

Why The Part 145 Supply Chain is Critically Important to the Aviation Eco-System

Sofema Aviation (SA) considers the burden of responsibility placed on the organisation by EASA in relation to Aviation Parts and Supply chain Integrity.

By establishing robust supplier oversight, embedding dynamic compliance monitoring, and enforcing meticulous stores inspection techniques, Part-145 organizations effectively secure their supply chain, safeguard against suspected unapproved parts, and uphold overall airworthiness integrity.

Introduction

Under EASA Part-145 regulations, Specifically aligned with safety management principles detailed in Regulation (EU) 2021/1963

- The European Union Aviation Safety Agency places total responsibility for component eligibility and airworthiness directly onto the approved maintenance organization.
- Because competent authorities do not directly oversee or certify commercial parts stockists and brokers, the primary safeguard against compromised airworthiness is the organization's ability to "know your supplier."
- Managing the aviation supply chain is no longer a passive procurement function; it is an active risk-management process where the organization's Compliance Monitoring System (CMS) must fully integrate with the Safety Management System (SMS) to exercise rigorous oversight.

Supplier Evaluation and the Role of the Compliance Monitoring System

The transition of regulatory responsibility mandates that a Part-145 organization establishes robust mechanisms for component acceptance under point 145.A.42. The organization must ensure that every part, standard hardware item, or raw material installed on an aircraft or component is fully compliant with approved design data and accompanied by authentic certification.

The "Know Your Supplier" Framework

Establishing supplier legitimacy requires a multi-tiered evaluation methodology tailored to supplier classification:

- **Production and Maintenance Approval Holders:** Original Equipment Manufacturers (OEMs), Part-21G production organizations, and Part-145 maintenance organizations hold regulatory approvals that reduce supply chain risk. Oversight focuses on verifying current approval schedules, capability lists, and scope of approval.

- **Distributors and Stockists:** Non-certified Stockists present the highest supply chain vulnerability. The CMS must establish strict qualification criteria, favoring distributors accredited under recognized industry standards (such as ASA-100, EN/AS 9120, or FAA AC 00-56). Unaccredited brokers must undergo direct quality audits or be subjected to stringent incoming inspection controls.
- **Raw Material and Standard Parts Vendors:** Suppliers of raw stock (metallic sheets, extrusion bars) and standard hardware (AN, NAS, MS standards) must provide full Certificate of Conformity (C-of-C) traceability from the original mill or manufacturer, including material test reports (MTRs).

CMS Integration into Supply Chain Oversight

The CMS must transition from traditional static desk audits to dynamic, risk-based oversight. Effective CMS oversight involves:

- **Risk-Based Audit Schedules:** Audit frequency and depth must reflect vendor criticality, historical performance, part complexity, and commercial origin. High-risk brokers or vendors supplying life-limited components require regular on-site audits rather than simple desktop questionnaires.
- **Closed-Loop Performance Monitoring:** The CMS must collect operational data from receiving inspection, including scrap rates, paperwork errors, packaging failures, and suspected unapproved parts reports. Poor performance metrics must automatically trigger vendor status downgrades or corrective action requests (CARs).
- **Cross-Functional SMS Interface:** Supply chain hazards—such as recurring documentation errors or component lead-time pressures—must feed directly into the organization’s SMS hazard register. This ensures safety risk assessments evaluate how vendor performance impacts maintenance operations.

Identifying Suspected Unapproved Parts (SUP) and Traceability Issues

Suspected Unapproved Parts (SUP) pose an immediate threat to aviation safety. Identifying SUP, counterfeit items, and fraudulent documentation requires specialized audit techniques during stores inspections.

- Incoming Component
- Physical Inspection
- Documentation Verification
- Database/Registry Cross-Check
- Acceptance / Quarantine

Advanced Audit Techniques for Document Verification

Document fraud is increasingly sophisticated. Auditors and receiving inspectors must apply systematic techniques to verify airworthiness release certificates (such as EASA Form 1, FAA Form 8130-3, TCCA Form One, or UK CAA Form 1):

- **Form Structural Analysis:** Audit the physical or digital document for anomalies. Check for mismatched fonts, irregular spacing, pixelated corporate logos, missing tracking numbers in Block 3, or altered text in Block 12 (Remarks).
- **Authorization Scope Validation:** Cross-check the organization approval number listed in Block 4 against official authority registers (such as EASA's online list of approved organizations). Verify that the maintenance or production organization held active approval for that specific part number or capability on the exact date of release.
- **Block 12 Remarks Scrutiny:** Ensure Block 12 explicitly details the work performed (overhaul, repair, inspection, modification), cites approved technical data used, and lists any relevant Airworthiness Directives (ADs) complied with. Generic statements like "repaired per CMM" without specifying revision status or AD compliance indicate potential non-conformance.
- **Dual Release Integrity:** For components carrying dual EASA/FAA release, verify that the organization holds both approvals and that the dual-release statements in Block 12 conform precisely to bilateral aviation safety agreement (BASA) implementation procedures.

Physical Inspection Techniques for SUP Detection

Physical examination of parts must go beyond counting quantities:

- **Surface and Marking Anomalies:** Audit parts for signs of re-stamping, double-vibro-etching, hand-ground part numbers, or altered serial numbers. Check whether casting marks, mold lines, and surface finishes match OEM manufacturing standards.
- **Refurbishment Discrepancies:** Inspect "new" parts for subtle evidence of prior installation, such as safety-wire impression marks, wrench wear on bolt heads, painted-over corrosion, thread wear, or residual fluid contamination.
- **Standard Hardware Verification:** Audit high-strength fasteners and standard parts using optical comparators or thread gauges. Verify head markings against industry standards. Counterfeit fasteners often exhibit poorly forged head markings, inconsistent thread pitches, or missing manufacturer identification symbols.

Ensuring Back-to-Birth Traceability for Life-Limited Components

Components subject to mandatory life limitations (such as engine disks, landing gear structural members, and rotorcraft dynamic components) require unbroken chain-of-custody documentation:

- **Historical Log Reconciliation:** Auditors must verify that the documentation contains complete operating history, including total flight hours, flight cycles, calendar time, and modification history from initial manufacture.
- **Operational Environment Tracking:** Confirm whether the component was previously installed on aircraft subjected to extreme environments (such as military operations, salt-water exposure, or fire-fighting applications), as these conditions impact structural integrity and life limits.
- **Verification of Intermediate Handlers:** Audit the paper trail through intermediate owners, leasing companies, and repair stations to ensure no undocumented time gaps exist in the component's operational lifecycle.

Stores Compliance: Common Findings and Objective Assessment Strategies

Stores compliance directly impacts maintenance quality. A breakdown in stores controls allows non-conforming or unairworthy components to migrate onto active maintenance lines.

Receiving Inspection

- **Common Findings:** Receiving inspectors accepting components based solely on a distributor C-of-C without verifying original airworthiness release documentation; failure to inspect external packaging for shipping damage or environmental exposure; inspectors signing off parts outside their scope of authorized approval.
- **Objective Audit Assessment:** Select a sample of recently received components across various categories (repaired, new OEM, standard parts, raw materials). Audit the physical shipment against the purchase order, incoming check sheet, and authorized release certificate. Shadow a receiving inspector during a live receipt process to assess adherence to Maintenance Organisation Exposition (MOE) procedures.

Component Segregation and Storage Environment

- **Common Findings:**
 - Co-mingling of serviceable and unserviceable parts;

- Inadequate storage of Electrostatic Discharge Sensitive (ESDS) components (such as ungrounded workbenches or conductive packaging materials);
- Failure to maintain regulated storage environments for temperature- and humidity-sensitive materials (such as composite pre-pregs, sealants, and structural adhesives).
- **Objective Audit Assessment:** Inspect physical store barriers.
 - Verify that serviceable items, unserviceable components, scrap parts, and customer-furnished equipment are physically segregated.
 - Audit environmental data loggers in chemical storage units and composite freezers, comparing historical temperature records against manufacturer storage specifications.
 - Test ESDS workstations using calibrated wrist-strap and surface-resistance meters.

Shelf-Life Control

- **Common Findings:**
 - Expired elastomeric seals, O-rings, adhesives, paints, or chemical agents found in active picking bins;
 - Failure to recalculate shelf-life expiry dates upon opening multi-use containers;
 - Lack of automated notifications within the Enterprise Resource Planning (ERP) software.
- **Objective Audit Assessment:** Perform targeted sampling of time-sensitive materials in active inventory bins and cold-storage units.
 - Compare the physical cure date, assembly date, or opening date against the manufacturer's maximum allowable shelf-life.
 - Test system controls by attempting to process a simulated issue request for an intentionally expired batch number within the inventory management software to confirm automated blockades function.

Quarantine Controls

- **Common Findings:** Insecure quarantine areas allowing unauthorized physical access;
 - lack of physical quarantine tags on non-conforming parts;

- failure to maintain digital quarantine locks within inventory software;
- delayed disposition of quarantined parts leading to store clutter and accidental re-introduction into service.
- **Objective Audit Assessment:** Test physical security by attempting unauthorized access to quarantine cages or designated holding zones. Select items currently in quarantine and trace their disposition logs in the ERP system. Verify that items marked as quarantined in software cannot be issued or transferred to an active job card.

Tagging and Component Traceability

- **Common Findings:** Unserviceable parts missing internal work tags detailing the specific reason for removal or defect description;
 1. Raw stock (such as sheet metal or tubing) lacking batch/heat numbers tied to original mill test certificates once cut into smaller pieces;
 2. Unidentifiable components residing in store bins without internal trace tags.
- **Objective Audit Assessment:** Perform bidirectional audit trails:
 1. **Backward Trace:** Select an installed part from an active maintenance work pack on the hangar floor. Trace its identity backward through the store issue slip, receiving log, purchase order, supplier file, and original airworthiness release certificate (EASA Form 1).
 2. **Forward Trace:** Select a physical raw-material batch or lot of standard hardware from a store bin. Trace its distribution forward to every work order where fragments or items from that batch were issued and installed.

Strategic Best Practices for Supply Chain Assurance

To mitigate supply chain risks under EASA Part-145, organizations must go beyond basic compliance and implement proactive operational controls.

Risk-Based Supplier Rating Engines

Integrate real-time vendor performance data into procurement systems. Automated algorithms should calculate vendor risk scores based on incoming inspection acceptance rates, documentation accuracy, on-time delivery, and audit results.

- Procurement software may automatically restrict purchase order generation for vendors whose quality rating drops below established thresholds.

Digitized Receiving Inspection and Verification Gates

Replace paper-based receiving checklists with digitized, mandatory workflow gates within the inventory management system.

- Receiving personnel must upload scanned copies of airworthiness certificates, input batch numbers, and complete mandatory verification fields before the software permits bin allocation or printing of internal serviceable tags.

Joint CMS and SMS Oversight Integration

Establish a unified oversight interface where audit findings from stores inspections and supplier audits feed directly into the organization's SMS safety risk management workflow.

- When a supplier delivers a non-conforming part or falsified document, treat the occurrence not merely as a quality defect, but as an operational safety hazard subject to root cause analysis, human factors evaluation, and safety risk quantification.

Specialized Continuous Training

Conduct specialized, recurring training for receiving inspectors, stores managers, and quality auditors.

- Training programs should cover physical anti-counterfeiting identification methods, dynamic EASA/FAA bilateral agreement provisions, advanced document authentication, and human factors in store operations (such as time-pressure management during high-priority aircraft-on-ground scenarios).