SABRe

Supplier Management System Requirements

Revision 1
1 July 2012

Edition 2

1 Purpose

SABRe Supplier Management System Requirements is the supplier-facing element of the Rolls-Royce Management System

The purpose of SABRe Supplier Management System Requirements is to formally communicate Rolls-Royce requirements and expectations to the global supply chain and is available to view and download from the Rolls-Royce Global Supplier Portal (GSP) https://suppliers.rolls-royce.com

2 Contents, scope and applicability

SABRe Supplier Management System Requirements comprises of three (3) chapters and is applicable to all suppliers or partners who supply product related to Rolls-Royce contracts / purchase orders as follows:

Chapter A - General Requirements

Is modelled upon the structure of ISO9001 (clause titles 4 to 8) and shows the additional general requirements and expectations of Rolls-Royce

Chapter B - Product and Production Process Requirements

Has commonality with AIAG's APQP (Advanced Product Quality Planning and Control Plan) but differences exist given the distinctive requirements of Rolls-Royce

Embodies the concepts of error prevention and continual improvement that will be used to 'Build in Quality' into the production processes as contrasted with error detection and is applicable as follows:

- New Product Introduction (NPI)
- Product Introduction (PI)
- Suppliers who currently supply product (also see B5.1)

Chapter C - Production Product Approval Process

Enables a supplier to obtain production product approval from the customer

Has commonality with AIAG's PPAP (Production Part Approval Process) but differences exist given the distinctive requirements of Rolls-Royce and is applicable as follows:

- New Product Introduction (NPI)
- Product Introduction (PI)
- When requested by the customer.

3 Definitions

Refer to SABRe definitions for additional information. This document is available to view and download from the Rolls-Royce Global Supplier Portal (GSP) https://suppliers.rolls-royce.com

4 Forms and form templates

Forms and form templates are available to view and download from the Rolls-Royce Global Supplier Portal (GSP) https://suppliers.rolls-royce.com

- **FORMS** refer to the forms that shall be used in accordance with the relevant section of this document
- **FORM template** refers to available templates that can be used in accordance with the relevant section of this document. However, the supplier's own form may be used when shown to be similar / equivalent.

Chapter A

General Requirements

A1 Quality management system requirements

❖ *The sub-clause titles used in this section are based on ISO9001 clause 4 (Quality management system requirements) and show the additional requirements and expectations of Rolls-Royce.*

A1.1 Quality management system certification and approval

The supplier shall:

a) Establish a documented quality management system (QMS) that is independently assessed and certified by a certification body. The certification body shall be accredited to provide audit and certification of quality management systems

b) Ensure that their QMS addresses Rolls-Royce and applicable statutory / regulatory requirements

c) Hold a Rolls-Royce approval as communicated by the relevant Rolls-Royce sector / regional business unit[1]

d) Work only within the scope of their QMS certification and the scope of the approval as communicated by the relevant Rolls-Royce sector / regional business unit

e) Maintain a third party / other party approval for the following (as applicable):

Aerospace contracts[2]

- Design / Production - AS/EN/JISQ 9100 or National Aviation Authority Approval PART 21
- Maintenance - AS/EN/JISQ 9100 or 9110 or National Aviation Authority Approval PART 145
- Stockists and distributors[3] - AS/EN/JISQ 9120
- Raw material manufacturers of Rolls-Royce material specifications - AS/EN/JISQ 9100
- Raw material manufacturers of non-Rolls-Royce material specifications - ISO9001[4]
- Inspection and testing - ISO/IEC17025 (or AC7004)
- Testing and calibration laboratories - ISO/IEC17025
- Special Processors - Nadcap / NUCAP is applicable to Rolls-Royce designed Aerospace products and suppliers / sub-tier suppliers providing design and make activities in support of a Rolls-Royce Aerospace product for processes defined in MLC127.

Non-Aerospace contracts

- Design, production - ISO9001[4]
- Stockists and distributers - ISO9001[4]
- Raw material manufacturers - ISO9001[4]
- Testing and calibration laboratories - ISO/IEC17025

Nuclear contracts

- Nuclear Sector (Civil) – see Non-Aerospace contracts. Additional certification to ASME BPVC Code (Boiler and Pressure Vessel Code) is required as / when applicable
- Nuclear Sector (Submarines) - see Non-Aerospace contracts

Marine contracts

- Marine - see Non-Aerospace contract. Additional approval by a relevant Class Society is required as / when applicable.

NOTE 1: Approvals / authorisations granted by a Rolls-Royce sector / regional business unit are only applicable to the specific Rolls-Royce sector / regional business unit from where the approval / authorisation originated.

NOTE 2: Only 91xx series Aerospace certification registered in OASIS www.iaqg.org/oasis shall be valid.

NOTE 3: ISO9001 certification acceptable for stockist and distributers of non-Rolls-Royce material specifications.

NOTE 4: TS16949 is an acceptable alternative to ISO9001.

A1.2 Supplier code of conduct

The supplier shall:

Demonstrate compliance with the minimum standard of business behaviours, health, safety and environmental practices, applicable laws and regulations and act in a way that is ethical and corporately responsible as specified in the Rolls-Royce supplier code of conduct which is available to view and download from the Rolls-Royce Global Supplier Portal (GSP) https://suppliers.rolls-royce.com

A1.3 Control of Rolls-Royce documents

❖ *Rolls-Royce documents are available to view and download from the Rolls-Royce Global Supplier Portal (GSP) https://suppliers.rolls-royce.com*

The supplier shall:

a) Comply with the current revision[1] of documents / specifications referenced on the product definition or Rolls-Royce purchase order / contract

b) Take appropriate action when document changes cannot be implemented prior to the shipment of the product (see A5.4)

c) Flow down Rolls-Royce documents / specifications to sub-tier suppliers (when applicable)

d) Ensure that the translation of Rolls-Royce documents into a supplier's national language is performed by a competent translator prior to use.

NOTE 1: The supplier shall comply with the current revision of documents / specifications at the date of product launch or any further revisions thereafter. Unless otherwise specified, in-process product (including raw material) may be produced in accordance with either the document / specification revision stated at product launch or a subsequently revised version.

A1.4 Control of Rolls-Royce records

The supplier shall:

Control records related to Rolls-Royce product in a manner that will allow the recovery of a readable version of any records (including electronic records) by ensuring that:

- Records are retrievable on request within 24 hours
- Documents / records requiring authorisation by Rolls-Royce are written in the English language or dual language i.e. the supplier's national language plus an accurate English translation made from the original document / record (see also A1.3)
- Records created by and / or retained by subcontractors / sub-tier suppliers are appropriately controlled in accordance with these requirements
- Hand-written amendments to records shall be dated and signed in ink with the original information being legible after the change
- Ensure that the storage, usage and disposal of records are performed in a manner appropriate to their security classification (when stated) and will prevent unauthorised or fraudulent use.

Category	Period	
A	Permanently	Retained permanently or until Rolls-Royce has instructed the supplier to dispose of the records. Rolls-Royce or Regulatory Authority shall be the final disposal authority.
B	6 years	Retained for six (6) years minimum commencing from the date that the product was delivered to Rolls-Royce. The supplier can dispose of these records at the end of the specified period.

NOTE 1: All records related to Rolls-Royce Global Indirect contracts will be maintained as category 'B'.

A2 Management responsibility

❖ *The sub-clause titles used in this section are based on ISO9001 clause 5 (Management responsibility) and show the additional requirements and expectations of Rolls-Royce.*

A2.1 Management commitment

The supplier shall:

Match quality policy, quality objectives, quality planning and quality management reviews to the potential effects of the supplier's product on the Rolls-Royce product into which they are incorporated (see A4.1)

A2.2 Responsibility, authority and communication

The supplier shall:

a) Define the personnel responsible for product quality (across all production shifts) and ensure that they have the following:

- ➢ Authority to stop production to correct quality problems
- ➢ Organisational freedom and unrestricted access to top management to resolve quality issues

b) Establish a procedure for task and shift handovers that ensures that that all necessary information is communicated (verbally and in written form) between the out-going and in-coming personnel.

A3 Resource management

❖ *The sub-clause titles used in this section are based on ISO9001 clause 6 (Resource management) and show the additional requirements and expectations of Rolls-Royce.*

A3.1 Training and competence

The supplier shall:

a) Establish a **documented procedure** for identifying training needs, achievement and review of competence of all personnel performing work directly or indirectly affecting conformity to product or production process requirements

b) Create role profiles / accountabilities and provide on-the-job training for personnel performing work directly or indirectly affecting conformity to product or production process requirements, including any new or modified job and contract or agency personnel

c) Establish a business skills matrix to identify training requirements as well as identifying areas for succession planning and risk management / treatment to maintain continuity of supply

d) Maintain records of training and competence for the period that the relevant employee remains within the supplier's organisation, plus three (3) years.

A3.2 Cleanliness of workplace

The supplier shall:

Maintain its workplace in a state of order, cleanliness and repair consistent with the product and production process needs.

NOTE: Tools such as 5S (Five-S) and visual management (see A4.6) should be used for workplace organisation improvement.

A3.3 Vision standards

❖ *Applicable to personnel conducting product verification / inspection that requires visual acuity.*

The supplier shall:

a) Perform a vision assessment (eye examination) on commencement of employment and at two (2) yearly intervals for personnel engaged in product verification / inspection activities to ensure visual acuity

b) Ensure that the vision assessment (optometric examination) is performed by a trained / qualified person

c) Ensure that optical aids used during the vision assessment to ensure visual acuity are also used during product verification / inspection activities

d) Perform a (one time only) colour perception test to ensure that personnel are capable of distinguishing and differentiating colours where colour perception is required for product verification / inspection activities

e) Maintain records of vision standards for the period that the relevant employee remains within the supplier's organisation, plus three (3) years.

A3.4 Business continuity and risk management

The supplier shall:

a) Establish business continuity plans that identify, analyse, evaluate and / or mitigate risks related to business continuity that includes (but is not limited to) the following:

- Product, facility or individual skill uniqueness
- Access to alternative production facilities
- Single points of failure (including sub-tier suppliers) or key processes
- Remote backup of computer data
- Access to alternative information technology systems
- Action plans and timescales for business recovery
- Contacts, process owners and procedures to follow in the event of an emergency
- A strategy to control, review periodically and communicate plans to all relevant personnel

b) Perform a business risk assessment, the output of which will be used as part of the business continuity plan, that includes (but is not limited to) the following:

- Risk identification - identify sources of risk, their cause and effects and their potential business impact
- Risk analysis - consider the likelihood and level of impact of the identified risks
- Risk evaluation - compare the level of risk found during the analysis process and prioritise risks treatment
- Risk treatment - prepare contingency and / or mitigation plans to reduce risk levels
- Monitor and review the risk management activities to ensure controls are effective

c) Inform their Rolls-Royce purchasing contact immediately regarding the following:

- Changes to third party or other party certification including lapse / withdrawal / major audit findings
- Change of the nominated quality representative
- Significant change to the quality management system
- Change in ownership or discontinuation of business activities
- Risks that could impact upon the continuity of the supplier's business / operations
- Risks with the supply of substances used in the production or physical make-up of products, due to laws and regulations concerning the control or use of such substances that may be published from time-to-time

d) Ensure that chemical substances constituting or contained in products supplied to Rolls-Royce are not restricted under Annex XVII of REACH (Registration, Evaluation and Authorisation of Chemicals)

e) Ensure that data related to the use of substances and mixtures that has been provided to the supplier by Rolls-Royce is passed onto sub-tier / subcontract suppliers (when applicable)

f) Submit risk register and contingency plans to Rolls-Royce on request

g) Maintain records of risk management as category 'B' (see A1.4).

A4 Product realization

❖ *The sub-clause titles used in this section are based on ISO9001 clause 7 (Product realization) and show the additional requirements and expectations of Rolls-Royce.*

A4.1 Critical items and assurance of product Integrity

The supplier shall:

a) Ensure personnel are aware of critical items incorporated into a Rolls-Royce product and the potential consequences of delivering product that does not conform to requirements.

b) Specify, as applicable, any critical items, during purchasing / subcontracting (see A4.3), product design and development (see B2) and production design and development (see B3), including any key characteristics, and specific actions to be taken for these items.

A4.2 Control of work transfers (source change)

❖ *Control of work transfers (source change) is applicable to suppliers planning the temporary or permanent transfer of work and is used to control and verify that the product conforms to requirements during and after the following types of transfers:*

- *From the supplier's facility to another facility*
- *From the supplier's facility to a subcontractor / sub-tier supplier*
- *From a subcontractor / sub-tier supplier to the supplier's facility*
- *From one subcontractor / sub-tier supplier to another subcontractor / sub-tier supplier*
- *Any transfer of work within the supplier's facility that could have an effect upon the continuity of supply of product*

❖ *Control of work transfers (source change) is NOT applicable to:*

- *Purchased standard catalogue hardware or deliverable software*
- *A proposed source that holds a current valid First Article Inspection Report (FAIR) for the product*
- *Raw material purchased from a stockist / distributor*
- *Rolls-Royce Global Indirect contracts*

The supplier shall:

a) Establish a **documented procedure** for the control of work transfers (source change) to plan, control and verify the conformity to specified requirements during the temporary or permanent transfer of work. The procedure shall contain (but not be limited to):

- Formal notification to all stakeholders and customers before any change commences
- Risk assessment and mitigation
- Transfer plan
- Demonstration of capacity at the in-loading area to protect customer delivery
- Demonstration that generation of buffer stocks are built into load and capacity plans to protect customer delivery

b) Complete and submit the form(s) associated with this activity to their Rolls-Royce purchasing contact (see forms below)

c) Proceed with the work transfer (source change) when a response has been received from their Rolls-Royce purchasing contact and comply with requirements specified in the response

d) Ensure that work transfer (source change) documentation / information is communicated along the purchase order cascade

e) Ensure delivery performance is protected prior to any work transfer (source change)

f) Maintain records of work transfers (source change) as category 'B' (see A1.4).

FORMS (see section 4 on page 2)

A4.3 Purchasing / subcontracting

- *This process is NOT applicable to:*
  - *Purchased standard catalogue hardware*

The supplier shall:

a) Only purchase from a source holding appropriate certification (see A1.1)

b) Only purchase from a Rolls-Royce approved source (see A1.1) unless the supplier (purchaser) is:

- Approved / authorised by Rolls-Royce to 'control subcontractors / sub-tier suppliers'

-------- OR --------

- Purchasing the following:
  - Conventional machining operations on unclassified products using material issued by the supplier (purchaser) and the product verification and release is performed by the supplier (purchaser)
  - Conventional rough machining on castings or forgings (classified or unclassified products) to produce the 'condition of supply' shape / configuration
  - Rolls-Royce material specifications from a material stockist / distributor[1]
  - Non-Rolls-Royce material specifications from a material stockist / distributor[2][3]
  - Non-Rolls-Royce material specifications from a raw material manufacturer[3]
  - Industry standard parts (only qualified manufacturers shall be used when specified in a related technical specification)

c) Ensure that the purchasing information / documentation:

- Communicates (flows down) the supplier's (purchaser's) requirements and Rolls-Royce requirements (including applicable SABRe requirements) to subcontractors / sub-tier suppliers
- Specify the supporting documentation to be provided with the purchased product on receipt that states that the product meets specified purchase requirements.

d) Maintain records of purchasing / subcontracting as category 'B' (see A1.4).

NOTE 1: Traceability to the Rolls-Royce approved raw material manufacturer is required (see A1.1)

NOTE 2: Traceability to the raw material manufacturer is required (see A1.1)

NOTE 3: Test to specification by a certified inspection and testing laboratory is required (see A1.1)

A4.4 Receipt inspection / verification of purchased product

The supplier shall:

a) Have a receipt inspection process to verify that the purchased product meets the purchaser's requirements

b) Ensure that the required supporting documentation has been provided with the purchased product that states that the product meets specified purchase requirements.

c) Maintain records of receipt inspection and supporting documentation as category 'B' (see A1.4).

A4.5 Subcontractor / sub-tier supplier monitoring

The supplier shall:

a) Monitor subcontractor / sub-tier supplier performance through the following indicators:

- Delivered product quality
- Customer disruptions / customer returns
- Delivery schedule performance
- Conduct load and capacity reviews with key subcontractor / sub-tier suppliers annually or following significant load increase

b) Take appropriate corrective action with poorly performing subcontractor / sub-tier suppliers

c) Maintain records of subcontractor / sub-tier supplier monitoring as category 'B' (see A1.4).

A4.6 Visual management

The supplier should:

Establish a visual management process that will provide feedback to everyone involved in the process i.e. current status, flow of work, priority and the performance of the process so it can be assessed and understood at a glance, so everyone can see what is under control (and what isn't).

A4.7 Preventive and predictive maintenance

The supplier shall:

a) Identify key process equipment and provide resources for machine / equipment maintenance and develop an effective planned total preventive maintenance system that includes the following:

- Planned maintenance activities (including the identification of critical spares)
- Packaging and preservation of equipment, tooling and gauging
- Availability of replacement parts for key production equipment
- Documenting, evaluating and improving maintenance objectives
- Identification and control of all safety-critical plant and equipment
- Loss to available capacity (see B1.5) related to planned maintenance activities

b) Utilise predictive maintenance methods to continually improve the effectiveness and the efficiency of production equipment.

A4.8 Foreign Object Debris (FOD)

❖ *This process is only applicable to Rolls-Royce Aerospace and Nuclear contracts / purchase orders.*

The supplier shall:

a) Establish a process to detect and prevent Foreign Object Debris. The process should contain the following elements as a minimum:

- Design FOD process review (where applicable)
- Production FOD process review
- Training of FOD practices
- Material handling and product protection
- Tool / hardware accountability
- Lost items search and documentation process
- Physical entry control into FOD critical areas
- Inspection for foreign objects prior to closing apertures and compartments during assembly

b) Ensure that all incidents of actual or potential FOD is reported and investigated (see A5.4).

A4.9 Delivery transport

The supplier shall:

a) Deliver product using the Rolls-Royce standard delivery transport network and collection service as / when specified by Rolls-Royce (i.e. Manifest or equivalent)

b) Use appropriate transport to ensure that the product is delivered in a timely manner and ensures that the product will be received in a condition that is fit for purpose (i.e. when the Rolls-Royce standard transport network and collection service is not specified or will not / cannot be used).

A4.10 Storage and inventory

The supplier shall:

a) Provide secure storage facilities for product, equipment, tools and material

b) Ensure the conditions of storage prevent deterioration and damage of stored items

c) Assess the condition of product in stock at appropriate planned intervals in order to detect deterioration

d) Use an inventory management system to optimise inventory turns over time and assure stock rotation, such as “first-in-first-out” (FIFO)

e) Establish an inventory management procedure that includes (but is not limited to) the following:

- Rule for determining safety stock levels
- Method to guarantee inventory accuracy
- Key performance indicators to monitor inventory
- Method to monitor, review and action slow-moving work in progress
- Control of shelf life product

f) Ensure segregation of serviceable product, equipment, tools and material from unserviceable product, equipment, tools and material

g) Ensure that access to storage facilities is restricted to authorised personnel.

A5 Measurement, analysis and improvement

❖ *The sub-clause titles used in this section are based on ISO9001 clause 8 (Measurement, analysis and improvement) and show the additional requirements and expectations of Rolls- Royce.*

A5.1 Quality and delivery performance

The supplier shall:

a) Monitor quality and delivery performance using key performance indicators[1]

b) Ensure 100% quality performance and 100% on-time and in-full delivery performance is achieved

c) Take appropriate corrective action (see A5.7) when quality or delivery performance is not, or will not be, achieved

d) Inform their Rolls-Royce purchasing contact immediately when delivery schedules are not, or will not be, achieved and submit a recovery plan (within 24 hours) to their Rolls-Royce purchasing contact.

e) Use a cross-function team to develop continual improvement policy and plans to meet customer performance expectations

f) Monitor the implementation of improvement plans and evaluate the effectiveness of the results.

NOTE 1: Where Rolls-Royce has provided the supplier with a ‘scorecard’ the supplier will use the scorecard as a key performance indicator.

A5.2 Audit process

The supplier shall:

a) Establish an annual audit programme (product and process audits) that includes internal production and subcontract activities, to verify compliance to planned arrangements related to Rolls-Royce contracts. The audit programme shall be prioritised based on product and process risk

b) Audit products at appropriate stages of production using a product that has been selected at random from the current production process to determine the following:

- Production method provides a record to demonstrate that all operations are complete
- Verification / inspection records demonstrate that all operations are appropriately verified
- Dimensional acceptability to product definition
- Visual acceptability to product definition
- Functional performance test to product definition (where applicable)

c) Audit each manufacturing process to determine if the resources and controls used to transform inputs into outputs are effective and comply with requirements

d) Have internal auditors who are appropriately trained and competent (see A3.1) to perform audits

e) Establish specific checklists to be used for each audit.

f) Increase audit frequencies when internal / external nonconformities or customer complaints occur

g) Take immediate action when an audit result identifies a product non-conformance (see A5.4)

h) Take appropriate corrective action (see A5.7) within 90 days or prior to shipment of product

i) Maintain records of internal audits as category ‘B’ (see A1.4).

A5.3 Release documentation

The supplier shall:

a) Provide separate release documentation with each delivery to Rolls-Royce
b) Ensure that the release documentation:

- Is written in English or in a language specified by the customer
- Refers to a single purchase order / schedule
- Refers to a single part number
- Is legible and protected from damage / deterioration
- Is attached to the outside of the secondary packaging
- Contains the following information as a minimum:
  - Unique traceable document reference number
  - Supplier's name, address and telephone number
  - Delivery address
  - Rolls-Royce purchase order number (including purchase order item number)
  - Rolls-Royce plant and storage location (when specified)
  - Description of the product (as referenced on the Rolls-Royce purchase order)
  - Part number (as referenced on the Rolls-Royce purchase order)
  - Kit number (when applicable) – plus a list of part numbers, quantities, serial numbers
  - Traceable reference (serial, batch, lot, heat, cast numbers - as applicable)
  - Quantity
  - Date of despatch
  - Conformance / compliance statement[1]
  - Signature of person authorised to release the product to the customer

c) Provide additional information (when applicable):

  - First Article Inspection Report (FAIR)
  - Modification, repair scheme, or service bulletins
  - Classification of product
  - Approval plan number
  - Quality plan number
  - Deviation permit number (deviation permit to be provided)
  - Concession category and concession number (concession to be provided)
  - Hazardous substances / safety data sheet (safety data sheet to be provided)
  - Shelf life (cure date, batch, group) – no mixed cure dates / batches
  - Virus-free declaration (computer software)
  - Cross reference to the original raw material manufacturer's name (stockists / distributors)
  - Cross reference to customer name and purchase order (material processors)

d) Provide a certificate of analysis or raw material manufacturer's certificate with the shipment of raw material that contains the following:

- Traceable reference to batch, lot, heat, cast numbers
- Chemical analysis including constituent elements and percentages
- Physical analysis, i.e., stress strain data, and temper

e) Provide an Authorised Release Certificate when required by the applicable national authority regulations i.e. Aerospace Part 21, PART 145, Marine Class Society etc.

f) Maintain records[2] of release documentation as category 'A' when the product definition specifies 'Fixed Process Control' (see B4.7). All other records will be maintained as category 'B' (see A1.4).

NOTE 1: Typical compliance statement: "Certified that the whole of supplies hereon have been inspected / tested and unless otherwise stated, conform in all respects to specification, drawing and purchase order requirements".

NOTE 2: Records of release documentation held electronically shall contain all of the information shown on the original document and a traceable reference to the person authorised to release the product to customer.

A5.4 Control of nonconforming product

The supplier shall:

a) Establish a method of detection and feedback of product nonconformities or process noncompliance

b) Contain nonconformities by segregating (or identifying and controlling) the product or process to prevent its unintended use or delivery

c) Take necessary actions to contain[1] the effect of the nonconformity on other processes or products i.e. work in progress, stores stock, shipping area, in transit, sub-tier / subcontract activities, similar products, despatched / delivered to customer (within 48 hours)

d) Immediately notify their Rolls-Royce purchasing contact and their Rolls-Royce technical authority (or other impacted customers) of any delivered nonconforming product and continually pursue a response that the notification has been received by Rolls-Royce.

e) Stop shipment of product when notified of nonconformance by Rolls-Royce until appropriate corrective action (see A5.7) has been established

f) Clearly and permanently mark (or establish alternative controls to prevent use) product dispositioned for scrap until physically rendered unusable

g) Take appropriate corrective action (see A5.7)

h) Maintain records related to the control of nonconforming product as category 'A' (see A1.4).

NOTE 1: To assist the Rolls-Royce investigation related to the impact of any delivered nonconforming product, the supplier shall segregate any undelivered nonconforming product and hold until a response related to the disposal of the product has been received from Rolls-Royce.

A5.5 Deviation permit / concession

The supplier shall:

a) Ensure that written authorisation has been granted by their Rolls-Royce purchasing contact prior to the shipment of a product which does not conform to specified requirements

b) Complete and submit the form(s) associated with this activity to their Rolls-Royce purchasing contact (see forms below) or through e-concessions (electronic concession system) where access has been granted by Rolls-Royce

c) Take appropriate corrective action (see A5.7)

d) Flow the nonconformance documentation along the purchase order cascade

e) Mark the product as indicated on the deviation permit / concession, including (but not limited to) the relevant concession category and concession number allocated by Rolls-Royce in accordance with the applicable identification marking method (and location) specified in the product definition

f) Attach an orange coloured concession label[1] that states the concession category and concession number allocated by Rolls-Royce to the primary, secondary and tertiary packaging (as applicable)

g) Maintain records of deviation permits / concessions as category 'A' (see A1.4).

NOTE 1: Concession labels are only applicable to Rolls-Royce Aerospace contracts / purchase orders being delivered to Rolls-Royce UK and RR Deutschland

FORMS (see section 4 on page 2)

A5.6 Control of reworked product

The supplier shall:

a) Rework product in accordance with controls specified within the process specifications on the product definition or to an agreed rework procedure authorised by Rolls-Royce

b) Ensure that instructions for rework, including re-verification / inspection requirements are accessible to and utilised by the appropriate personnel

c) Maintain records of reworked product as category 'A' (see A1.4).

A5.7 Corrective action

The supplier shall:

a) Perform problem solving activities to establish the root cause of nonconformities

b) Take appropriate corrective action to eliminate the causes of nonconformities in order to prevent recurrence

c) Verify that a permanent fix has prevented any further nonconformities

d) Flow down corrective action requirements to subcontractors / sub-tier suppliers (when applicable)

e) Submit a Problem Improvement Request (PIR) form[1] to their Rolls-Royce purchasing contact when:

- Deviation permit or concession is to be submitted by the supplier (see A5.5)
- Nonconformance has been identified to the supplier by Rolls-Royce

f) Review / update the Process Failure Mode Effects and Analysis (PFMEA) and the Control Plan when corrective action has been identified

g) Ensure the continuity of supply of conforming product to Rolls-Royce, while all nonconformances are being investigated

h) Maintain records of corrective action as category 'B' (see A1.4).

NOTE 1: A completed Problem Improvement Request (PIR) form will be submitted to Rolls-Royce within 30 days (unless otherwise stated). Other corrective action forms may be submitted when the content is shown to be similar to the Problem Improvement Request (PIR).

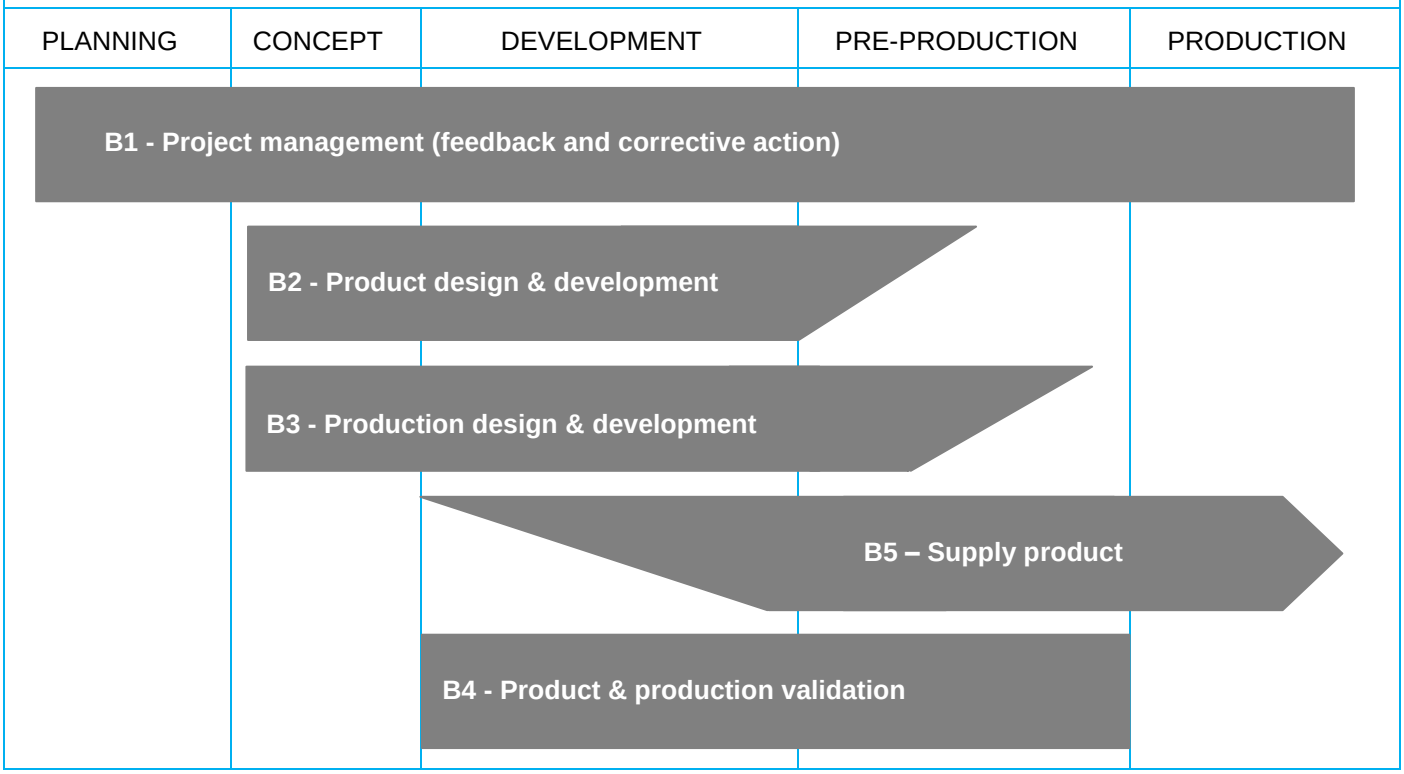
FORM template (see section 4 on page 2)

Chapter B

Product and Production Process Requirements

B1 Project management (feedback and corrective action)

B1.0 Product and production readiness landscape



B1.1 Project management

The supplier shall:

a) Plan, organise and manage resources to bring about the successful completion of specific project goals and objectives, this shall include:

- Defined and agreed programme deliverables and programme milestones
- Programme schedule and assigned / available resource
- Programme reporting, monitoring and metrics
- Programme review and revision procedure
- Risk management (see A3.4)

b) Establish a product (manufacturing) launch plan in advance of producing the product that refers to the requirements of all key production activities, timescales, resource requirements (including feedback into capacity planning / management), authorisations and dependencies necessary (including external purchasing / subcontracting) to ensure the production areas are prepared to launch the product in a timely manner.

B1.2 Review of requirements related to the product

The supplier shall:

a) Review the requirements related to the product, purchase order / contract, prior to committing to supply the product or acceptance of orders / contracts

b) Respond to requests related to quotations, proposals, purchase order / contract via Exostar within 1 week of receipt (unless otherwise specified or agreed by the Rolls-Royce purchasing contact)

c) Maintain records of the review of requirements related to the product as category ‘B’ (see A1.4).

B1.3 Plant, facility and equipment planning

The supplier shall:

a) Use a cross-function team to develop plant, facility and equipment plans

b) Assess production feasibility to ensure that the product can be produced in accordance with the standards, specifications and tolerances specified by Rolls-Royce

c) Ensure that plant layouts optimise material travel, handling and value-added use of floor space, and facilitate synchronous material flow[1]

d) Ensure that methods are established to evaluate and monitor the effectiveness of existing operations.

NOTE 1: Synchronous material flow is a pull production system such as Kanban.

B1.4 Production planning / scheduling

The supplier shall:

a) Plan / schedule[1] production in order to meet customer requirements

b) Ensure that production planning / scheduling includes (but is not limited to) the following:

- Sales and operation planning
- Master production schedule
- Material requirements planning
- Control of purchasing activities
- Control of production activities

c) Communicate (flow down) production schedule information to subcontractors / sub-tier suppliers

d) Ensure increased planning accuracy by periodically verifying planning assumptions used in production scheduling with those actually achieved.

e) Review and respond to Rolls-Royce supply chain planning (Exostar) schedules on request

f) Respond to Rolls-Royce Sales and Operations Review Board (SORB) on request.

NOTE 1: Methods such as just-in-time supported by an information system that permits access to production information at key stages of the process and is order driven should be used to implement these requirements.

B1.5 Capacity planning / management

The supplier shall:

a) Establish a process to plan[1] and manage production capacity that includes (but not limited to) the following:

- Availability of resources for labour and equipment
- Effect upon available capacity during new product introduction / product introduction

b) Resolve discrepancies between the available capacity and the demands of the customer

c) Monitor the effectiveness[2] of labour, equipment and processes to ensure planning assumptions are accurate and enable feedback into the planning process

NOTE 1: Plans should be profiled in months for a 2 year time period.

NOTE 2: Methods such as Overall Equipment Effectiveness (OEE) should be used for equipment or processes that are a constraint to output, high value or a risk to the guarantee of on-time delivery, quality or cost from the process.

B2 Product design and development

B2.1 Product design and development

Product design & development requirements are applicable to:

- *Suppliers authorised by Rolls-Royce to create design definitions, using their own design rules and standards within the constraints defined in this document and / or the Rolls-Royce contract / purchase order.*

The supplier shall:

Comply with the requirements of RRES 90009 - Requirements for design & development activities.

B2.2 Control of design changes

- *Design Control is applicable to:*
  - *Design changes that affect the fit, form or function of existing designs i.e. design changes following a configuration freeze, which do not fulfil the criteria for a Definition Alteration Request (see B4.6).*

The supplier shall:

a) Ensure design changes are authorised by their Rolls-Royce technical authority before implementation (including verification and validation as appropriate)

b) Complete and submit the form(s) associated with this activity to their Rolls-Royce technical authority (see forms below) with all applicable information at each stage of implementation

c) Ensure that configuration management related to design changes are controlled

d) Maintain records of design changes as category 'A' (see A1.4).

FORMS (see section 4 on page 2)

B3 Production design and development

B3.1 Process flow diagram

The supplier shall:

Develop and document the production process flow, from the beginning of the process up to the delivery of the product, that includes (but is not limited to) the following:

- Process operational sequence related to the production of the product
- Processes requiring a qualified operator
- Identification of external (purchasing / subcontract) activities
- Where in the process product verification is performed (see B4.1)
- Where in the process performance metrics are recorded (see B5.2)
- Configuration management

NOTE: A single process flow diagram may apply to a group or family of products that are produced by the same process at the same source.

B3.2 Value stream mapping

The supplier shall:

a) Develop a value stream map of the product supply chain (internal and external) related to the production processes, from the beginning of the process up to the delivery of the product, including (but not limited to) the following:

- Physical flow
- Information flow
- Key contributing parties

b) Ensure the value stream map contains (but is not limited to) the following:

- Customer demand (quantity per week or month and lot size)
- Every process step stating production rate, on-time delivery, lot size and lead time
- Inventory between process steps (number of days = quantity / downstream usage)
- Bottleneck identification

c) Measure capacity related to:

- Every process step
- Number of resources
- Available time
- Utilisation
- Efficiency.

d) Use the value stream map as a baseline for improvement and the creation of a future state map.

NOTE 1: A single value stream map may apply to a group or family of products that are produced by the same process at the same source.

B3.3 Test / inspection criteria and planning

The supplier shall:

a) Use a cross-function team to develop a characteristic matrix for all product characteristics and production operations.

b) Plan the test and inspection requirements related to product measurement. This may be part of the production documentation, but shall include the following:

- Where in the sequence the testing, inspection / measurement operations are performed
- A reference to each product characteristic to be inspected at each operation
- Type of measurement equipment required and any specific instructions associated with their use
- Criteria for acceptance and / or rejection
- A reference to product verification activities to be witnessed by the customer.

B3.4 Process Failure Mode and Effects Analysis (PFMEA)

The supplier shall:

a) Use a cross-function team to establish a PFMEA that includes (but is not limited to) the following:

- Process identification
- Process work elements
- Potential process failure mode
- Severity (S) – The seriousness of a failure mode
- Occurrence (O) – The likelihood that a given failure mode will happen
- Detection / Prevention (D) – The likelihood that the failure mode will be prevented / detected
- Risk Priority Number (RPN) – Severity (S) x Occurrence (O) x Detection (D) = Risk priority
- Standard scoring criteria

b) Develop a PFMEA for the production processes identified in the process flow diagram (see B3.1) in advance of producing the product

c) Evaluate and document the potential failure of a product / process and the effects of that failure

d) Determine the risk priority related to the impact on the product, process and customer

e) Take appropriate corrective action (see A5.7) for high RPN's to reduce or eliminate the chance of the potential failure occurring

f) Review / update and recalculate RPN's for the PFMEA when changes are made to product definition, process operating conditions or when nonconformance has been identified

g) Provide feedback to the customer along the purchase order cascade when appropriate risk mitigation cannot be provided

h) Maintain records of PFMEA as category 'B' commencing from the date that the final product was delivered to Rolls-Royce (see A1.4).

NOTE 1: A single PFMEA may apply to a group or family of products that are produced by the same process at the same source.

FORM template (see section 4 on page 2)

B3.5 Control plan

The supplier shall:

a) Use a cross-function team to develop control plans for the production processes for each product, which defines the controls to be used in advance of producing the product

b) Ensure that the control plan takes into account (but is not limited to) the following elements:

- PFMEA outputs (see B3.4)
- Authorised reduced inspection (see B4.2)
- Authorised sample inspection (see B4.3)
- Variation management (see B4.5)

c) Ensure that the control plan contents includes (but is not limited to):

- Part / process number
- Process name / operation description
- Product / process characteristics
- Control method
- Reaction plan

d) Review and update control plans when any change occurs affecting product, production process, measurement, logistics, supply sources or PFMEA

e) Maintain a process to review the effectiveness of these controls

f) Maintain records of control plans as category 'B' commencing from the date that the final product was delivered to Rolls-Royce (see A1.4).

NOTE 1: A single control plan may apply to a group or family of products that are produced by the same process at the same source.

FORM template (see section 4 on page 2)

B3.6 Work instructions

The supplier shall:

a) Prepare documented work instructions[1] for personnel having the responsibility for the operation of processes that impact product quality

b) Ensure work instructions are accessible for use at the work station

c) Ensure work instructions are derived and cross referenced to sources such as the PFMEA (see B3.4) and / or the control plan (see B3.5).

NOTE 1: Work instructions can include process flow diagrams, production documents such as production plans, travellers, routers, work orders, process cards) and inspection documents.

B3.7 Measurement System Analysis (MSA)

The supplier shall:

a) Define the metrological requirements and the metrological function in accordance with ISO10012

b) Ensure that the personnel nominated to perform product verification (see B4.1) activities are trained and competent (see A3.1) in the use of the monitoring / measuring equipment

c) Ensure that the monitoring / measuring equipment used to perform product verification (see B4.1) activities is calibrated and traceable to international or national measurement standards (see A1.1)

d) Have personnel available who are trained and competent (see A3.1) in measurement systems analysis techniques[1]

e) Validate the measurement system by performing statistical studies[1] related to a representative range of tolerances and features (including tightest tolerance measured) to analyse the variation present in the results of each type of monitoring / measuring and test equipment system. The participants in the study shall be representative of those using the measurement systems on a day-to-day basis

f) Perform product feature specific statistical studies[1] to validate the measurement system where Conformance Control Features (CCFs) have been identified to the supplier by Rolls-Royce

g) Monitor[2] and maintain the capability of measurement equipment over time to ensure it performs as initially validated

h) Perform a review of measurement capability when tolerances, personnel or environmental conditions have changed

i) Record the results of statistical studies in a study report to identify how the study was undertaken and the conclusions

j) Maintain records of MSA as category 'A' when the product definition specifies 'Fixed Process Control' (see B4.7). All other records will be maintained as category 'B' (see A1.4).

NOTE 1: Measurement system analysis techniques and statistical studies refer to Gauge Repeatability & Reproducibility and / or Attribute Agreement Analysis.

NOTE 2: In addition to calibration, the monitoring / measuring equipment shall be checked regularly against a calibrated reference of known size and form.

B3.8 Identification, traceability and serialisation

The supplier shall:

a) Identify raw material / product by suitable means throughout production activities

b) Maintain the traceability for all product during production (including product quantities, split orders, nonconforming product)

c) Control the unique and serialised identification of the product when specified in the Rolls-Royce product definition and / or purchase order / contract (see forms below)

d) Establish a method to differentiate between an unfinished / incomplete product during subcontract / sub-tier supplier processing activities (see A4.3) and a finished / completed product

e) Maintain records of product identification, traceability and serialisation as category 'A' (see A1.4).

FORMS (see section 4 on page 2)

B3.9 Traceability of product provided by Rolls-Royce

The supplier may (unless otherwise specified):

Accept the release documentation from Rolls-Royce as sufficient evidence of product traceability, where the product is provided by Rolls-Royce. In such cases, any requirement to check test reports and original raw material manufacturer source certificates is not necessary.

B3.10 Tooling control

The supplier shall:

a) Establish a system for the management of pre-production and production tooling, jigs and fixtures that includes (but is not limited to) the following:

- Unique tool identification
- Validation of tool prior to release for production
- Protection from damage and deterioration during storage
- Maintained as fit for purpose
- Storage and recovery
- Tool set-up
- Tool life control / tool-change programmes
- Tool design modification documentation, including engineering change level
- Tool modification and revision

b) Ensure that tooling, jigs and fixtures owned by Rolls-Royce and / or Rolls-Royce customers (including shared ownership) are controlled as shown above, plus the following:

- Identified as Rolls-Royce owned
- Tooling register established
- Used only for Rolls-Royce applications
- Audited annually (stock take) and periodic preservation / condition checks for tooling held in storage
- Modifications only after written authorisation by Rolls-Royce
- Disposal only after written authorisation by Rolls-Royce
- Provision of tool information (including photographic information) to Rolls-Royce on request

c) Maintain tooling control records (Rolls-Royce owned tooling) as category ‘B’ (see A1.4).

B3.11 Protection, packaging and labelling

The supplier shall:

a) Ensure that products are packaged to a standard that provides adequate protection against damage, deterioration and tampering during shipment, storage and distribution

b) Ensure that the product packaging is labelled to a standard that provides adequate identification and traceability of the product

c) Establish work instructions (see B3.6) to ensure that the packaging and labelling of the product is performed in a consistent and acceptable manner

d) Compile a ‘Packaging and Labelling Data Sheet’ (see forms below) to define the packaging and labelling applied to the product and submit to Rolls-Royce (on request)

e) Comply with the ‘Protection Packaging and Labelling Guidelines’[1].

NOTE 1: Protection Packaging and Labelling Guidelines is available to view and download from the Rolls-Royce Global Supplier Portal (GSP) https://suppliers.rolls-royce.com

FORMS (see section 4 on page 2)

B4 Product and production validation

B4.1 Production verification

❖ *The product verification process is NOT applicable to purchased standard catalogue hardware.*

The supplier shall:

a) Measure 100% of all product characteristics related to all product to verify that requirements have been met. This shall be carried out at appropriate stages of the production process such as receipt inspection, in-process inspection, final inspection etc, in accordance with the planned arrangements

b) Ensure that personnel performing product verification / inspection activities are appropriately trained and competent (see A3.1) to discriminate between an acceptable and unacceptable product

c) Ensure product verification / inspection activities requiring accurate visual verification are performed in lighting conditions that provide a white light intensity of not less than 500 LUX

d) Ensure that monitoring / measuring equipment and the inspection standard to be achieved are subject to the same units of measurement (as stated on the product definition) and avoid the application of conversion calculations

e) Ensure that monitoring / measuring equipment used for the final verification / inspection of product is independent to those used for product measurement during production activities or will be re-calibrated / verified prior to use where independence cannot be achieved

f) Record the actual measurement results / values for the following:

- Features on product classified as “Critical” (see RRES90002) on the product definition
- Features where a Coordinate Measuring Machine (CMM) is the method of inspection

g) Only apply reduced inspection when the requirements of section B4.2 have been met

h) Only apply sample inspection when the requirements of section B4.3 have been met

i) Maintain records of product verification as category ‘A’ when the product definition specifies ‘Fixed Process Control’ (see B4.7). All other records will be maintained as category ‘B’ (see A1.4).

NOTE: Refer to RRES90009 for product design verification.

B4.2 Reduced inspection

❖ *The Reduced Inspection process is NOT applicable to purchased standard catalogue hardware.*

The supplier shall:

a) Only apply reduced inspection of variables as a means of product acceptance when:

- Process stability and capability can be demonstrated during product verification activities
- Process capability data has met the requirements specified by the Rolls-Royce technical authority
- The proposed sample size and verification method of the product characteristic taken from every product within the batch has been documented in a control plan (see B3.5)
- The control plan (see B3.5) has been submitted to, and authorised by the Rolls-Royce technical authority

b) Only apply reduced inspection of formed characteristics[1] as a means of product acceptance when:

- Appropriate control methods such as control of process settings, tooling, standard processes and / or error-proofing have been introduced
- Measurable evidence demonstrates that the control methods are effective and continually produce a product that conforms to requirements
- The method by which the formed characteristic is produced plus the verification method and the verification intervals are documented in a control plan (see B3.5)
- The control plan (see B3.5) and measurable evidence of product conformance have been submitted to, and authorised by the Rolls-Royce technical authority (on request)

c) Ensure that reduced inspection activities related to fixed process controlled product (see B4.7) are appropriately controlled and authorised by their Rolls-Royce technical authority, prior to being introduced

d) Ensure that reduced inspection is NOT applied to the following:

- Product used for First Article Inspection (see B4.4)
- Non-destructive testing inspection operations (unless specified in a controlling specification)
- Functional testing

e) Maintain records of reduced inspection as specified for product verification (see B4.1).

NOTE 1: Reduced inspection of formed characteristics may apply to a group or family of products that are produced by the same process at the same source.

B4.3 Sample inspection

❖ *The Sample inspection process is NOT applicable to purchased standard catalogue hardware.*

The supplier shall:

a) Only introduce sample inspection as a means of product acceptance when:

- Process stability and capability can be demonstrated using variation management (see B4.5)
- The sample size and the verification method for each product characteristic under consideration has been documented in a control plan (see B3.5)
- The control plan (see B3.5) and statistical data (see B4.5) have been submitted to, and authorised by the Rolls-Royce technical authority

b) Ensure that sample inspection activities related to fixed process controlled product (see B4.7) are appropriately controlled and authorised by their Rolls-Royce technical authority, prior to being introduced

c) Ensure that sample inspection is NOT applied to the following:

- Product used for First Article Inspection (see B4.4)
- Non-destructive testing inspection operations (unless specified in a controlling specification)
- Functional testing
- Product classified as critical (see RRES90002)

d) Maintain records of sample inspection as specified for product verification (see B4.1).

B4.4 First / Last Article Inspection Report (FAIR / LAIR)

- *FAIR / LAIR applies to:*
  - *Products designed and / or produced by a supplier for a Rolls-Royce application*
  - *Assemblies and all levels within an assembly, including castings and forgings*
  - *Repair instructions / schemes*
- *FAIR / LAIR does NOT apply to:*
  - *Purchased standard catalogue hardware or deliverable software*
  - *Elements of the process related to material or product provided by Rolls-Royce.*

The supplier shall:

a) Implement the requirements of AS/EN/SJAC 9102[1]

b) Perform a FAI on the first production product[2] to be delivered

c) Perform FAI / LAI dimensional inspection at the end of the production process using:
   - Capable measuring equipment (see B3.7)
   - Measuring equipment and inspection personnel independent[3] of that used in the production process

d) Ensure that Coordinate Measuring Machines (CMM) inspection programmes and programmers used for the FAI are independent[3] to those used for product measurement during the production process

e) Ensure features that will become inaccessible[4] during subsequent production process operations are independently inspected prior to becoming inaccessible

f) Perform a LAIR on a product that represents the production method at the end of production, when the source of complete production is planned to change or at the request of Rolls-Royce

g) Record all measurement equipment in the FAI / LAI inspection plan, including programme version number where applicable

h) Include a cascade diagram with the FAIR to identify the bill of materials for the product

i) Complete and submit a FAIR / LAIR using the eFAIR[5] system provided by Rolls-Royce

j) Only release product into Rolls-Royce against an approved FAIR

k) Maintain records of FAIR / LAIR as category 'A' when the product definition specifies 'Fixed Process Control' (see B4.7). All other records will be maintained as category 'B' (see A1.4).

NOTE 1: AS/EN/SJAC 9102 requirements are applicable to Rolls-Royce Aerospace, Energy and Naval Marine contracts.

NOTE 2: Only when it is not physically possible to perform the FAI on a single product, data from multiple products can be used, providing all parts have been manufactured using the same engineering definition, bill of material, supply chain and method of manufacture (including measurement method). The FAI report shall be annotated to signify the use of multiple product and provide traceability of the products used to obtain the inspection results.

NOTE 3: Coordinate Measuring Machines used for FAI / LAI do NOT have to be independent to those used for product measurement during production activities.

NOTE 4: Where inaccessible features may be affected by subsequent production operations, the method of verification shall be agreed with the design engineering authority and recorded in the report.

NOTE 5: Where a supplier has not been given access to the Rolls-Royce eFAIR system, the FAIR / LAIR shall be submitted to their Rolls-Royce technical authority.

FORMS (see section 4 on page 2)

B4.5 Variation management

❖ *Variation management is NOT applicable to:*

- *Development products*
- *Purchased standard catalogue hardware or deliverable software*
- *Product provided by Rolls-Royce (unless otherwise specified).*

The supplier shall:

a) Identify / designate Key Characteristics (KCs) requiring statistical process control (SPC) as an output of the control plan (see B3.5)

b) Identify Conformance Control Features (CCFs) that have been designated by Rolls-Royce

c) Perform statistical process control (SPC) studies on KCs and CCFs to demonstrate they are in a state of statistical control and that capability has been established as follows:

- Apply statistical control of process that allows timely reaction to out of control conditions, ensuring appropriate containment, corrective action and escalation occurs to bring the process back to a state of statistical control
- Calculate the process capability (Cp, Cpk) index only when the process is shown to be stable and in statistical control, using industry standard statistical control charts
- Establish process capability using representative data gathered in time sequence from three or more concurrent batches / lots containing a combined total of at least twenty-five (25) products
- Ensure that a process using variable data can demonstrate process capability of Cpk ≥ 1.33 or as specified by Rolls-Royce
- Monitor to ensure continued performance and apply continual improvement techniques to eliminate problems and improve stability / capability
- Establish records of the results of SPC studies (control chart and capability analysis) conducted on current production processes

d) Ensure that processes that cease to be in control and / or capable resume normal product verification / inspection (see B4.1) until the cause has been identified, corrected and process capability and control are re-established

e) Record the results of CCF monitoring using the process control document (PCD) in accordance with the requirements of AS/EN/SJAC 9103 or use an equivalent document containing the same information (applicable to Rolls-Royce Aerospace contracts / purchase orders)

f) Submit supporting evidence of CCF variation management (control chart and capability analysis) at the earliest possible time after the initial FAIR (see B4.4) to their Rolls-Royce technical authority. CCFs which do not demonstrate capability shall have a documented improvement plan and evidence submitted when capability is achieved.

g) Perform MSA studies (see B3.7) prior to performing SPC and process capability studies

h) Maintain records of variation management as specified for product verification (see B4.1).

B4.6 Definition Alteration Request (DAR)

❖ *Definition Alteration Request (DAR) is applicable to:*

- ➢ *Changes that DO NOT affect fit, form or function*
- ➢ *Changes that impact upon Rolls-Royce requirements*
- ➢ *Changes that require a decision by Rolls-Royce Engineering*

The supplier shall:

a) Complete and submit the form(s) associated with this activity to their Rolls-Royce technical authority (see forms below)

b) Ensure definition alteration requests are authorised by Rolls-Royce before implementation (including verification and validation as appropriate)

c) Ensure that configuration management related to definition alteration requests are controlled

d) Maintain records of definition alteration requests as category 'A' (see A1.4).

FORMS (see section 4 on page 2)

The supplier shall ensure that a revised component definition (i.e. amended drawing) has been issued / released prior to implementation of change and shipment of product to Rolls-Royce Deutschland.

B4.7 Fixed process control

❖ *Fixed Process Control is applicable to all suppliers when the product definition specifies 'Fixed Process Control' (Engineering Control of Manufacturing Source & Method).*

The supplier shall:

a) Plan and develop the fixed process document in accordance with the requirements of RRES90000

b) Complete and submit the form(s) associated with this activity to their Rolls-Royce technical authority (see forms below) along the purchase order cascade for initial approval and approval of any change to source and / or method of production in accordance with the requirements of RRES90000

c) Produce the product in accordance with the Rolls-Royce approved Fixed Process Document

d) Maintain records of fixed process control as category 'A' (see A1.4).

FORMS (see section 4 on page 2)

B5 Supply product

B5.1 Production (process requirements)

❖ *Production process requirements include the activities required to demonstrate that the production process can provide the repeatable supply of product that conforms to customer requirements.*

The supplier shall:

a) Comply with chapters A and B when current production activities have been established and a product has been produced and shipped with an approved FAIR (see B4.4)

b) Comply with chapters A, B and C when conducting activities related to New Product Introduction (NPI) and Product Introduction (PI).

B5.2 Production process performance metrics

The supplier shall:

a) Develop production process performance metrics that monitor (but is not limited to) the following:

- Statistical process control
- Cycle-time and lead-time adherence
- Process yield rates (% scrap, % rework)
- Product % Right First Time

b) Monitor performance metrics in accordance with customer expectations / targets (where specified)

c) Feedback performance metrics for process improvement

d) Use performance metrics to maintain accurate planning parameters (see B1.5)

e) Maintain records of process performance metrics as category ‘B’ (see A1.4).

Chapter C

Production Product Approval Process (PPAP)

C1 PPAP process requirements

C1.1 General requirements

- *PPAP is NOT applicable for the following (unless specified by the customer):*
  - *Purchased standard catalogue hardware or deliverable software*
  - *Development product*
  - *Product provided by Rolls-Royce to the organisation*
- *Production product approval demonstrates that:*
  - *All customer design record and specification requirements are properly understood, accounted for, verified and recorded by the product supplier*
  - *The manufacturing process / tool / facility have the potential to produce product consistently meeting these requirements during an actual production process run at a quoted production rate*
- *It is the responsibility of the supplier to obtain production product approval from the customer.*

The supplier shall:

a) Obtain production product approval from the Rolls-Royce technical authority[1] for the following:
  - New product
  - Product modified by engineering change
  - Correction of a discrepancy on a previous submission / product
  - Customer notification (see C1.2)
  - When specified by customer-specific requirements (see C1.6.18)

b) Establish a **documented procedure** to comply with the requirements of this chapter

c) Develop metrics that monitor progress and satisfaction of key milestones such as production process run and submission(s), and when requested by Rolls-Royce provide results

d) Define the person(s) responsible for PPAP (supplier PPAP co-ordinator)

NOTE 1: All questions concerning the need for PPAP should be addressed to the Rolls-Royce technical authority.

C1.2 Customer notification

❖ *Customer notification refers to changes by the supplier to product or process and when the supplier is required to obtain production product approval in connection with the referenced requirements.*

The supplier shall:

For the following, apply PPAP requirements and provide a customer submission (see C1.5) after implementing the change unless otherwise specified by or agreed with the Rolls-Royce technical authority:

- Product design – design / make suppliers only (RRES90009 and notification of change)
- Production process design - (for product subject to RRES90000 or First Article Inspection)
- Facility and / or subcontractor and / or sub-tier (for works transfer).

C1.3 PPAP file

The supplier shall:

a) Establish a PPAP file[1] as early as possible during the product and / or production design and development cycle (see B1.0) for a specific product or product group or family[2]

b) Identify the PPAP co-ordinator (see C1.1) for the PPAP file and applicable / non-applicable PPAP elements (see C1.6)

c) Gather supporting data for these PPAP elements as it is produced regardless of whether or not the customer requests a formal submission

d) Analyse the result and provide feedback to resources affected by or responsible for, the requirement(s). Where concerns are identified in meeting any specified requirement:

- Determine, document and implement appropriate mitigating actions
- Provide feedback to the customer when concerns and / or mitigating action(s) are likely to impact the customer

e) Retain the PPAP file at the manufacturing location

f) Make the PPAP file available for submission or review by the customer.

NOTE 1: The actual file can contain the evidence or provide links to the evidence provided this is understandable upon customer review or submission.

NOTE 2: A product group or family PPAP file may be implemented when appropriate. However, customer submission is required to be part number based.

C1.4 Production process run

- *A production process run provides an indication of the potential for both process capability to produce conforming product in the actual production environment and process capacity to support production quantities at a consistent quality level*
- *The duration and the number of events planned are appropriate to manufacture product to production requirements (e.g., speeds and feeds) and supply to customer requirements (e.g., customer delivery schedule).*

The supplier shall: (unless otherwise agreed to by the Rolls-Royce technical authority):

a) Perform a production run or runs at the supplier's manufacturing location using the intended production tooling, gauges, processes, sequence, operations, instructions, materials, personnel and environment

b) Manufacture a minimum of twenty five (25) products[1] during the production process run

c) Operate, measure and monitor the production process to determine the potential to achieve the customer demand rate[2]

d) Use sufficient product from this production process run to satisfy the PPAP elements (see C1.6) and to be representative of unique processes[3] (if applicable).

NOTE 1: The minimum of twenty five (25) products may alter when authorised by the Rolls-Royce technical authority and when significant production volumes exist >25 or in circumstances where low production volumes exist <25.

NOTE 2: Customer demand rate is the number of products produced by the process over a specified period of time to satisfy the delivery schedule cascaded by the customer.

NOTE 3: Examples of unique processes are duplicate manufacturing or assembly lines and / or work stations, each position of a multiple cavity die, mould, tool or pattern.

C1.5 Submission Level (SL)

- *The submission level (SL) identifies the information to be submitted to the customer*
- *The retention / submission table (see C1.5.1) defines for each PPAP element, the PPAP file record, customer submission and associated action requirements for the submission level.*

The supplier shall:

a) Use submission level 3 (see C1.5.1) as the default level for all submissions unless otherwise specified by the Rolls-Royce technical authority

b) Notify the customer of the planned submission date[1]

c) Submit (S) to the customer on the planned submission date evidence of all applicable PPAP elements (see C1.6) and related to the associated submission level (SL)

d) Retain (R) data / information for all applicable PPAP elements at appropriate locations (including manufacturing) regardless of the associated submission level (SL).

NOTE 1: Notification shall be addressed to the Rolls-Royce technical authority.

C1.5.1 Retention / submission table

PPAP elements 1 to 21		Submission level				
		SL1	**SL 2**	**SL 3**	**SL 4**	**SL 5**
1	Product definition / engineering specification	R	S R	S R	C R	S R W
2	Authorised engineering change documents	R	S R	S R	C R	S R W
3	Customer engineering approvals	R	S R	S R	C R	S R W
4	Design Failure Mode and Effects Analysis (DFMEA)	R	R	S R	C R	S R W
5	Process flow diagram	R	R	S R	C R	S R W
6	Process Failure Mode and Effects Analysis (PFMEA)	R	R	S R	C R	S R W
7	Control plan	R	S R	S R	C R	S R W
8	Test / inspection criteria and planning	R	S R	S R	C R	S R W
9	Qualified laboratory documentation	R	R	S R	C R	S R W
10	Packaging and labelling standard and documentation	R	R	S R	C R	S R W
11	Sample production product	R	S R	S R	C R	S R W
12	Measurement System Analysis verification	R	R	S R	C R	S R W
13	Dimensional results	R	S R	S R	C R	S R W
14	Records of material / performance test results	R	S R	S R	C R	S R W
15	Initial process studies	R	S R	S R	C R	S R W
16	Process control surveillance results	R	R	S R	C R	S R W
17	Initial manufacturing performance studies	R	R	S R	C R	S R W
18	Customer-specific requirements	R	S R	S R	C R	S R W
19	First Article inspection Report (FAIR)	S R	S R	S R	S R	S R W
20	Process Control Document (PCD)	S R	S R	S R	S R	S R W
21	Production Submission Warrant (PSW)	S R	S R	S R	S R	S R W

S	**S**ubmit to the Rolls-Royce technical authority.
R	**R**etain a record as part of the PPAP file and make available to the customer upon request.
C	**C**onsult the customer – submission (S) and / or witness (W) may be required.
W	**W**itness by the Rolls-Royce technical authority (or nominated representative) through a supporting data / information review at manufacturing location.

C1.6 PPAP element details

The supplier shall:

a) Meet all specific requirements detailed in C1.6.1 to C1.6.21[1]

b) When required by submission level, provide documentation in an organisation-specific format[1] unless C1.6.1 to C1.6.21 details a specific format and / or method.

NOTE 1: Organisation-specific format is a format that is suitable to the supplier's operation and provides the required information / data / documentation in an understandable format to the Rolls-Royce technical authority.

C1.6.1 Product definition / engineering specification

Have records of the latest engineering drawing / specification release, which fully define the product, part, component or assembly including physical or electronic drawings, electronic models or other associated information that defines the final product.

C1.6.2 Authorised engineering change documents

a) If applicable, have records of any authorised engineering change documents for those changes not yet recorded in the product definition / engineering specification (see C1.6.1) but incorporated in the product

b) When required by submission level and in accordance with the applicability, provide a copy of an authorised:

- Design Change Proposal (see B2.2)
- Definition Alteration Requests (see B4.6).

C1.6.3 Customer engineering approvals

If applicable, have records of obtained customer engineering approval for:

- Design / make suppliers only, design verification plan (see RRES90009)
- Deviation permit, concession (see A5.5)
- For parts subject to RRES90000, Fixed Process Control (see B4.7).

C1.6.4 Design Failure Mode and Effects Analysis (DFMEA)

Design / Make Suppliers only, have developed a Design FMEA in accordance with RRES90009.

NOTE: DFMEA for groups or families of parts, components or assemblies are acceptable evidence if the new materials, part, component or assembly can be confirmed as having been reviewed for commonality and accuracy of risk priority numbers by the supplier.

C1.6.5 Process flow diagram

Have developed a process flow diagram[1] (see B3.1).

NOTE 1: Process flow diagram for groups or families of material, parts, components, assemblies or processes are acceptable evidence if the new material, part, component, assembly or process can be confirmed as having been reviewed for commonality by the supplier.

C1.6.6 Process Failure Mode and Effects Analysis (Process FMEA)

a) Have developed a process FMEA (see B3.4)

b) When Conformance Control Features (CCFs) have been specified, demonstrate traceability from the source through the PFMEA and control plan (see C1.6.7).

NOTE: PFMEA for groups or families of parts, components, assemblies or processes are acceptable evidence if the new materials, part, component, assembly or process can be confirmed as having been reviewed for commonality and accuracy of risk priority numbers by the supplier.

C1.6.7 Control plan

Have developed control plans for the production manufacturing process (see B3.5).

NOTE: Control plan approval may be required by certain requirements in advance of Production Submission Warrant (see C1.6.21), Product Verification (see B4.1), FAIR (see B4.4).

C1.6.8 Test / inspection criteria and planning

Have developed test / inspection criteria (see B3.3) for the production manufacturing process and the product definition / engineering specification (see C1.6.1).

FORM template (see section 4 on page 2)

C1.6.9 Qualified laboratory documentation

When material / performance tests are specified within the test / inspection criteria (see C1.6.8) have records that demonstrate that these have been performed by an accredited laboratory. The accredited laboratory (internal or external to the organisation) shall have a laboratory scope and documentation showing that the laboratory is qualified for the type of measurements or tests conducted.

C1.6.10 Packaging and labelling standards and documentation

Have developed packaging and labelling technical instructions in accordance with section B3.11.

NOTE: Where approval is required, this may take place as part of customer submission.

C1.6.11 Sample production product

- *Sample products are parts, components or assemblies related to the product documented within the submission and can be used to support cosmetic or functional approval, or assist upstream / downstream manufacturing evaluation of fit or producibility.*

When required by the Rolls-Royce technical authority or customer-specific requirements (see C1.6.18) provide sample product as specified.

C1.6.12 Measurement System Analysis (MSA) studies

a) Have applicable MSA studies (see B3.7) for measurement system specified by control plan (see B3.5) and / or test / inspection criteria and planning (see B3.3)

b) Evaluate these results against the MSA results table (see C1.6.12.1).

C1.6.12.1 MSA results table

Results	Interpretation / reaction plan
≤ 10%	When required by submission level, submit for approval.
> 10% to ≤ 30%	Contact Rolls-Royce technical authority to determine acceptability and if applicable, implement a corrective action plan to improve measurement capability.
> 30%	Not acceptable, implement a corrective action plan to improve measurement capability.

C1.6.13 Dimensional results

a) Have produced dimensional reports for no less than five[1] (5) randomly selected products produced during the production process run (see C1.4) and in accordance with the test / inspection criteria and planning (see C1.6.8)

b) Evaluate conformity and record results.

NOTE 1: The minimum of 5 products may alter when authorised by the Rolls-Royce technical authority when significant production volumes exist >5 or circumstances where low production volumes exist <5.

FORM template (see section 4 on page 2)

C1.6.14 Records of material / performance test results

a) Produce material and / or performance test reports for any material / performance tests specified within the test / inspection criteria and planning (see C1.6.8). The quantity of product is as required by test / inspection criteria and the number of products produced during the production process run.

b) Evaluate conformity and record results.

NOTE 1: When an external / commercial laboratory is used, results submitted on laboratory letterhead or normal laboratory report format is acceptable when this identifies the name of the laboratory that performed the tests, the date (s) of the tests, and the standards used to run the tests.

FORM template (see section 4 on page 2)

C1.6.15 Initial process studies

❖ *Initial Process Studies refer to part, component or assembly having characteristics identified as Conformance Control Features (CCFs).*

a) When Conformance Control Features (CCFs) are specified, conduct initial process studies (see B4.5)

b) When required by the submission level provide evidence of:

- Process capability calculations
- Use of industry recognised statistical methods and suitable control charts

c) Evaluate these results against the reaction plan (see C1.6.15.1).

C1.6.15.1 Initial process studies reaction plan

Results	Interpretation / reaction plan
Cpk ≥ 1.33	When required by submission level, submit for approval (meets the acceptance criteria).
1.00 ≤ Cpk < 1.33	Contact Rolls-Royce technical authority to determine acceptability and if applicable, implement a corrective action plan to improve capability.
Cpk < 1.00	Contact the Rolls-Royce technical authority if the acceptance criteria cannot be attained by the required submission date, submit a corrective action plan for approval and continue with variation reduction activities.

C1.6.16 Process control surveillance results

a) Have conducted product and manufacturing process audit during production process run

b) Evaluate the results and record any non-conformity.

FORMS (see section 4 on page 2)

C1.6.17 Initial manufacturing performance studies

a) Have a record of the expected production volumes as cascaded by the customer or the expected production volumes by evaluating delivery schedule cascaded by the customer

b) Have determined the expected customer demand rate[1]

c) Have conducted manufacturing performance studies during a production process run to determine the following for each operational step:

- Total number of product produced
- Total number of conforming products
- Total process time required to produce the products
- Total available process time
- Total process time for all other product produced from the process
- Equipment availability

d) Evaluate the results to determine the potential to satisfy customer demand rate and support production quantities at a consistent quality level.

NOTE 1: Customer demand rate is the number of products produced by the supplier over a specified period of time to satisfy the delivery schedule cascaded by the customer.

FORM template (see section 4 on page 2)

C1.6.18 Customer-specific requirements

a) Have records of compliance for all applicable requirements cascaded (cascade of customer-specific requirements) by Rolls-Royce Production Product Approval Checklist and / or purchase order and / or (if applicable):

- Design / Make suppliers only, an approved design and development quality plan (see RRES90009)
- Supplier product / process change in accordance with customer notification (see C1.2)

b) When applicable have information related to Rolls-Royce customer tooling (see B3.10)

c) Have records that demonstrate sub-tier / subcontractor can meet the intent of C1.6.17.

C1.6.19 First Article Inspection Report (FAIR)

a) Have an approved First Article Inspection Report (see B4.4)

b) When required by submission level, use all associated First Article Inspection Report (FAIR) front sheet(s).

C1.6.20 Process Control Document (PCD)

❖ *Process Control Document (PCD) refers to the approval document / report required for initial process studies specific (see C1.6.15) to Conformance Control Features (CCFs).*

Have a developed Process Control Document (PCD), the approval of which can be prior to, or part of the customer submission.

C1.6.21 Production Submission Warrant (PSW)

❖ *The Production Submission Warrant (PSW) has commonality with the AIAG's Part Submission Warrant (PSW) format and intent. However, differences exist to accommodate for the process management of PPAP across the Rolls-Royce supply chain.*

The supplier shall:

a) Verify that:

- All customer / design engineering requirements are properly understood and recorded
- All of the results demonstrate conformance to customer / design engineering requirements
- Satisfactory process control (see C1.6.16) and conformity to SABRe requirements is deployed within the production manufacturing process
- Process capacity results demonstrate rate potential to customer demand rate requirements

b) Review the PPAP file for completeness of all required data / documentation. When the supplier considers a gap exists, the supplier will:

- Clearly define the non-compliances preventing approval
- Prepare an action plan
- Commit to a date for re-submission

c) Complete a separate PSW for each product definition, unless agreed by the Rolls-Royce technical authority

d) Ensure that PPAP coordinator (see C1.3) has reviewed and authorised the PSW

e) Submit the PSW form to the Rolls-Royce technical authority before the first production product is shipped or on a date agreed by the Rolls-Royce technical authority.

FORMS (see section 4 on page 2)

C2 PPA submission status

C2.1 General requirements

The supplier shall:

a) Upon receipt of customer response to the Production Submission Warrant (PSW), manage product supply (and if applicable corrective action) in accordance with the specifics provided by PPA status plan (see forms below) and any additional instructions detailed on the PSW

b) If required, implement containment actions to ensure that only acceptable product is being shipped to the customer

c) Upon approval[1] of the submission, assure that future production continues to meet all customer requirements.

NOTE 1: Approval refers to the PPA classification and identifies the product and process as production ready.

FORMS (see section 4 on page 2)

SABRe

Supplier Management System Requirements

Change History					
Revision	Date	Description of Change	Author	Owner	Approval
1	July 2012	This document is an initial issue of an updated compilation of SABRe documents that were previously communicated as separate modules.	C. Peters	S. Hudson	I. Riggs A. Page S. Clarke S. Hudson

Document update policy

This document may be updated periodically. Major amendments will be shown as an update from one revision number to a higher revision number (e.g. revision 1 to revision 2) and therefore the content of the higher revision will be regarded as the latest requirements. A minor amendment will be shown as a number change after a decimal point (e.g. revision 1.1 to revision 1.2) and therefore any of these revisions may be regarded as the latest requirements until a major amendment is introduced