/materials is a key component to the management of nonconforming materials.

4.11 Qualification of Personnel:

The supplier is responsible for having a documented procedure for identifying training needs, or alternative requirements, to ensure personnel are competent to meet the requirements described in this manual and any other requirements communicated as part of the contract agreed upon to supply products or materials to Aearo or its customers.

Section 5: Cost Containment

5.1 Pre-production Cost Management Requirements:

The supplier is responsible for the pre-production cost management of all components. This shall be achieved through the application of an advanced product quality planning process.

Utilization of Process Flow Diagrams and Process Control Plans to plan prototyping and production activities meets the minimum expectations for this requirement.

5.2 Cost Planning:

- The supplier shall ensure that competitive cost targets are clearly established, understood, and are committed to at the earliest opportunity in any new material or part development program.

- Cost targets shall be mutually agreed upon for appropriate elements of cost and shall represent the target cost when volume production begins.

- These cost targets may be modified if there is a significant change in the part design or in subsequent post-commercialization raw material costs.

5.3 Cost Control and Reduction:

The supplier shall have a process that ensures;

- Costs are controlled during the life of the product.

- Potential cost reduction opportunities are actively pursued.

Proposals to add value, reduce or control costs, may involve the following areas of opportunity;

- Part Design
- Material Type
- Packaging Requirements
- Logistics
- Cycle Time Reduction
- Workplace Organization
- Validation Test Requirements

5.4 Design & Development Costs:

- The supplier shall clearly identify design & development costs in their product proposal, if applicable.
- The supplier shall commit to the provision of prototype and development components at fixed prices, recognizing the mutual benefit to be derived from the pre-volume build process. New materials / parts must be charged at the agreed to production volume price once the part is fully approved.
- To support the advanced quality planning process, the supplier should fund the production of a sufficient quantity of parts to demonstrate achievement of the targeted levels of process capability.

Section 6: Delivery Process

6.1 General Logistics Requirements:

- 100% on-time delivery is expected. The acceptable delivery window is up to 5 days early and 0 days late.
    a. On time delivery is calculated based on receipt of the complete quantity of parts ordered.
- Where transportation is provided by Aearo, the supplier must ensure that products, together with the appropriate means for labeling and loading, are available at the required times.
- Where transportation is the responsibility of the supplier, the supplier shall have an effective transportation policy. The policy shall be regularly reviewed for cost effectiveness and success in meeting Aearo requirements.
- The supplier shall measure transportation performance as a means of identifying further opportunities for delivery performance improvement.
- The supplier shall have a documented procedure which assures old revisions of a product will not be delivered after product modification or revision. Alternative transition plans are acceptable if mutually agreed upon.
- Delivered parts must meet quality requirements.
- Any extra cost, associated with a supplier's failure to meet Aearo (agreed upon) delivery, quantity, and quality requirements, will be debited back to the supplier.

- The supplier shall manage logistics via their supply chain to ensure the ongoing compliance to Aearo's requirements.

6.2 Designs for Packaging and Identification:

Prior to submission of the FAIR, when applicable, the supplier shall contact Aearo for packaging and labeling instructions, if not previously defined. Ensure that packaging and identification issues are given due consideration to enable the following;

- Optimal design to reduce packaging complexity.
- Optimal design to improve ease of handling and simplify packaging.
- Optimal design to reduce the likelihood of product damage, such as part deformation.
- Delivered product traceability and shelf life.
- Identification of storage requirements.
- Planning for the timely provision of containers and/or packaging media required to support Aearo's requirements.

Once packaging and labeling requirements have been approved, the supplier shall not change unless authorized in writing by Aearo's Engineering.

6.3 Supply Chain Flexibility:

The supplier shall complete an analysis of the effectiveness of the planned supply chain and its associated processes for each commodity utilized to provide the material or part produced for Aearo. Each supplier shall be responsible for managing its supply chain.

- The supplier shall identify any constraints that may prevent an adequate supply of materials and parts from sub-contractors through their manufacturing process and develop appropriate contingency plans. These plans should include prompt notification to Aearo should a delay in delivery of product be anticipated.
- Areas of inflexibility should be investigated so that they can be eliminated or managed.

6.4 Containerization:

The supplier shall develop and implement a system to monitor the quantity and suitable condition of containers.

- Shipping containers are to be kept in a suitably clean condition to prevent damage or contamination of product.
- The supplier shall take immediate action to replace or repair any damaged pallets or containers.

6.5 Excess Freight:

The supplier will be held liable for additional freight cost incurred because of the supplier's lack of quality and/or poor delivery performance required to meet agreed upon delivery dates.

Section 7: Appendix (Acronyms & Aearo Contact Information)

Appendix A: Acronyms and Their Meanings

ACRONYM	**MEANING**
Aearo	Aearo Technologies LLC – a 3M company
CNC	Computer Numerical Control
Cpk	The Capability Index for a process accounting for process centering.
DFMEA	Design Failure Mode Effects Analysis
FAIR	First Article Inspection Report
FMEA	Failure Mode Effects Analysis
KCC	Key Control Characteristic
MSDS	Material Safety Data Sheet
PFMEA	Process Failure Mode Effects Analysis
RoHS	Restriction of Hazardous Substances
SPC	Statistical Process Control
TSCA	Toxic Substances Control Act

Appendix B: Contacts

Project Engineer – Aerospace & Defense (USA):
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