Global Certificate in Aerospace Quality

Unit 5: Quality Tools and Techniques in Aerospace

In the aerospace industry, quality is of utmost importance to ensure the safety and reliability of aircraft, spacecraft, and missiles. To achieve this, various quality tools and techniques are employed throughout the design, manufacturing, and maintenance processes. One of the key concepts in quality management is total quality management, which involves the participation of all employees in the organization to improve quality and reduce defects. This approach emphasizes the importance of continuous improvement and customer satisfaction.

The Aerospace Quality Standard, also known as AS9100, is a widely adopted standard in the aerospace industry that outlines the requirements for a quality management system. This standard emphasizes the importance of risk management and supply chain management to ensure the quality of products and services. The AS9100 standard also requires organizations to establish a quality policy and quality objectives that are aligned with their overall business strategy.

Another important concept in aerospace quality is reliability, which refers to the ability of a product or system to perform its intended function over a specified period of time. Reliability engineering involves the use of various techniques, such as failure mode and effects analysis and reliability modeling, to identify and mitigate potential failures. The goal of reliability engineering is to minimize the likelihood of equipment failure and ensure the safety of passengers and crew.

The failure mode and effects analysis is a systematic approach to identifying potential failures and evaluating their impact on the overall system. This technique involves identifying potential failure modes and assessing their severity, occurrence, and detectability. The results of this analysis are used to prioritize corrective actions and implement design improvements to minimize the risk of failure.

In addition to reliability engineering, statistical process control is another important technique used in aerospace quality. This involves the use of statistical methods to monitor and control manufacturing processes, ensuring that they operate within predetermined limits. The goal of statistical process control is to minimize variability and ensure that products meet specifications. This technique is particularly useful in manufacturing environments where process control is critical to ensuring product quality.

The deming cycle, also known as the PDCA cycle, is a widely adopted approach to quality improvement. This cycle involves four stages: plan, do, check, and act. The plan stage involves identifying improvement opportunities and developing a plan to address them. The do stage involves implementing the plan and collecting data to evaluate its effectiveness. The check stage involves analyzing the data and determining whether the desired results have been achieved. The act stage involves implementing changes to the process based on the results of the analysis.

In the aerospace industry, lean manufacturing is a popular approach to improving efficiency and reducing

waste. This involves the use of various techniques, such as value stream mapping and kaizen events, to identify and eliminate non-value-added activities. The goal of lean manufacturing is to minimize lead time and maximize value to the customer.

The eight disciplines method, also known as 8D, is a structured approach to problem solving that is widely used in the aerospace industry. This method involves eight stages: establish the team, describe the problem, develop interim containment action, identify and verify the root cause, choose and verify the solution, implement the solution, evaluate the results, and recognize the team. The goal of the 8D method is to provide a structured approach to problem solving that ensures that all aspects of the problem are considered.

In addition to these techniques, root cause analysis is an important tool used in aerospace quality to identify the underlying causes of problems. This involves the use of various methods, such as five whys and fishbone diagrams, to drill down to the root cause of the problem. The goal of root cause analysis is to identify the underlying cause of the problem and implement corrective actions to prevent its recurrence.

The five whys method is a simple yet effective technique for identifying the root cause of a problem. This involves asking why five times to drill down to the underlying cause of the problem. For example, if a machine is not functioning properly, the first why might be "why is the machine not functioning?" The answer might be "because it is not receiving power." The second why might be "why is the machine not receiving power?" The answer might be "because the power cord is damaged." The third why might be "why is the power cord damaged?" The answer might be "because it was damaged during shipping." The fourth why might be "why was the power cord damaged during shipping?" The answer might be "because it was not properly packaged." The fifth why might be "why was the power cord not properly packaged?" The answer might be "because the packaging procedure was not followed."

The fishbone diagram, also known as the ishikawa diagram, is a visual tool used to identify the possible causes of a problem. This diagram is shaped like a fishbone and has several branches that represent different categories of causes. The main categories of causes are typically man, machine, material, method, and measurement. Each branch has several sub-branches that represent more specific causes. The goal of the fishbone diagram is to identify all possible causes of the problem and evaluate their likelihood and impact.

In the aerospace industry, audits are an important tool used to evaluate the effectiveness of quality management systems. An audit is a systematic examination of the quality management system to ensure that it conforms to the requirements of the Aerospace Quality Standard. The goal of an audit is to identify areas for improvement and provide recommendations for corrective actions. Audits can be internal or external, depending on who performs the audit.

An internal audit is performed by the organization itself, typically by a quality assurance department. The goal of an internal audit is to evaluate the effectiveness of the quality management system and identify areas for improvement. Internal audits are typically performed on a regular basis, such as quarterly or annually.

An external audit is performed by an independent third-party auditor, such as a certification body. The goal of an external audit is to evaluate the conformity of the quality management system to the requirements of the Aerospace Quality Standard. External audits are typically performed on a less frequent basis, such as every two or three years.

In addition to audits, certification is an important aspect of aerospace quality. Certification involves the evaluation of an organization's quality management system by an independent third-party certification body. The goal of certification is to provide assurance that the organization's quality management system conforms to the requirements of the Aerospace Quality Standard. Certification is typically voluntary, but it is often required by customers or regulatory bodies.

The certification process typically involves several stages, including application, audit, and certification. The application stage involves submitting an application