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How to Meet AS9100 Requirements as a Defense Subcontractor

by Vlad Di Natale, Operations Manager, dB Control

The aerospace industry continues to heat up, along with the need for systematic traceability that maintains quality while reducing costs. Considering that unmanned aerial vehicles (UAVs) like the RQ-4 Global Hawk can cost upwards of $130 million and other military aircraft like the B-52 can cost approximately $53 million, malfunctions of any kind can be disastrous. Even commercial aircraft like the Boeing 737 can cost between $51.5 million and $87 million, depending on the model. Malfunctions are not only costly, but can be life threatening.

The construction and maintenance of aircraft involves a variety of products, including wide-bandwidth amplifiers, high-voltage connectors, electromagnetic interference (EMI) filters, DC-DC converters, laser rangefinder receivers, onboard computers, lighting, communication systems and serial bus interfaces. These products, along with parts and supporting equipment/subsystems are designed and manufactured by dozens of companies with different specialties. One thing all of these suppliers must have in common is a concern for quality and compliance.

For these reasons, manufacturers supplying the aerospace industry face the decision whether to become AS9100 certified. An international quality management system standard, AS9100 builds on ISO 9001 and adds requirements specific to the aircraft, space and defense industry. For those new to this standard, it combines and harmonizes AS9000, ISO 9001 and Europe's prEN9000-1 quality systems. It also defines specialized areas within an aerospace quality management system such as acquisition traceability, configuration management, product documentation and control of work performed outside the supplier's facilities. To satisfy DOD, NASA and FAA quality requirements, suppliers must be able to trace all components of a failing part back to its origin. To do this, and ultimately hold suppliers accountable for providing reliable products, they must have the ancestry of those components on file.

At its core, AS9100 consists of a "Plan-Do-Check-Act" cycle that focuses the organization on its key processes, planning, reviewing, and continual improvement. From its inception, one of the tenets of AS9100 has been to mandate what a quality management system must achieve, but not how to achieve it – leaving the latter up to the supplier. As a result, the way the requirements of the standard are met can vary dramatically from supplier to supplier.

Some manufacturers that are ISO 9001 certified create their own systems that meet AS9100 requirements. The AS9100 standard's flexibility allows these companies to fine-tune existing quality management systems and avoid investing the considerable time and money required to purchase and implement new enterprise-level software. dB Control (an international defense electronics manufacturer) was able to modify its existing quality system to meet AS9100 requirements. Even though its system was not originally designed for part tracking and traceability from procurement through final build and shipping, the company scrupulously monitors the process. Additionally, its quality manual and documentation remain extremely comprehensive and thorough.

For example, when a part arrives, it is received into the system, which then issues a receiving transaction number that begins the process of recording all subsequent information and becomes the internal lot number for that part. When the part gets kitted and sent to production that tracking number is recorded on the stock issue report. This tracking continues as the component becomes part of larger and larger assemblies. The end result? A build package that includes all routing documents created throughout the process. This package now contains a very detailed "as-built" list. Even though this process is only minimally automated, the company knows which parts from which lots were used to build which products and sold to which customers all while maintaining full traceability for each part back to its origin. It also makes it possible to produce any associated certificates, test reports and other supporting documentation quickly, should the need arise.

Going Above and Beyond the Standard

For manufacturers supplying hardware that will be used in space, the requirements for "hi-rel" and space-qualification vastly exceed those of AS9100. Considering that repairs are generally impossible for equipment orbiting the Earth, component failure is not an option. For these companies, meeting the AS9100 standard is considerably less difficult – more like dotting i's and crossing t's. Companies must maintain extraordinary levels of traceability, including the serial and lot numbers for every component in an assembly. Traceability must also be maintained from the materials level through plating and a broad array of other functions that are well beyond what is required in AS9100 as it applies to the aerospace community as a whole.

For example, a manufacturer required to meet the MIL-PRF-38534 QML for hybrid microcircuits must meet specifications that demand extraordinary traceability, require extensive accountability for manufacturing control, worst-case analysis, shock, vibration, thermal cycling, and many other factors. Serial numbers, part numbers and date codes must be present on every product. Traceability must be provided all the way back to original materials and components, i.e., the wafer number in the case of a semiconductor or the lot number for a packaged part. This requires strict controls on materials procurement, kitting, and record retention during manufacturing – an expensive, labor-intensive process. The benefit to the customer is that if a problem develops even five years after the product was delivered, the manufacturer can trace the individual failed component, in which products it was used, as

well as the customers who received them. Many terrestrial platforms also require this high level of detail and testing, especially in military and mission-critical applications, but this is usually flowed down contractually regardless of what certifications a subcontractor may hold.

AS9100D Compliance Beckons

The latest revision of the standard (AS9100D) is expected to be released later this year. Although the new standard will contain many edits and clarifications to its predecessor, its most significant and broad-based enhancements will be to planning and risk management. In fact, language specifically dedicated to risk management is present throughout.

In general, AS9100D is expected to increase requirements for demonstrating compliance in more detail, from internal auditing to corrective action, while also mandating the ability to provide objective evidence of compliance, whether a document, chart, or diagram, thus eliminating some gaps in the previous version. It is generally acknowledged among QA managers that the forthcoming changes within AS9100D were driven by the aerospace industry rather than the aircraft industry. Thus validation of tests, risk analysis, assessment and mitigation, processes that were touched upon in the current version, are now essential. In addition to taking a major step forward in risk mitigation, AS9100D will expand sections of its predecessor to better define compliance requirements. In short, it calls for more detailed documentation and thus potentially greater traceability.

As the AS9100D standard will require significantly higher levels of effort to remain compliant, enterprise software and the automated accountability it provides can be a significant benefit. For example, rather than simple tooling documentation, a procedure must be in place and records kept as to when a tool will be serviced or replaced and whether it in fact was replaced. Enterprise software can automate this and many other functions. In larger companies, this has become a necessity. Another benefit of enterprise software is that it can make companies more productive without adding massive amounts of overhead and touch labor which can actually complicate, rather than streamline, the process.

Customers Influence Certification Decision

The Department of Defense, FAA, and NASA endorse AS9100 certification, but do not typically demand it. As suppliers serving the defense and aerospace markets are not required to be certified, in practical terms, the decision is often determined by whether or not a major customer requires it. For example, if a manufacturer's customers are prime contractors such as Boeing, Rolls Royce, United Technologies or Raytheon, certification can become a necessity. In addition, if a manufacturer is supplying a component to a contractor further up the food chain and the ultimate recipient of the end product requires certification to AS9100, the manufacturer may find itself in a situation that much resembles a full-blown certification audit. With this comes the need to prove compliance and adherence to key aspects of the standard.

For many manufacturers, the customer with the most strenuous requirements dictates whether ISO 9000 alone or AS9100 (which incorporates, adds to and amplifies the requirements of ISO 9001) is necessary. At the very least, AS9100 is beneficial because it forces manufacturers to pay strict attention to quality. At its best, the standard provides a very high level of accountability, especially in the case of first article inspection – the standard's furthest reach into the domain of military specifications.

Not only does AS9100 provide a single standard for all suppliers, it enables greater focus on key customer requirements, improved product and process quality, reduced quality variation, increased efficiency, potential reduction of second-party audits and precise traceability throughout the supply chain. Subcontractors who provide products to AS9100-certified prime contractors must maintain the same standards for quality as their customer. However, as specific procedures for traceability remain at the discretion of the company, a manufacturer that is ISO 9001 certified can fulfill AS9100 traceability requirements by using accounting data to track part lots. By tapping into an existing methodical system, data accuracy is ascertained. Plus, using accounting data to fulfill traceability requirements comes at no additional cost, as the accounting system is already in use. As found in the example at dB Control, a company can create a build package that includes every routing document created throughout the process. This make it possible to find what lot tracking number was given to every part, trace it back to its supplier and produce any associated certificates/test reports at a moment's notice.

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