Standard Issues

ASD STANDARDS

The Complete Package

24 standards to help you improve quality, schedule and cost performance

by L.L. "Buddy" Cressionnie

When users think about the International Aerospace Quality Group (IAQG) or aerospace quality standards, they typically think only of the aerospace standard AS9100. But what about the other standards that IAQG provides for a complete quality management system (QMS) solution for the aviation, space and defense (ASD) industry?

The IAQG has 24 standards published in the Americas by the Society of Automotive Engineers, which can be grouped into four categories: certification scheme QMS standards, oversight of certification scheme QMS standards, a QMS auditing standard and QMS improvement standards. The relationship among these standards is outlined in Online Figure 1, which can be found on this column's webpage at qualityprogress.com.

The use of these standards should result in improved quality, schedule and cost performance by reducing or eliminating requirements that are unique to the organization and providing wider application of best practices.

Let's look at each of the four categories in more detail.

Certification scheme QMS standards

Certification scheme QMS standards often are called the AS9100-series certification standards. The baseline standard is AS9100, with about 90% of aerospace certified organizations in the Americas being certified to AS9100 and the remaining 10% to AS9110 and AS9120. There are about 21,000 certified aerospace organizations worldwide, which often is a customer requirement to provide products and services to the ASD industry.

The growth of these certification standards since they were first issued in 1999 is impressive. Online Figure 2 shows their growth from January 2004 through July 2018.

The certification scheme QMS standards are:

+ ***AS9100—Quality management systems—Requirements for aviation, space and defense organizations:*** This document standardizes QMS requirements to the greatest extent possible and can be used at all levels of the supply chain by organizations around the world. Its use should result in improved quality, cost and delivery performance through the reduction or elimination of organization-unique requirements, effective implementation of the QMS and wider application of good practices.

  While primarily developed for the ASD industry, this standard also can be used in other industry sectors when a QMS with additional requirements over an ISO 9001 system is needed.
+ ***AS9110—Quality management systems—Requirements for aviation maintenance organizations:*** This document is primarily for civil and military aviation industry organizations that provide maintenance services. AS9100 requirements were added or removed as deemed appropriate for maintenance services. This standard complements Federal Aviation Administration (FAA) requirements and provides a structure for improved quality, cost and delivery performance.
+ ***AS9120—Quality management systems—Requirements for aviation, space and defense distributors:*** This document is for organizations that procure parts, materials and assemblies, and resell those products to a customer in the ASD industry. This includes

organizations that procure products and split them into smaller quantities, including those that coordinate a customer or regulatory-controlled process on the product.

AS9100 requirements were added or removed as deemed appropriate for distributors. This standard is not intended for organizations that maintain or repair products, or for organizations that perform work that affects or could affect product characteristics or conformity.

Oversight of certification scheme QMS standards

These standards frequently are called the "trilogy" because they work together to form the oversight of the certification scheme.

The other-party management team is responsible for the IAQG certification scheme, which is called the industry-controlled other party (ICOP) scheme. The ICOP scheme leverages the checks and balances of the International Organization for Standardization scheme, with organizations being audited by certification bodies (CB), which are in turn audited by accreditation bodies (AB). The ICOP scheme adds additional assurances by industry engagement to ensure the scheme is robust, recognized and valued.

The common auditing standard ensures that all other-party assessments are conducted consistently and that information can be located easily in the audit records held in the OASIS database.

The oversight of certification scheme standards are:

+ ***AS9104-1—Requirements for aviation, space and defense quality management system certification programs:*** This document defines the basic requirements for managing the aerospace QMS certification scheme, including requirements for ABs, CBs, auditors, auditor authentication bodies (AAB), training provider approval bodies (TPAB), industry oversight and online aerospace supplier information system (OASIS) database management.

  This document provides organizations with a better understanding of the certification scheme requirements and how audits are scheduled and conducted.
+ ***AS9104-2—Requirements for oversight of aerospace quality management system registration/certification programs:*** This standard documents the oversight process of AS9100-series certification for the ICOP scheme. The oversight process covers participating IAQG member organizations, ABs, CBs, AABs, TPABs and training providers to ensure consistent conformance with requirements.
+ ***AS9104-3—Requirements for aerospace auditor competency and training courses:*** This document provides the minimum requirements for aerospace auditors participating in AS9100-series certification activities, including the auditor authentication process and requirements for a training organization. It applies to auditors seeking formal approval to conduct audits in support of the IAQG, and to those who manage the competency element of an aerospace QMS audit program or training organizations.

QMS auditing standard

The ICOP auditing scheme uses the same auditing standard for all AS9100-series certification standards. The common auditing standard ensures that all other-party assessments are conducted consistently and that information can be located easily in the audit records held in the OASIS database. The QMS auditing standard is:

AS9101—Quality management systems audit requirements for aviation, space and defense organizations: This standard defines requirements for preparing and executing the audit process. It defines the content and composition for the audit reporting of conformity and process effectiveness to the AS9100 series of standards, the organization's QMS, and customer, statutory and regulatory requirements.

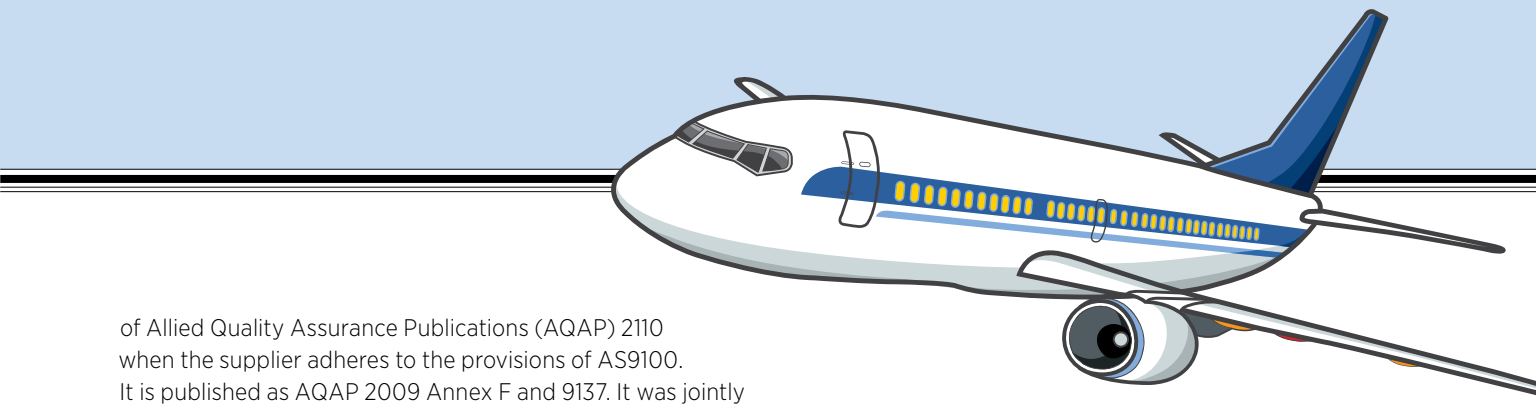
QMS improvement standards

The QMS improvement standards include guidance or requirements that do not add to or modify the requirements of AS9100. The intent of these improvement standards is to standardize certain aspects of the QMS to meet industry requirements.

The use of these standards should result in improved quality, schedule and cost performance by reducing or eliminating organization-unique requirements and providing a wider application of best practices. Online Table 1 shows the relationship between these standards and the relevant clauses of AS9100. In the Americas, these standards consist of aerospace standards and aerospace recommended practices (ARP). These documents can be flowed contractually from a customer to a supplier or used by organizations to improve their QMSs.

The QMS improvement standards are:

+ ***AS9102—Aerospace first article inspection requirement:*** This document standardizes the first article inspection process requirements to provide consistent process and documentation requirements for product verification.
+ ***AS9103—Aerospace series—Quality management systems—Variation management of key characteristics:*** This document standardizes requirements for identifying, controlling, documenting and approving key characteristics for the industry. It establishes common requirements by organizations to reduce resultant variation inherent in the build process.
+ ***ARP9107—Direct delivery authorization guidance for aerospace companies:*** This document provides guidance for production and design organizations on how to comply with direct delivery authorization, including appropriate arrangement requirements.
+ ***ARP9114—Direct ship guidance for aerospace companies:*** This document standardizes requirements for the direct shipment of articles from an approved manufacturer's supplier to an approved manufacturer's customer. It was originally produced as a cooperative effort between the FAA and the IAQG.
+ ***AS9115—Quality management systems—Requirements for aviation, space and defense organizations—Deliverable software:*** This document supplements AS9100 requirements for deliverable software and contains QMS requirements for organizations that design, develop or produce deliverable software and services for the ASD industry. This includes, as required, support software used to develop and maintain deliverable software and services. The deliverable software may be standalone, embedded, mobile application or loadable onto a target computer.
+ ***AS9116—Aerospace series—Notice of change (NOC) requirements:*** This document provides for the uniform submittal of change notifications and approval when contractually invoked at any level, or as guidance in the ASD industry.
+ ***AS9117—Delegated product release verification:*** This standard specifies requirements for delegated product release verification (DPRV) to establish common product or service requirements for use at all levels of the supply chain. It applies when an organization elects DPRV by contractual flow-down to its supplier or to perform product acceptance on the organization's behalf. The delegating organization uses this standard as the baseline for establishing a DPRV process, although it may include additional contract requirements to meet its specific needs.
+ ***AS9131—Aerospace series—Quality management systems—Nonconformance data definition and documentation:*** This document standardizes requirements for nonconformance data definition and documentation for the industry.
+ ***AS9132—Data matrix quality requirements for parts marking:*** This document standardizes data matrix quality requirements for parts marking for the industry.
+ ***AS9133—Qualification procedure for aerospace standard products:*** This standard defines a system for qualifying standard products for ASD applications. It defines the principles that must be followed to carry out product qualification and is applied in conjunction with the rules and procedures of the certification authority (CA). The system enables the CA to confirm compliance is achieved and maintained in accordance with the requirements of its product definition and associated controlling technical specifications by an original component manufacturer of standard products.
+ ***ARP9136—Root cause analysis and problem solving (9S methodology):*** This standard proposes a method for improving the way issues are managed, including communication between all parties (such as engineering, the materials review board, manufacturing, manufacturing engineering, the supplier and the customer), to reduce their effect. It also proposes a method to containing the issues as far upstream as possible and prevent recurrence—that is, ensure the right measures are taken at the right location and at the right time.
+ ***ARP9137—Guidance for the application of AQAP 2110 within a 9100 quality management system:*** This document provides information and guidance on the application



of Allied Quality Assurance Publications (AQAP) 2110 when the supplier adheres to the provisions of AS9100. It is published as AQAP 2009 Annex F and 9137. It was jointly developed by the North Atlantic Treaty Organization (NATO) and industry representatives for use by NATO and industry to facilitate the use and understanding of the relationship between the AQAP 2110 and AS9100.

+ ***AS9138—Aerospace series—Quality management systems statistical product acceptance requirements:*** This standard establishes the general requirements applicable to any method of statistical product acceptance to reduce inspection costs while still ensuring acceptable quality. There is no single specific plan considered best suited for all applications or processes. This document applies only to statistical methods used for product acceptance. Many organizations use excellent statistical methods solely to monitor and improve their product quality, and those methods are not subject to the requirements of this document.
+ ***AS9145—Aerospace series—Requirements for advanced product quality planning and production part approval process:*** This standard specifies requirements in a structured framework to plan and complete actions of the product realization cycle necessary to ensure quality products are delivered on time while satisfying cost performance targets.

Advanced product quality planning (APQP) drives a quality-focused approach to product development using a phased planning process. In the approach, specific deliverables are established, monitored and tracked to closure while highlighting and mitigating risks as they are identified.

The production part approval process is an output of APQP. It confirms that the production process has demonstrated the potential to produce products that consistently fulfill all requirements while operating at the customer demand rate.

Successful implementation of APQP requires management commitment and support from the beginning of the product development cycle. It also requires multidisciplinary project teams integrating all stakeholders and delivering a committed timeline for executing planned activities.

APQP has five phases, starting with conceptual product needs and extending throughout the product life cycle. The actual duration of each phase depends on the scope and timing of the specific product or product development project.

+ ***AS9146—Foreign object damage (FOD) prevention program—Requirements for aviation, space and defense organizations:*** This standard defines FOD prevention program requirements for organizations that design, develop and provide ASD products and services. It also applies to organizations that provide post-delivery support, including maintenance, spare parts or materials for their own products and services.
+ ***AS9147—Unsalvageable items management:*** This standard, which is still in development, applies to all items used for manufacturing, maintenance and repair of ASD products from the raw material to the final product. It considers items dispositioned for scrap as per the relevant nonconformity management requirements or as per an organization's decision, such as obsolescence, warehouse management or missing traceability documentation.
+ ***ARP9162—Aerospace operator self-verification programs:*** This standard focuses on standardizing—to the extent possible—operator self-verification practices in the ASD industry.

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Vital resources

The IAQG was instituted to seek common industry QMS processes and documentation to avoid the high costs of a supply chain that must meet unique customer requirements. With the development of these standards and use of the *Supply Management Handbook*,[1] organizations should see improved quality, schedule and cost performance. These documents can be invaluable to organizations and QMS practitioners in search of expert guidance and support as they grapple with the day-to-day demands of their profession. QP

REFERENCE

1. Joseph L. Cavinato, *The Supply Management Handbook*, seventh edition, McGraw-Hill Education, 2006.

L.L. "Buddy" Cressionnie is president of ASD Expertise LLC, with industry leadership positions of Americas Aerospace Quality System Committee (AAQSC) chair and AAQSC leader of requirements, projects and AS9100. He is active in standards development as a liaison member to the International Organization for Standardization (ISO) Technical Committee (TC) 176, including writing ISO 9001:2015 and ISO 9004:2018, and participating in the ISO 9001 Interpretations Committee.