

# From turbulence to tranquillity: Resolving non-conformances in Aerospace & Defense



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## Introduction

The Aerospace & Defense industry operates in a context where precision is not merely a quality criterion; it is the very essence of engineering in this domain. With stakes exceptionally high and the margin for error virtually non-existent, non-conformances—deviations from established standards or requirements—can cause more than just turbulence; they can lead to significant setbacks. However, by adopting a stringent approach to resolving these non-conformances, tranquility can be restored, ensuring safety, reliability, and customer satisfaction.

Non-conformances in the Aerospace & Defense sector can emerge from a wide array of sources, each presenting unique challenges to the manufacturing and operational processes. These deviations from established standards or requirements signify potential threats to the integrity and functionality of aerospace products, which can have far-reaching implications for the safety and reliability of aircraft and defense systems.



## Sources of non-conformances

**Material defects:** Material defects are among the most common sources of non-conformances. These can include impurities in metals, inconsistencies in composite materials, or flaws in purchased components. In an industry where every part must perform reliably under extreme conditions, even minor material defects can lead to significant failures. For instance, a microscopic crack in a turbine blade could propagate over time, leading to catastrophic engine failure.

**Design discrepancies:** Design discrepancies occur when there is a deviation between the intended design specifications and the actual product. These can result from errors in the initial design phase, misinterpretations of design documents, or software inaccuracies. In aerospace engineering, where tolerances are incredibly tight, even slight deviations can compromise the aerodynamics, structural integrity, or overall performance of an aircraft.

**Process failures:** Manufacturing process failures can include anything from incorrect machining practices to improper assembly techniques. These failures often stem from a lack of adherence to standardized procedures, inadequate training, or equipment

malfunctions. Process failures can lead to parts being produced out of specification, which can affect everything from fit and finish to functional performance. For example, an improperly drilled hole might lead to improper stress distribution, ultimately affecting the structural integrity of the component.

**Human error:** Human error remains a significant factor in non-conformances. These can range from simple mistakes on the production line to more complex errors in quality control or testing procedures. While automation and advanced manufacturing technologies have reduced the incidence of human error, it remains a critical factor, particularly in the final stages of assembly and inspection, where human oversight is essential.



## The implications of non-conformances

Non-conformances carry implications that extend beyond the immediate failure of a part or system. They represent a breach in the stringent quality assurance protocols that are fundamental to the Aerospace & Defense sector.

- **Safety risks:** The most direct and severe consequence of non-conformances is the risk they pose to safety. Aircraft and defense systems are designed to operate under extreme conditions and to the highest standards of reliability. A single non-conforming part can jeopardize the entire system, leading to potential accidents and loss of life. For instance, a non-conformance in manufacturing a critical control system component could result in loss of control of an aircraft.
- **Operational reliability:** Non-conformances can also impact the operational reliability of aerospace and defense systems. Aircraft and defense equipment are expected to perform flawlessly over extended periods. Non-conforming parts may fail prematurely, leading to increased maintenance costs and downtime. This affects the availability of aircraft and defense systems and has significant financial implications for operators.
- **Regulatory compliance:** The Aerospace & Defense industry is heavily regulated, with strict compliance requirements enforced by authorities such as the Federal Aviation Administration (FAA) and the European Union Aviation Safety Agency (EASA). Non-conformances can result in non-compliance with these regulations, leading to fines, sanctions, and reputational damage.



## Approaching non-conformances

Recognizing and addressing non-conformances promptly is crucial to maintaining the highest safety and performance standards. This involves a proactive approach to quality management, including thorough inspections, rigorous testing, and continuous monitoring of manufacturing processes.

- **Early detection:** Implementing advanced inspection techniques, such as ultrasonic testing and digital radiography, can help detect non-conformances at an early stage. Early detection allows for immediate corrective actions, reducing the risk of defective parts reaching the final stages of production.
- **Root cause analysis:** Conducting comprehensive root cause analyses to understand the underlying reasons for non-conformances is essential. Techniques such as the 5-Why analysis and Fishbone Diagrams can help identify systemic issues and prevent recurrence.
- **Corrective and Preventive Actions (CAPA):** Establishing robust CAPA processes ensures that corrective actions are not only implemented effectively but also that preventive measures are put in place to avoid future occurrences. This may involve revising manufacturing processes, enhancing employee training, or upgrading equipment.



## Managing non-conformances in aerospace & defense

Effectively managing and mitigating non-conformances (NC) is critical in the Aerospace & Defense industry. A systematic approach ensures that issues are identified, investigated, and resolved, preventing future occurrences and maintaining high quality and safety standards.

### **The Root Cause Corrective Action (RCCA) approach:**

One effective method for resolving non-conformances is the Root Cause Corrective Action (RCCA) process. This systematic approach involves identifying the fundamental cause of a problem and implementing measures to prevent its recurrence. The RCCA process is a cornerstone in the Aerospace & Defense industry, ensuring that it is thoroughly investigated, understood, and rectified once a non-conformance is detected.

### **The 8D process: A Structured Path to Resolution:**

The 8D process is a comprehensive problem-solving method for addressing non-conformances. It begins with immediate containment actions to prevent further impact. It progresses through stages that include building a team, defining the problem, optimizing containment actions, and, crucially, identifying and eliminating the root cause. This structured approach resolves the current issue and lays the groundwork for preventing future occurrences.

**Zero defect approach:** The zero-defect approach emphasizes the importance of getting things right the first time. It aims to eliminate defects, improve product or service quality, and reduce costs associated with waste. While achieving absolute zero defects is technically not feasible in any sizable or complex manufacturing project, the concept drives the quest for perfection, pushing quality and improvements to levels that meet even the most stringent metrics. According to the Six Sigma standard, zero defects are defined as 3.4 defects per million opportunities (DPMO), allowing for a 1.5-sigma process shift.

### **Innovations in non-conformance management:**

Continuous improvement is vital in the Aerospace & Defense sector. Studies show that enhancing the non-conformance management process can significantly reduce scrap rates and defect recurrence. Tools like the 5-Why analysis and Fishbone Diagrams help organizations delve deeper into the causes of non-conformances and develop more effective corrective actions.

**The role of technology:** Advancements in technology play a pivotal role in managing non-conformances. Sophisticated databases track defects and trends, while analytical tools provide insights into process efficiencies, transforming raw data into actionable intelligence. Artificial Intelligence (AI), Machine Learning (ML), and Robotic Process Automation (RPA) revolutionize traditional activities, enabling faster problem resolution in areas like assembly line engineering and repetitive human tasks.



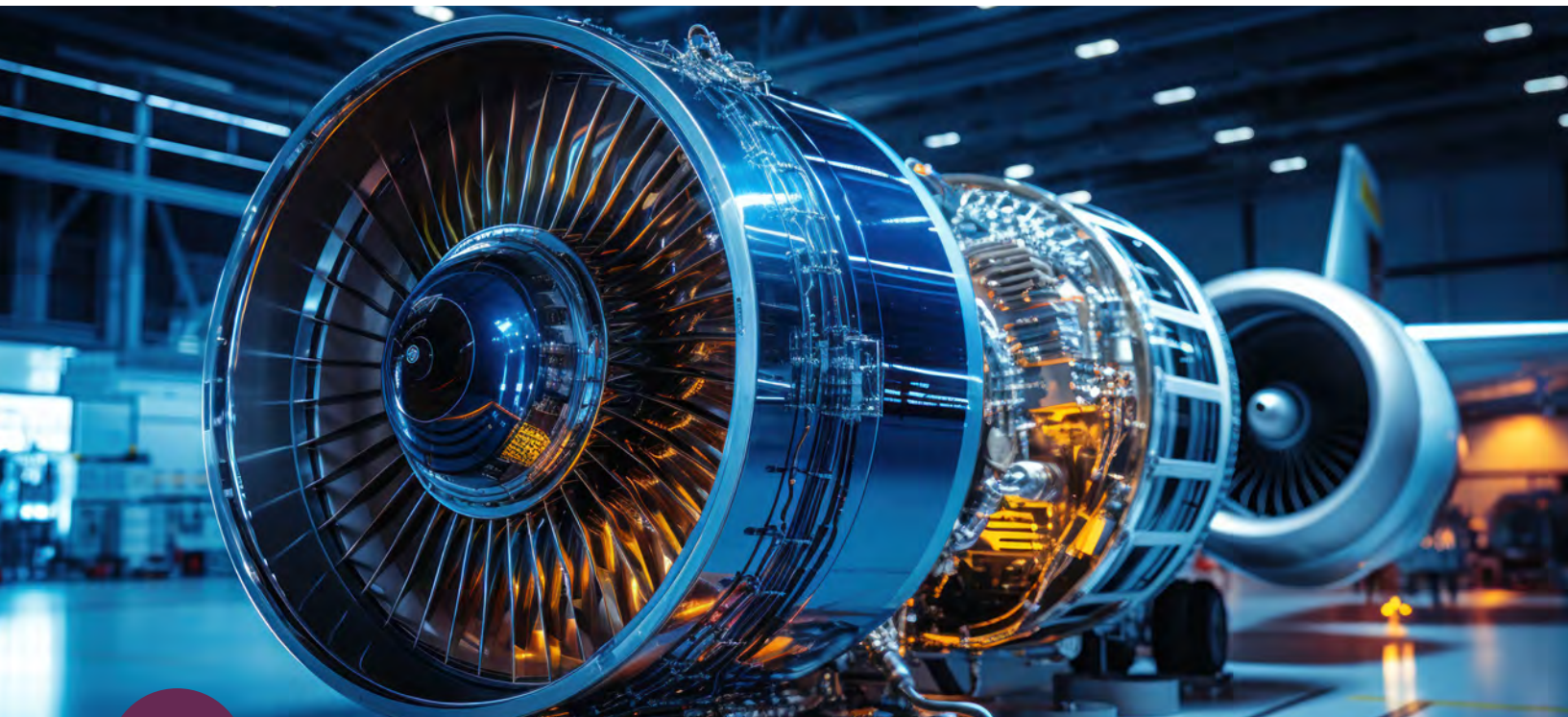


## Quest Global as a strategic partner in solving and reducing non-conformances

The journey from turbulence to tranquility in the Aerospace & Defense industry is an ongoing endeavor. It requires diligence, expertise, and a commitment to excellence. With structured approaches such as RCCA, the 8D process, and the zero-defect approach, and by embracing technological innovations, the industry can navigate the complexities of non-conformances and maintain the highest standards of quality and safety.

Quest Global has established itself as a strategic partner in solving and reducing non-conformances for global aircraft and aero engine customers, amassing over 10 million hours of experience. Here's how Quest Global delivers a wide range of benefits to its clients:

- **Increased production throughput:** Clients have achieved up to a 3X build rate, significantly enhancing production efficiency.
- **Cost savings:** Quest Global's non-conformance management approach has led to cost reductions in non-quality, with annual savings of up to \$10 million for major aerospace and defense companies.
- **Process improvement:** The partnership accelerates processes, reducing the time required for disposition to as little as one-fifth of the original time.
- **Expertise and capability:** With an integrated team of design engineering, manufacturing engineering, and quality professionals, Quest Global provides engineering signatories and material review engineers to aid in final disposition, allowing customers to focus on high-priority projects.
- **Turnaround time improvement:** End-to-end management by Quest Global enables up to a 50% improvement in turnaround time, reducing handoffs and improving flow lines, ensuring timely delivery of parts to the assembly line.
- **Agile resource deployment:** Quest Global's agile resource deployment supports significant unplanned growth, scaling resources up or down as needed.
- **Continuous improvement:** Quest Global is committed to improving manual processes by up to 15% annually to boost efficiency.
- **Technology enablement:** Infusing advanced technologies like AI, ML, RPA, and Knowledge-Based Engineering (KBE), Quest Global has implemented multiple automation tools to reduce turnaround time and improve efficiency.



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