

STANDARD ISSUES

Standards-related developments and activities



AS9145

FROM

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P R O A C T I V E

How AS9145 can change the way your organization identifies risk by Jennifer Gray

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he Aerospace Standard AS9145—*Requirements for Advanced Product Quality Planning (APQP) and Production Part Approval Process (PPAP)* is an upcoming standard for the aerospace, space and defense industry. APQP began in the 1980s when the U.S.

auto industry began facing severe competition from Japanese manufacturers. The quality and durability of U.S. products were less robust compared to their Japanese competitors.

At the time, the Big Three automakers—Ford, General Motors and Chrysler—came together to develop a set of standard tools, guidelines and principles to help suppliers regain a competitive edge within the auto market. Supplier parts made up a lot of the auto assembly, so it was vital that all parts had:

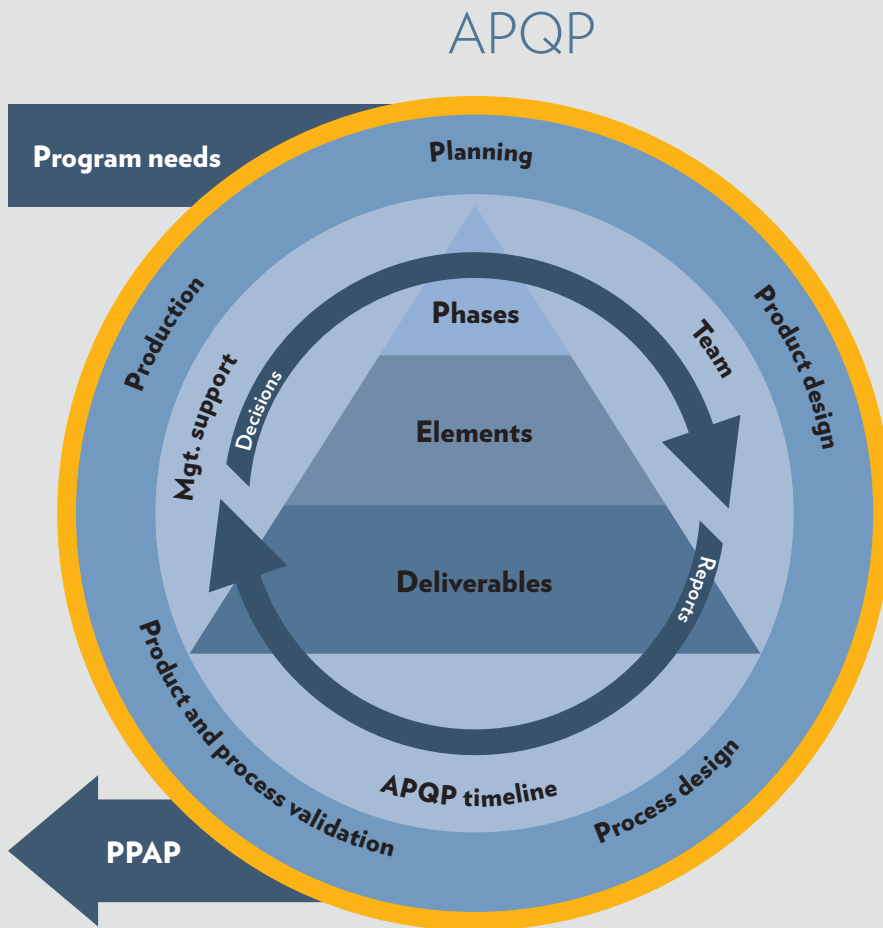
- High quality.
- High durability.
- Minimal variation from part to part and supplier to supplier.
- The ability to deliver at the customer's demand rate.

These guidelines and tools are now known as APQP. APQP is a structured method of defining and establishing the steps necessary to ensure the end product satisfies the customer at the customer's demand rate.

APQP has expanded from the auto industry into other industries, such as medical and special government agencies, and is making its way to the aerospace, space and defense industry. The International Aerospace Quality Group® (IAQG) has standardized the APQP approach for aerospace with AS9145.

FIGURE 1

APQP process



- Cost savings due to earlier defect identification.
- Cross-functional communication and collaboration.
- Decreased internal nonconformances and customer escapes.
- Higher supplier quality performance and on-time delivery.

Ultimately, APQP enables the production environment to be successful.

APQP is led by the leaders of the cross-functional team (usually called program managers) and is not just the responsibility of the quality department, as the name suggests. APQP is a fully integrated, cross-functional risk management activity that requires input and feedback from everyone. All functions contribute to the process by communicating from their perspective what items can affect or already have affected a product's quality, cost or delivery.

It takes the organization out of a siloed way of working and encourages communication and collaboration across all functions to ensure the organization creates robust processes and safe, reliable products that meet customer and regulatory requirements.

How does APQP work?

APQP is a phased planning process approach that highlights risks as they are identified via specific deliverables that are established, monitored and tracked to closure throughout the product development process (see Figure 1).

There are five phases of APQP, as shown in Table 1 (p. 50). Each phase has associated activities and outputs as a result.

Additionally, for an APQP project to be successful, the three pillars of APQP must be executed:

1. Leadership engagement and commitment.
2. Establishing multidisciplinary teams to support.
3. Managing the project to ensure on-time completion of the defined deliverables and outputs.

Source: International Aerospace Quality Group (IAQG), "Advanced Product Quality Planning (APQP) and Production Part Approval Process (PPAP)," IAQG, July 2019, <https://bit.ly/3yC0FP3>.

APQP = advanced product quality planning

Mgt. = management

PPAP = production part approval process

Why AS9145?

What does APQP do for us? In short, it takes us from a reactive state to a more proactive state. APQP requires upfront risk and issue identification and mitigation during the planning process to ensure a higher probability of stable and consistent processes

before manufacturing. If implemented well, it will eliminate quality and engineering issues before they're transferred to suppliers or customers. Customers will see benefits such as:

- Higher customer satisfaction.
- Earlier understanding of changes (intentional and incidental).

TABLE 1

Five phases of APQP

Phase one:	Planning	Customer requirements are captured, and the concept is defined
Phase two:	Product design and development	The product is designed considering risks and requirements
Phase three:	Process design and development	The production system is designed considering risks and requirements
Phase four:	Product and process validation	The product and process are validated to ensure compliance and consistency
Phase five:	Ongoing production, use and post-delivery service	Continuous improvement is managed

APQP = advanced product quality planning

TABLE 2

Elements of PPAP

Production Part Approval Process (PPAP) Element		APQP Phase
1.	Design documentation	2
2.	Design risk analysis, such as design failure mode and effects analysis (only applicable to design organizations)	2
3.	Process flow diagram	3
4.	Process failure mode and effects analysis	3
5.	Production control plan	4
6.	Measurement system analysis	4
7.	Initial process capability studies	4
8.	Packaging, preservation and labelling definition	3
9.	First article inspection report	4
10.	Customer PPAP Requirements	4
11.	PPAP approval form (or equivalent)	4

APQP = advanced product quality planning

What is PPAP?

Successfully implementing AS9145 requires completing all APQP

elements for the product. The PPAP is one element of APQP. Completing the PPAP, however, does not represent

the successful completion of APQP. The PPAP step in the APQP process is designed to create the baseline for all future changes to the product requiring a PPAP resubmission (see Figure 2).

The aerospace PPAP consists of 11 elements, which are outlined in Table 2.

PPAP is like the first article inspection process in AS9102 in that it is a set of living documents. When a process has changed or a nonconformance has been identified, the PPAP elements should be updated to reflect the change.

The AS9145 revision

AS9145 currently is being revised by the IAQG writing team. The team is focusing on providing additional clarification to the standard based on feedback from the aerospace industry.

The writing team consists of members from all three IAQG sectors and is represented by 19 member companies that include commercial, space and defense original equipment manufacturers, and suppliers from around the world.

Expected changes

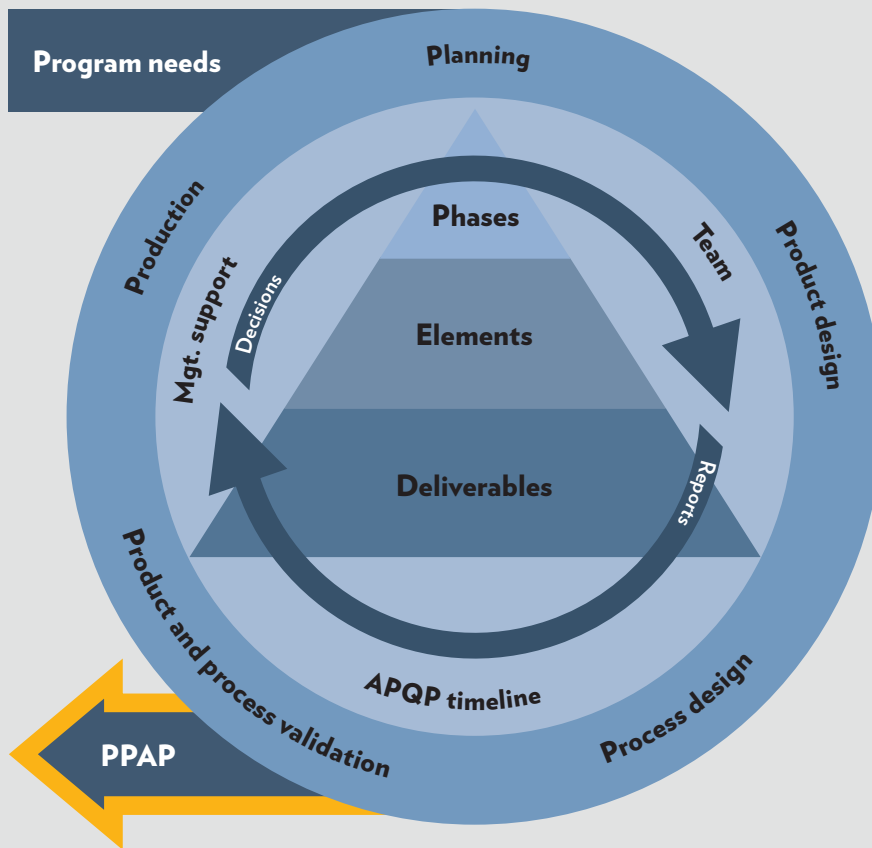
When updating the standard, the writing team addressed gaps, errors and needed clarifications identified by industry feedback. Some requested changes were beyond the scope of the standard, but the writing team felt it was valuable feedback and is adding the clarifications to the *IAQG Supply Chain Management Handbook*[®] (SCMH) APQP guidance material. This guidance material is anticipated to be updated within the IAQG SCMH website concurrently with the publication of the AS9145 revision.

One change to the standard is regarding the required deliverables identified in AS9145. The feedback identified a need for clarification in Appendix B, tables B1–B5. Currently, the standard lists required deliverables (identified in bold font) as well as additional deliverables.

FIGURE 2

Aerospace PPAP

Aerospace APQP



Source: International Aerospace Quality Group (IAQG), “Advanced Product Quality Planning (APQP) and Production Part Approval Process (PPAP),” IAQG, July 2019, <https://bit.ly/3yC0FP3>.

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According to the feedback, there is a misconception that all deliverables listed in the table are being interpreted as required, regardless of whether there is a “shall” statement in the body of the standard. The writing team has updated this by removing deliverables that aren’t required from the Appendix B tables. The SCMH APQP guidance material will include the removed deliverables. Additionally, each phase of the standard was updated to ensure consistency.

Another update is focused on change management. Currently, AS9145 doesn’t consider how the process addresses updated deliverables when changes occur. If product design changes are made after phase two, for example, evaluation is not required for updates to phase-two deliverables. Therefore, section 4.1.6 was added, which requires the application of a change management process to ensure that risks associated with changes are evaluated for updates to APQP deliverables. Also, an activity was added to Appendix B, tables B2–B4 to update deliverables from previous phases as necessary to address these changes.

The AS9145 revision will use the new standards development organization process using the online system—Standard Works v2—which is managed by the IAQG-1 Committee. This will allow the standard to be released faster because it doesn’t have to go through each sector’s publisher. Going forward, the standard no longer will maintain the sector prefixes but will instead be designated as IA9145. The standard is on track to be published by the end of 2023. **QP**



Jennifer Gray is a global supplier quality assurance manager for Spirit AeroSystems in Wichita, KS, and is the international document representative of the International Aerospace Quality Group (IAQG) 9145 standard, a contributing member of the IAQG 9145 deployment team, the Americas’ sector leader for the IAQG product and supply chain improvement team, as well as the Americas’ sector leader for the IAQG early career program. Gray received an MBA from Newman University in Wichita.