

AESQ Supplier Forum – AS13100 Deployment
6 October 2022

Welcome & Introductions



130+ Individuals Registered from 7 Countries

AESQ Supplier Forums



Typically held twice a year, rotating around North America, Europe and Asia

AESQ Supplier Forums provide an opportunity to;

- Provide updates on the work of the AESQ
- Share best practice
- Provide feedback to the AESQ
- Develop a network of practitioners and Subject Matter Experts

AESQ – Aerospace Engine Supplier Quality Strategy Group

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2022 AESQ Supplier Forums: Focus on AS13100 Deployment




Introducing AS13100: AESQ Quality Management Requirements

THE NEW STANDARD CREATING A COMMON LANGUAGE FOR QUALITY THROUGHOUT THE AEROSPACE ENGINE SUPPLY CHAIN

SAE AS13100 AESQ QUALITY MANAGEMENT SYSTEM REQUIREMENTS FOR AERO ENGINE DESIGN AND PRODUCTION ORGANIZATIONS

This standard sets out to create a common set of supplemental requirements with common training and reference manuals to improve understanding, efficiency, and performance. While significantly simplifying the businesses of suppliers with multiple customers, the primary intent of this new standard is to improve overall product quality by focusing on the key systems and processes currently deterring consistent aerospace engine product quality.

These common supplemental requirements aim to raise the bar for anticipated performance in these key areas, and therefore detailed guidance is provided to ensure clarity of expectations.

To assure customer satisfaction, the aviation, space, and defense industry organizations have to produce and continually improve safe, reliable products that equal or exceed customer and regulatory authority requirements. The globalization of the industry and the resulting diversity of regional/national requirements and expectations have complicated this objective. End-product organizations face the challenge of assuring the quality of and integration of product purchased from suppliers throughout the world and at all levels within the supply chain. Industry suppliers face the challenge of delivering product to multiple customers having varying quality expectations and requirements.



Learn about how SAE AS13100 AESQ Quality Management System Requirements for Aero Engine Design and Production Organizations minimizes requirements and improves overall product quality by focusing on the key quality systems and processes. Through an executive overview and a self-paced course, your organization can gain key knowledge about a common quality language, how to gain compliance to AS13100 and the business value and benefit of the standard. Walk-through each section of the standard and understand the new requirements.

For more information, please visit:
discover.sae.org/AS13100



TESTIMONIAL

"Although created by the Aero Engine Supplier Quality Group in conjunction with the SAE G-22 Aero Engine Supplier Quality Standards Committee, this standard and supporting materials will benefit any organisation, in any industry."

Dr. Ian Riggs
 Global Quality Executive
 Rolls-Royce & AESQ Chair

Learn more:
www.sae.org/standards/content/AS13100/



Agenda

Topic	Presenter
Welcome & Introductions	Barbara Negroe , Executive Sourcing Quality Leader, GE Aviation
Rolls-Royce Welcome Address	Candice Bineyard , Director of Programs - Defense, Rolls-Royce
AESQ Overview, Vision & Objectives	Lisa Claveloux , Sr. Director Group Quality, Pratt & Whitney
AS13100 Standard Overview	Larry Bennett , Consulting Engineer, Global Sourcing Quality, GE Aviation
Deployment Milestones <ul style="list-style-type: none">• Introduction & Milestones• Deployment Survey Results• APQP Deployment• Implementation Status Reporting in 2023	Elizabeth Pace , Supplier Quality Strategy, Associate Director, Raytheon Technologies Ricardo Banelas , Head of Continuous Improvement, Rolls-Royce Jim Wilson , Sr. Manager, Supplier Quality, & Development, Pratt & Whitney Canada
BREAK – 15 Minutes	

Agenda

Topic	Presenter
AS13100 Implementation Plans + RM13009 Gap Analysis Case Studies	Sean Keane , Director of Engineering, J&L Machine Co. Branden J. Workman , Sr. Quality Aerospace North America, SKF Steve McMulkin , Head of Manufacturing Quality, Parker Meggitt
Training Overview	Earl Capozzi , Associate Director, Discipline Chief, Quality & Process Engineering/Supplier Quality, Pratt & Whitney
GROUP PHOTO & LUNCH – 75 MINUTES	
OEM Requirements Session	Larry Bennett , Consulting Engineer, Global Sourcing Quality, Supply Chain Division, GE Aviation Tracey Lockhart , Head of Quality and Continuous Improvement, Defence, Rolls-Royce Jim Wilson , Sr. Manager, Supplier Quality, & Development, Pratt & Whitney Canada Denis Pottier , Head of the Purchasing Quality Assurance Department, Safran Aircraft Engines Catherine Catarina-Graca , Supplier Management System Coordinator, Safran Aircraft Engines

Agenda

Topic	Presenter
AS13100 FAQ Panel	MODERATOR: Barrie Hicklin , Sr. Director, Quality Systems & Regulatory Compliance, Honeywell Aerospace PANELISTS: Larry Bennett , Consulting Engineer, Global Sourcing Quality, Supply Chain Division, GE Aviation Catherine Catarina-Graca , Supplier Management System Coordinator, Safran Aircraft Engines Jim Wilson , Sr. Manager, Supplier Quality, & Development, Pratt & Whitney Canada Earl Capozzi , Associate Director, Discipline Chief, Quality & Process Engineering/Supplier Quality, Pratt & Whitney
BREAK – 15 Minutes	
Zero Defects Journey	Barrie Hicklin , Sr. Director, Quality Systems & Regulatory Compliance, Honeywell
AESQ How to Get Involved	Helen Djaknegren , Director Supplier Quality & Development, GKN Aerospace
Summary & Close	Barbara Negroe , Executive Sourcing Quality Leader, GE Aviation

WELCOME



Candice Bineyard
Director of Programs - Defense
Rolls-Royce

Rolls-Royce Indianapolis: Home to the largest RR Manufacturing site in North America



People:

3,300 Employees – over 1,175 Engineers and 1,000 UAW Hourly

One of the largest manufacturers in Indianapolis

Annual sales \$2.5 Billion

Primary Customers:

US Navy, Army & Air Force, Lockheed-Martin, Embraer, Cessna, Bell Helicopter and Robinson

Supply Chain:

Annual spend of over \$1.2 Billion

565 North American suppliers

Key Facilities



Main manufacturing assembly and test

- Excellence
- Performance
- Victory



The Meridian Center



Single Crystal
Operations



LiftSystem focus
factory



Compressor
banded stators



Controls test and mfg.
Purdue Technology
Center

AE family



We manufacture all the AE family of engines at our Indianapolis facility, including the engines used to power the top of the line Cessna Citation X.



AE 2100 turboprop

- Powering the latest generation of high-speed turboprop aircraft.
- More than 5 million flying hours.
- Proven AP family core.
- Designed for maintainability.




AE 3007 turbofan

- Industry standard for intelligence, reconnaissance and surveillance aircraft.
- Providing the power for Global Hawk.
- A single AE 3007M is used in unattended operations in flight up to 60,000 feet and for more than 32 hours per mission.
- Sharing a common core with the AE 2100 and AE 1107, with over 80% parts commonality allowing for reduced maintenance and lifecycle costs.




AE 1107- Liberty turboshaft



- Shares a common core with the AE engine family.
- Currently in service with the USMC (MV-22) and USAF (CV-22).
- Built to proven, robust state-of-the-art turbine architecture capable of meeting the needs of future medium and heavy lift platforms.



M250 turboshaft

- More than 30,000 engines produced, with 16,000 in service.
- More than 240 million flying hours logged to date.
- More than 170 different helicopter and fixed wing applications in both civil and military markets.
- Repair and Overhaul managed through the FIRST network of Authorized Maintenance Centers (AMC).




RR300 turboshaft

- The air-startable RR300 engine makes smooth, powerful and reliable turbine powered flight possible for a new generation of helicopters.
- Low cost turbine power for the light helicopter market.
- Design based on the proven RR300 heritage of more than 31,000 engines delivered with 225 million accumulated flight hours.




T56 turboprop



- A proven and reliable powerplant that provides unrivaled wide operational envelope in military and civil aviation.
- Operated in nearly 70 countries with over 16,000 engines that have accumulated over two 200 million flying hours.
- The enhancement kit will improve fuel efficiency, reduce maintenance costs, increase reliability and enhance performance.
- Serving the USAF since the 1990s.



Rolls-Royce LiftSystem



- We put the vertical lift in the F-35 Lightning II.
- Our LiftSystem is the only vertical lift technology for fighter jets in production in the world.



As an industry with Zero Defects, we will:

- Save money year on year avoiding unnecessary costs and penalties
- Have confidence in our ability to deliver products on time and on cost
- Have stable, capable processes that are predictable
- Have satisfied customers



AERO ENGINE SUPPLIER QUALITY GROUP (AESQ) OVERVIEW



LISA CLAVELOUX
SR. DIRECTOR, QUALITY
RAYTHEON TECHNOLOGIES
PRATT & WHITNEY DIVISION

Aero Engine Industry- The world ten years ago

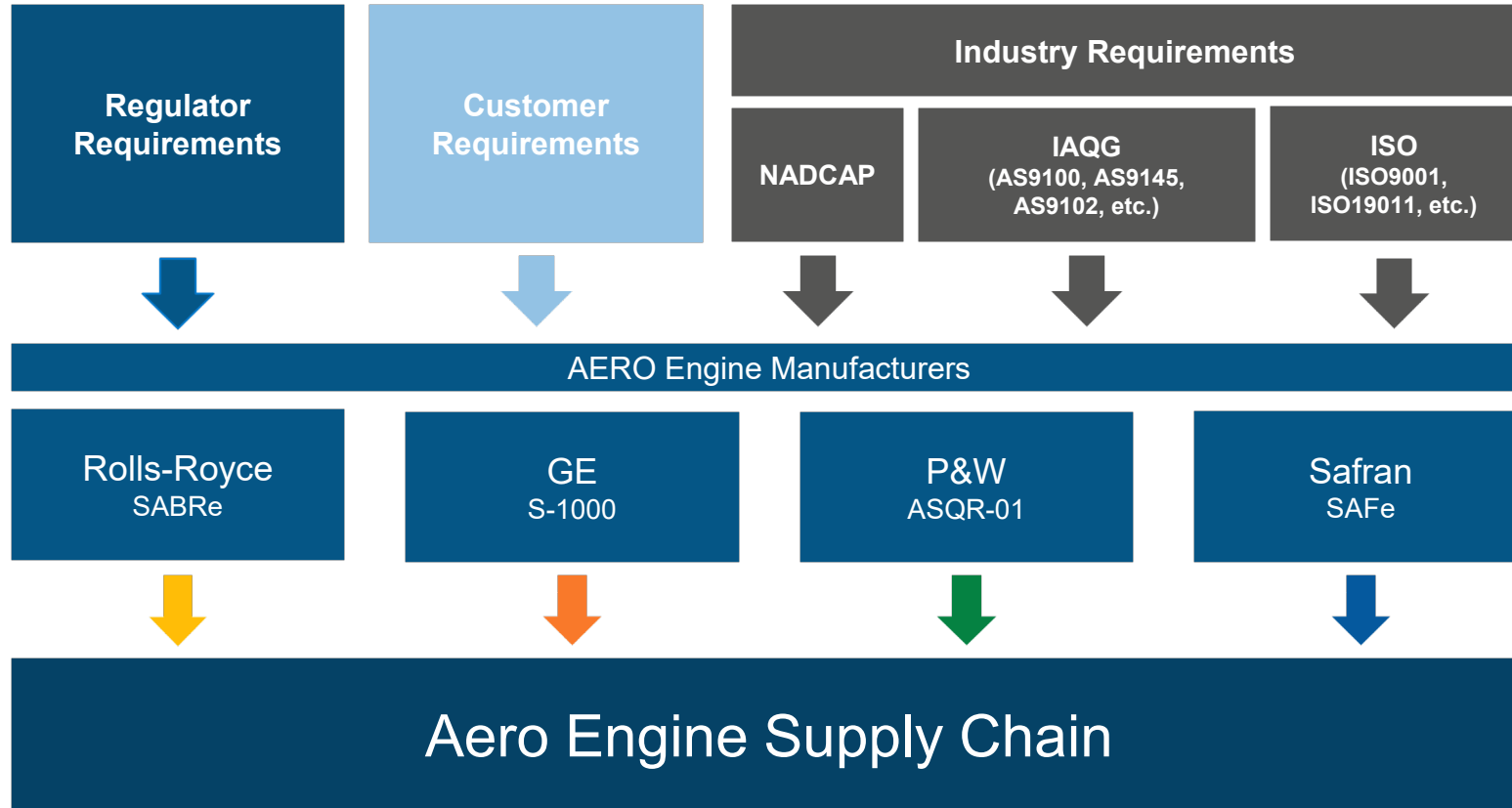
- Customers expect Zero Defects
- Airline passengers projected to double in size over the next 20 years
- Increasing level of supplier-made engine content
- Global Supplier Footprint
- Large number of common suppliers between engine manufacturers
- Wide range of Aerospace engine supplier businesses, from <\$1M to >\$2B
- Improving Safety, Quality, Delivery and Cost remained a key challenge

Aero Engine Manufacturers created a Collaboration working group in 2013 to address the challenges with key Global Suppliers

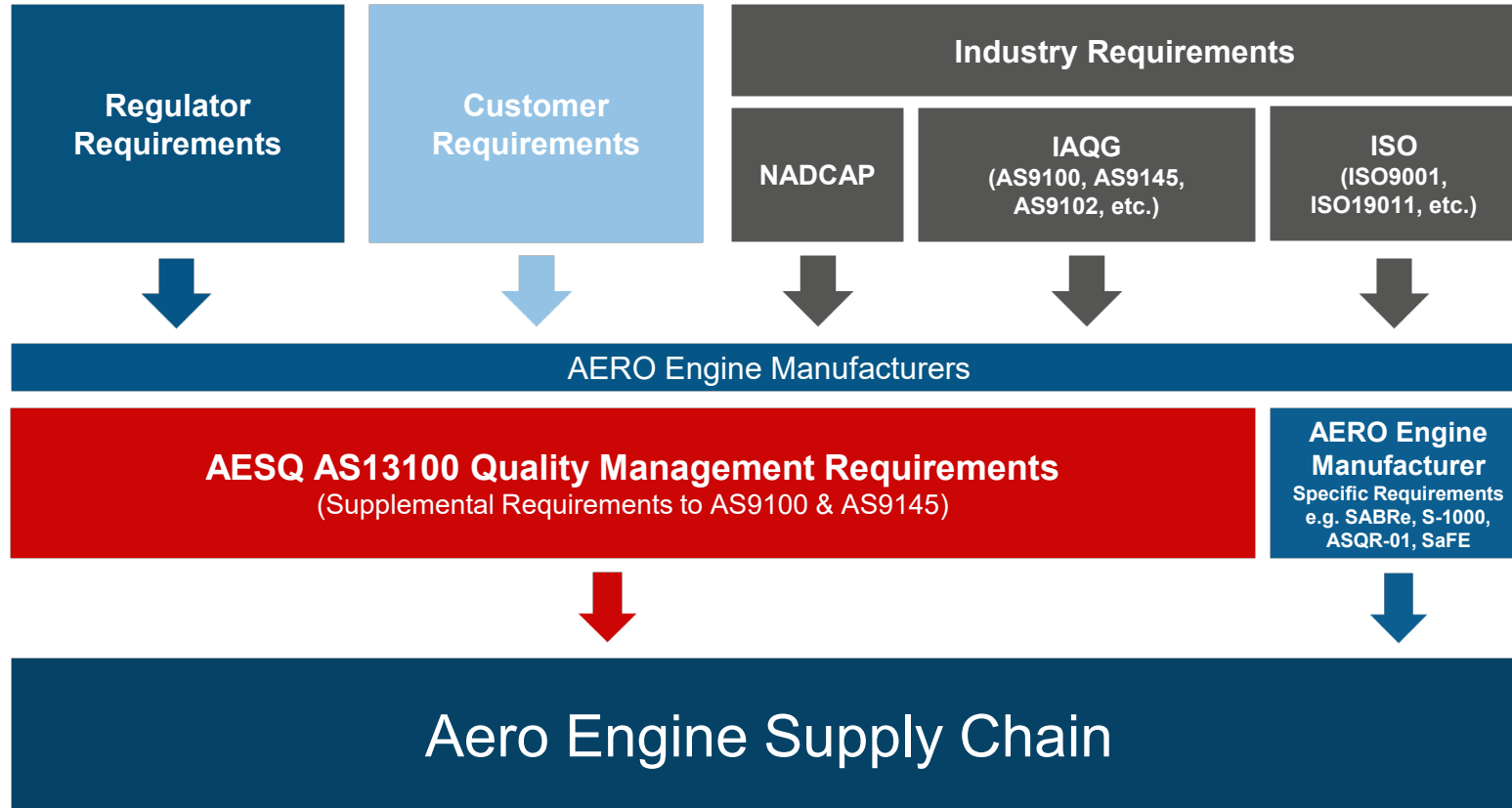
Used the Automotive example of QS-9000 with Ford, GM and Chrysler as the model



Aero Industry Requirements Flowdown in 2012



Aero Industry Requirements Current State



***Striving
for Zero
Defects***

Vision

To establish and maintain a common set of Quality Requirements that enable the **Global Aero Engine Supply Chain** to be truly competitive through lean, capable processes and a culture of Continuous Improvement

Guiding Principles



- Simplify and Standardize Aero Engine supplier requirements through the removal of duplication and waste
- Create a common language for Quality
- Build on existing industry standards, where they exist
- Create Requirements that are simple, prescriptive, and auditable
- Deliver results quickly
- Promote the use of standardized 3rd party training
- Focus on effective & supportive deployment

AESQ Strategy Group Company Members



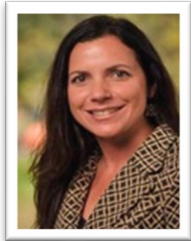
AESQ Members

Cincinnati Thermal Spray
Consolidated Precision Products
Parker Meggitt
Solar Atmospheres

AESQ – Aerospace Engine Supplier Quality Strategy Group

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AESQ Strategy Group Members



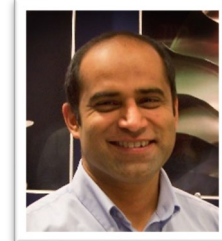
Barbara Negroe
Executive Sourcing Quality Leader
GE Aviation



Lisa Claveloux
Sr. Director Quality
Raytheon Technology Corp.



Helen Djäknegren
Director Supplier Quality
& Development
GKN Aerospace



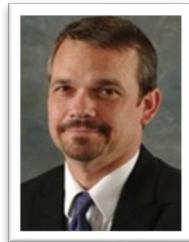
Uzam Khan
Supplier Quality Executive
Rolls-Royce



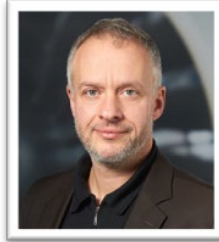
Denis Pottier
Head of Purchasing Quality
Assurance Department
Safran Aircraft Engines



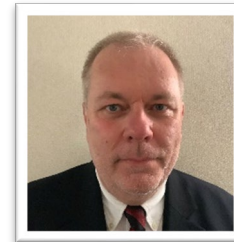
Jun Sakai
Chief Engineer
IHI Corporation



Barrie Hicklin
Sr. Director, Quality Systems
& Regulatory Compliance
Honeywell



Thomas Frank
Senior VP Corporate Quality
MTU Aero Engines



James Clifton
Global Quality Director
Precision Castparts Corp.

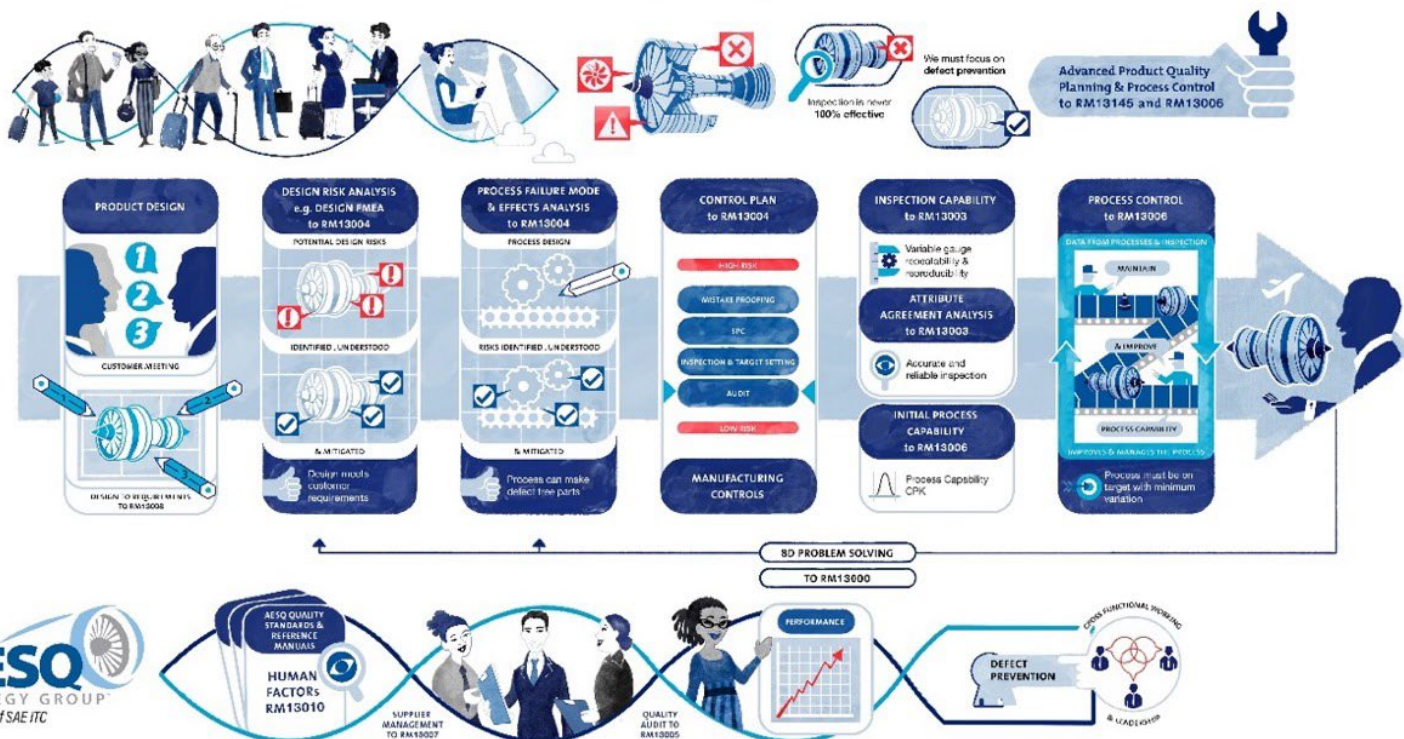


Osa Omoruyi
VP Quality
Howmet Engine Systems

AESQ – Aerospace Engine Supplier Quality Strategy Group

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Defect Prevention Key Quality Tools for Zero Defects



Defect Prevention Tools Must Work as a System

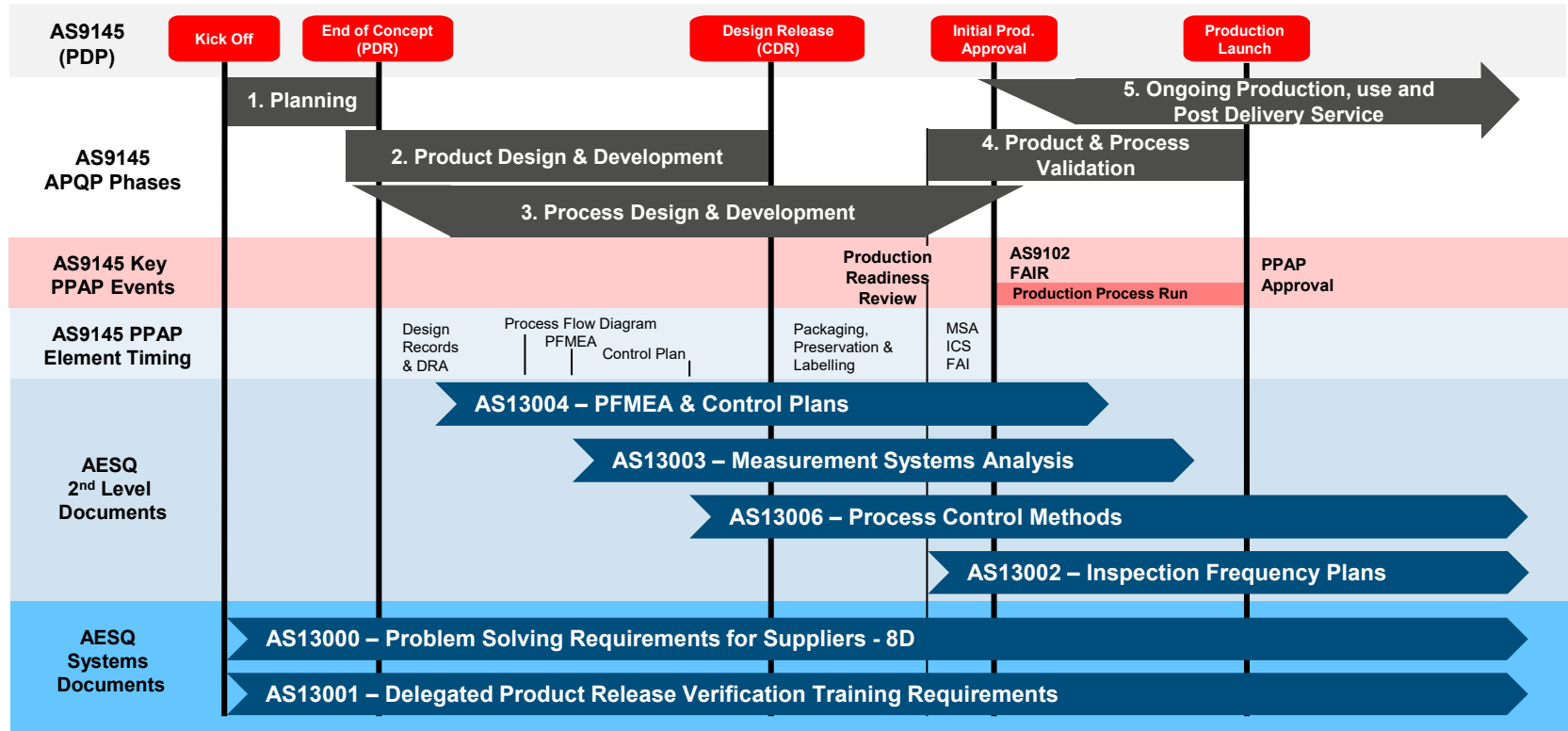
AS13100 OVERVIEW STRUCTURE & KEY HIGHLIGHTS



LARRY BENNETT

CONSULTING ENGINEER, GLOBAL SOURCING QUALITY
SUPPLY CHAIN DIVISION
GE AVIATION

Product Life Cycle & Current AESQ Document Interaction



AS13100 Creation Process



OEM Unique Requirements

Existing Engine Maker Supplier Requirements

Harmonized Requirements



Future Engine Maker Supplier Requirements

Overall Number of Requirements reduced by >50%

Starting Point
September 2018

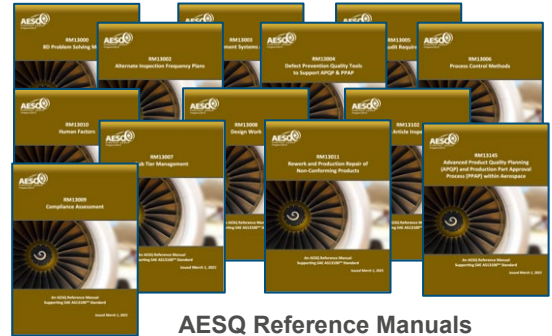


Requirements

Existing & WIP AESQ Standards



Supporting Guidance & Best Practice Material



AESQ Reference Manuals

AESQ – Aerospace Engine Supplier Quality Strategy Group

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AS13100 Structure

AS13100 Requirements	Chapter A AS9100 Rev D Supplemental Requirements										Chapter B APQP & PPAP AS9145 Supplemental Requirements						Chapter C Defect Prevention Quality Tools to Support APQP & PPAP							
Clause Number	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	DFMEA	Product KCs	Process Flow Diag.	PFMEA	Process KCs	Control Plan	MSA	Process Capability

Example Extract

9.3 Management Review

9.3.1 General Reference 9100D:09/2016 requirements.

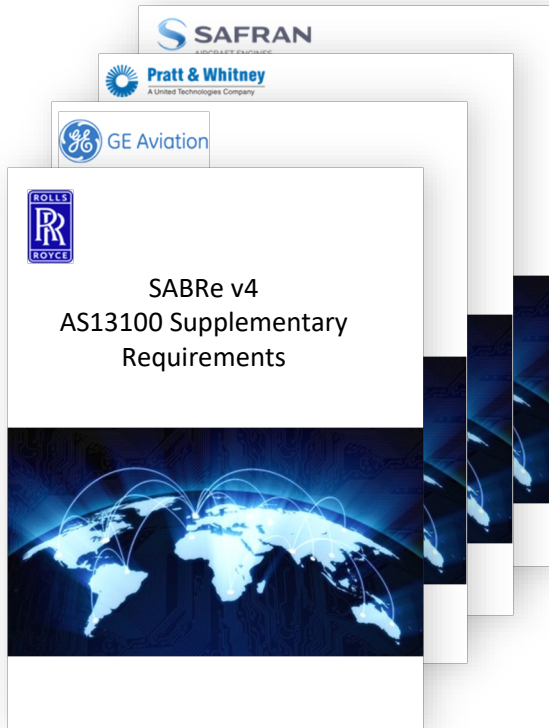
9.3.2 Reference 9100D:09/2016 requirements.

9.3.2.1 Management Review Inputs - Supplemental Requirements

Management Reviews shall be conducted at least annually and consider the following performance topics:

- **Cost of Poor Quality (COPQ).**
- **Manufacturing / Assembly Right First Time / First Pass Yield.**
- **Customer scorecards (where available).**
- **Human Factors reporting.**

AS13100 Customer Specific Requirements



Designed to Include Customer Specific requirements that could not be harmonized within AS13100.

These documents shall:

- Require Compliance to AS13100
- Signpost to Customer Specific Documents (where required)
- Definition of customer specific acceptance thresholds called out in AS13100 e.g., Cpk, GR&R scope, etc.
- Additional Customer Specific requirements not defined within AS13100
- Defines company specific key roles and accountabilities for approvals
- Includes specific IT interface requirements

AS13100 PARAGRAPH REFERENCE	ORGANIZATION TYPE					
	TYPE 1: MAKE TO PRINT	TYPE 2A: DESIGN AND MANUFACTURE	TYPE 2B: DESIGN ONLY	TYPE 3: DISTRIBUTOR	TYPE 4: SPECIAL PROCESS	TYPE 5: RAW MATERIAL
4.3.1	X	X	X	X	X	X
4.3.2	X	X	X			
4.3.3	X	X	X	X	X	X
4.3.4	X	X	X	X	X	X
4.3.5	X	X	X	X	X	X
4.4.3	X	X	X	X	X	X
5.1.1.1	X	X	X	X	X	X
5.2.1.1	X	X	X	X	X	X
5.3.1	X	X	X	X	X	X
6.1.3	X	X	X	X	X	X
7.1.3.1	X	X	X	X	X	X
7.1.5.1.1	X	X			X	
7.1.5.1.2	X	X			X	
7.1.5.1.3	X	X			X	

Table 1 provides a guide to the applicability of AS13100 Sections to Organization scope.

Organization Types

1. Type 1: Make to Print
2. Type 2A: Design and Manufacture
3. Type 2B: Design Only
4. Type 3: Distributor
5. Type 4: Special Process
6. Type 5: Raw Material

AS13100 Benefits

- 1. Single AESQ Standard aligned to AS9100 / ISO9001**
 - Less Requirements for the Supplier (>50% less)
 - Lower cost (suppliers do not need to buy multiple standards)
- 2. Supported by Free Issue Reference Manual Guides**
- 3. Will minimise the content of OEM Supplier Requirement Standards (SABRe, S-1000, ASQR-01 and SAFe)**
- 4. Creates a common language for Quality, OEMs have adopted standard approaches within their own operations.**
- 5. Aligns to relevant existing industry standards (ISO, AS9xxx, Nadcap, etc)**
- 6. Supported by global approved training resources**
- 7. Enables the AESQ OEMs to provide a harmonised approach to Supplier Development**
- 8. Supplier Compliance continues to be assessed through Customer Audit**
- 9. Allows AESQ to focus on Supply Chain Capability Development**

AS13100 Requirement Highlights



The current AS13xxx series of standards have been integrated into AS13100;

- AS13000 Problem Solving using 8D
- AS13002 Alternative Inspection Plans
- AS13003 MSA
- AS13004 Process FMEA and Control Plans
- AS13006 Process Control

Free issue Guidance Material will be made available to support the deployment of AS13100.

Also integrates draft standards on Audit (AS13005) and Sub-tier Management (AS13007)

AS13001 DPRV Training will remain unchanged.

AS13100 organizes its additional requirements aligned to AS9100 and AS9145 standard structures.

It also includes requirements to other AS series standards including;

- AS9102 First Article Inspection
- AS9146 FOD
- AS9115 Deliverable Software
- AS9116 Design Change Process
- AS9117 DPRV
- AS5553 Counterfeit Parts (EEE)
- AS6174 Counterfeit Parts



NEW

Recognizes NADCAP certification for special processes for both internal and external operations.

(Section 4.3.3)

AS13100 Requirement Highlights



Organization's are required to include **Human Factors** within the scope of their QMS

(Section 4.4.3, 5.1.1.1, 5.2.1.1 and 7.3.1)



The organization shall conduct a **Compliance Assessment** of their QMS to ensure that it captures all of the requirements of AS13100.

Any gaps must be agreed with the individual customer.

(Section 4.3.5)



An agreed set of **Certification Requirements**, matched to the scope of the supplier's activities is defined

(Section 4.3.3)

Organizations are required to comply with the customer's **Supplier Code of Conduct** and implement their own (Section 5.1.2.1).



AS13100 Requirement Highlights

AS13100 requires four **Audit Types** to be conducted;

- 1) Quality Management System Audits
- 2) Production Process Audits
- 3) Product Audits
- 4) Special Process Audits

Organization's to produce an Annual Audit Report to summarize performance for Customer Review (Section 9.2.3)



Auditor Competence Requirements defined for;

- Qualifications
- Education
- Experience
- Ongoing professional development

(Section 7.2.2)



Quality Leaders are required to attend the **AESQ Quality Foundation Training Class**. Also recommended for other key personnel

(Section 7.2.4)



Organizations are required to provide **On the Job Training** that includes customer requirements, regulatory requirements, etc.

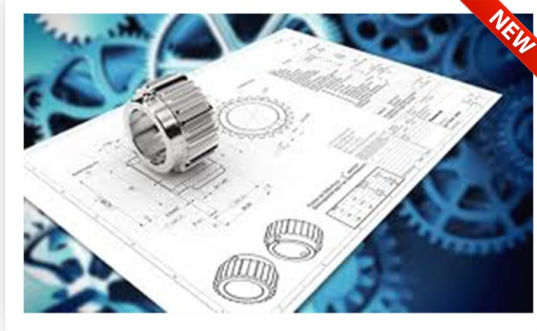
(Section 7.2.1)

AS13100 Requirement Highlights



Common **Record Retention** policy for OEMs

(Section 7.5.3.5)



Requirements for **Design & Development** defined including the use of **DFMEA** for Design Risk Analysis

(Section 8.3)



AS13100 defines the requirements for **Supplier Evaluation, Selection, Control and Performance Monitoring.**

(Section 8.4.1)



Compliance to **AS9146 FOD Prevention** is required in Design Requirements (8.3.3.3), Production Control (8.5.4.1) and Supplier Control (8.4.2.2)



AS13100 Requirement Highlights



Specifies the use of **AS5553** Counterfeit Electrical, Electronic and Electromechanical Parts and **AS6174** for Counterfeit Material (Section 8.1.4.1 & 8.4.2.3)



The organization shall verify that the correct metallic raw material is used e.g. through the use of **hand held spectrometry**.

(Section 8.5.1.1)



Defines the use of **8D Problem Solving** for key issues.

Additional guidance on Problem Solving when 8D's are not required to be included in the Guidance Document GD13000.

(Section 10.2.3)



Customer Scorecards

The organization shall ensure that it uses the customer created scorecard to prioritize improvement actions.

The organization must strive for **100% Quality, & Delivery performance**.

(Section 9.1.2.1)

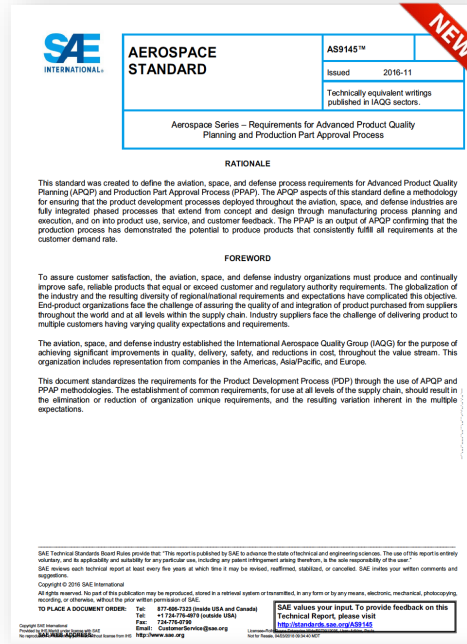
AS13100 Requirement Highlights: Chapter B APQP & PPAP

AS9145 APQP & PPAP required to manage;

- New Product Introduction
- Product & Design Changes
- Source Changes
- Major Quality Issues

Additional Quality Tools identified that are not in AS9145 APQP / PPAP

1. Pre-launch Control Plan
2. Supply Chain Risk Management Process



SAE INTERNATIONAL

AEROSPACE STANDARD

AS9145™

Issued 2016-11

Technically equivalent writings published in IAGG sectors.

Aerospace Series - Requirements for Advanced Product Quality Planning and Production Part Approval Process

RATIONALE

This standard was created to define the aviation, space, and defense process requirements for Advanced Product Quality Planning (APQP) and Production Part Approval Process (PPAP). The APQP aspects of this standard define a methodology for ensuring that the product development processes deployed throughout the aviation, space, and defense industries are fully integrated phased processes that extend from concept and design through manufacturing process planning and execution, and on into product use, service, and customer feedback. The PPAP is an output of APQP confirming that the production process has demonstrated the potential to produce products that consistently fulfill all requirements at the customer demand rate.

FOREWORD

To assure customer satisfaction, the aviation, space, and defense industry organizations must produce and continually improve safe, reliable products that equal or exceed customer and regulatory authority requirements. The globalization of the industry and the resulting diversity of regional/national requirements and expectations have complicated this objective. End-product organizations face the challenge of assuring the quality and integration of product purchased from suppliers throughout the world and at all levels within the supply chain. Industry suppliers face the challenge of delivering product to multiple customers having varying quality expectations and requirements.

The aviation, space, and defense industry established the International Aerospace Quality Group (IAQG) for the purpose of achieving significant improvements in quality, delivery, safety, and reductions in cost throughout the value stream. This organization includes representation from companies in the Americas, Asia/Pacific, and Europe.

This document standardizes the requirements for the Product Development Process (PDP) through the use of APQP and PPAP methodologies. The establishment of common requirements, for use at all levels of the supply chain, should result in the elimination or reduction of organization unique requirements, and the resulting variation inherent in the multiple expectations.

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Fax: 724-776-0740
Email: CustomerService@sae.org
http://www.sae.org

SAE values your input. To provide feedback on this Technical Report, please visit <http://standards.sae.org/AS9145>

Additional Quality Tools identified that are not in AS9145 PPAP

1. DFMEA defined as the Design Risk Analysis tool
2. Defines AESQ Guidance Documents for PPAP elements
3. Initial manufacturing Performance Studies
4. Dimensional / non-Dimensional Results

Defines Submission Requirements for PPAP based on Supplier Performance;

1. Submit Warrant only to customer, Retain evidence at Supplier
2. Submit PPAP evidence to customer and Retain all documents
3. Witness at Supplier

AS13100 Core Writing Team: Thank you for sticking with it, every Wednesday, for two & a half years, even during the pandemic, to get it published.



Dr Ian Riggs
Rolls-Royce
Writing Team Leader



Larry Bennett
GE Aviation
Writing Team Deputy Leader



Elizabeth Pace
Raytheon



Earl Capozzi
Pratt & Whitney



Jim Wilson
Pratt & Whitney Canada



Catherine Catarina-Graca
Safran Aircraft Engines



Paula Adkins
Rolls-Royce



Peter Amsden
Pratt & Whitney

AESQ – Aerospace Engine Supplier Quality Strategy Group

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Thank you to the 99 Subject Matter Experts who created the Reference Manuals

Aaron Stahl
Adam Rogers
Ake Winkvist
Andrew Stout
Anil Oenuer
Barrie Hicklin
Benoit Gottie
Björkålv Håkan
Brian Murphy
Carrie Sharkey
Catherine Belgacem
Catherine Catarina-Graca
Charles Barry
Chip Svoboda
Chris Bishop
Chris Craig
Dave Goldberg
Earl Capozzi
Ed Briggs
Erika Grimm
Frederic Vetil
Grant Braun
Helen Djäknegren

Hector Mata-Collado
Helmuth Weitmann
Herelio Munoz-Morales
Ian Bentley
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Inger Henström
James Kelly
Jim Barge
Jim Nelson
Jim Wilson
Jonas Nickel
John Calder
Jule Hegwood
Jun Sakai
Jun Teshima
Karen Scavotto
Karl Evans
Kristin Gantz
Larry Bennett
Lars Brander
Laura Hill
Lena Wendel Eckerbom

Lise Brox
Ludovic Chevet
Marc Boursicot
Marie Partridge
Marnie Ham
Mattias Eriksson
Maura Callahan
Melanie Deroo
Melanie Renault
Michael Cera
Michael Cosenza
Michael Fuehner
Michael Gerhmann
Michael Stock
Mike Cosenza
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Nick Watling
Nicolas Reignier
Olivier Castets
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Perr Rendell
Pete Bilbie
Pete Teti
Peter Papadopoulos
Phil Bamforth
Rebecca Lemon
Ricardo Banuelas
Rich DeMary
Richard Baker
Richard Bolingbrook
Rob Farndon
Robert Starcke
Roger Persson
Rudi Braunrieder
Simon Gough-Rundle
Song Gao
Stefan Gehring
Stefan Lund
Steve Christensen
Steven Finup
Susie Neal
Sverker Johnson

Thomas Herter
Thomas Schmitt
Tobias Kranz
Todd Angus
Tony Pailing
Vince Miller
Ward Baun
Wilibald Schoder
Wolfgang Wagner
Yvonne Mansson



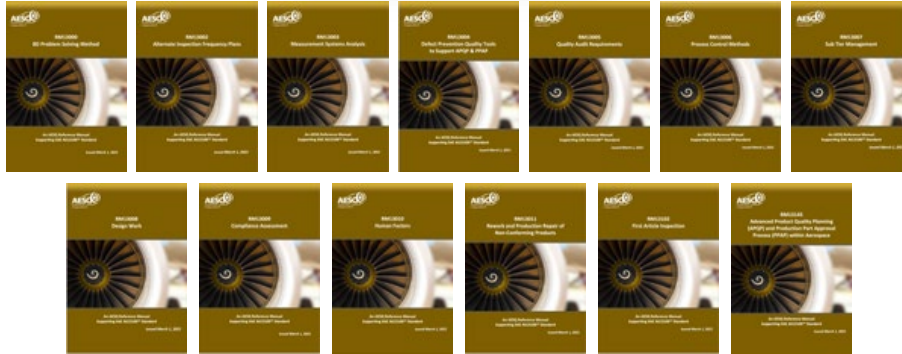
AS13100 Supporting Reference Manuals



AS13100 Standard defines mandated requirements.

The Standard is supported by free issue Reference Manuals from the AESQ Website:

→ <https://aesq.sae-itc.com/content/aesq-documents>



Reference Manuals provide industry best practice guidance and case study material on how to deploy quality tools effectively.

Reference Manuals are maintained and updated by the **AESQ Subject Matter Interest Groups** and may be updated at any time when new or revised information becomes available

AERO ENGINE SUPPLIER QUALITY GROUP (AESQ) OVERVIEW

DEPLOYMENT & TRANSITION TO AS13100



EARL CAPOZZI
DISCIPLINE CHIEF; QUALITY & PROCESS
ENGINEERING / SUPPLIER QUALITY
PRATT WHITNEY

TRANSITION TO AS13100 FROM AS130XX

AS9145 – Requirements for Advanced Product Quality Planning and Production Part Approval Process. 2016 - November

AS13000 – Problem Solving Requirements for Suppliers - 8D 2014 - May

AS13001 – Delegated Product Release Verification Training Requirements 2015- February

AS13002 – Inspection Frequency Plans 2015 - March

AS13003 – Measurement Systems Analysis 2015 - February

AS13004 – PFMEA & Control Plans 2017 - August

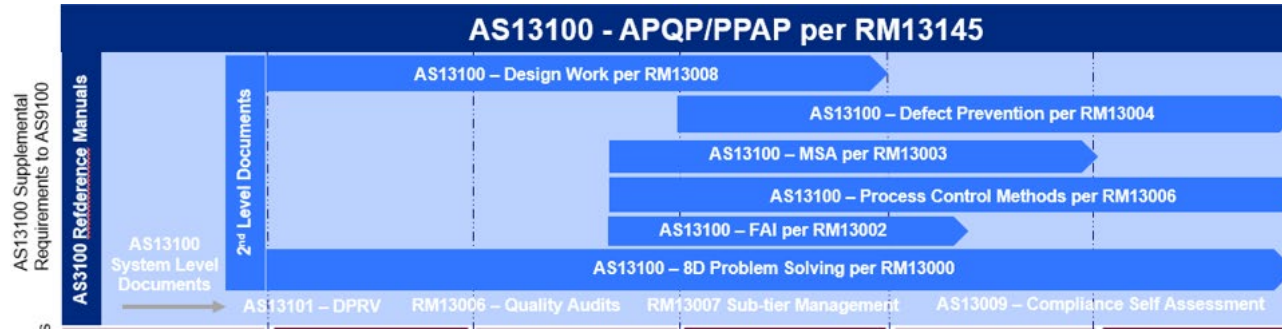
AS13006 – Process Control Methods 2018 – September



TRANSITION TO AS13100 FROM AS130XX

With the adoption of AS13100 we:

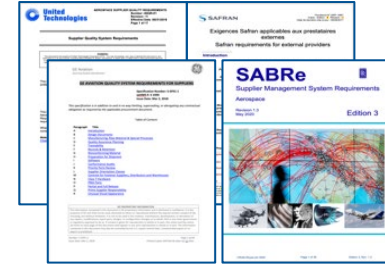
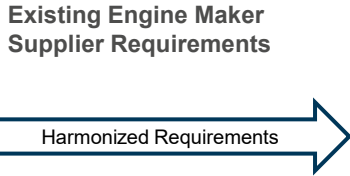
- Reduced set of requirements from **174** pages to **102 pages** a 49% reduction in pages
- “Shalls” reduced more than **23%**
- With the addition of:
 - ✓ Human Factors
 - ✓ Sub-tier Management
 - ✓ Internal Audit and Auditor Competencies
 - ✓ Design and Development
- AS13100 leverages the AESQ developed Reference Manuals (RM13xxx) as guidance on how to comply to requirements stated in AS13100. 603 pages of free guidance.



AESQ – Aerospace Engine Supplier Quality Strategy Group

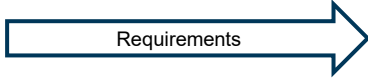
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AS13100 Creation Process

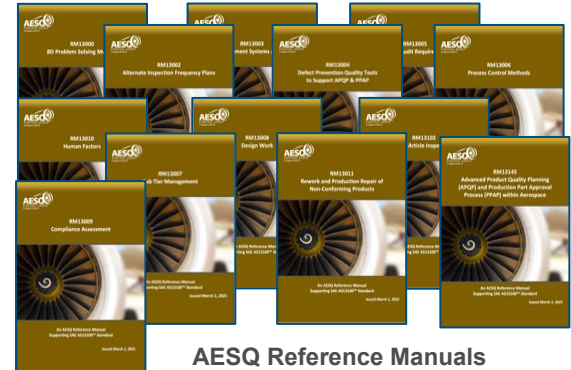


Future Engine Maker Supplier Requirements

Starting Point
September 2018



Existing & WIP
AESQ Standards



AESQ Reference Manuals

AESQ – Aerospace Engine Supplier Quality Strategy Group

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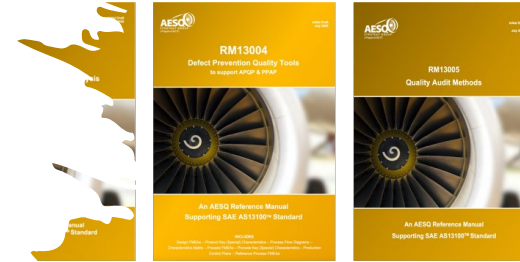
Major Changes within AS13100

Five new key areas within AS13100 to focus Producers

AS13100 leverages the AESQ developed Reference Manuals (RM13xxx) as guidance on how to comply to requirements stated in AS13100.

P&W to utilize reference document when educating supply base

- RM13000 Problem Solving Methods (8D)
- RM13002 Alternate Inspection Frequency Plans
- RM13003 Measurement System Analysis
- RM13004 Defect Prevention Quality Tools
- RM13005 **Quality Audit Methods**
- RM13006 Process Control Methods
- RM13007 **Sub Tier Management**
- RM13008 **Design Work**
- RM13009 **Compliance Assessment (with Form) -- GAP ASSESSMENT**
- RM13010 **Human Factors**
- RM13011 Rework and Production Repair of Non-Conforming Products
- RM13102 First Article Inspection
- RM13145 Advanced Product Quality Planning (APQP) and Production Part Approval Process (PPAP)

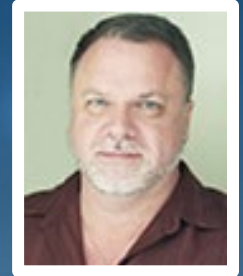


Updates likely required to your QMS

AS13100 DEPLOYMENT INTRODUCTION & MILESTONES



ELIZABETH PACE
ASSOCIATE DIRECTOR, SUPPLIER QUALITY
RAYTHEON TECHNOLOGIES



JIM WILSON
SENIOR MANAGER, SUPPLIER QUALITY
ASSURANCE AND DEVELOPMENT
PRATT WHITNEY

Where are we?



March 2021
AS13100 Publication

October 2021
Deployment Started

April 2022
Deployment Ongoing

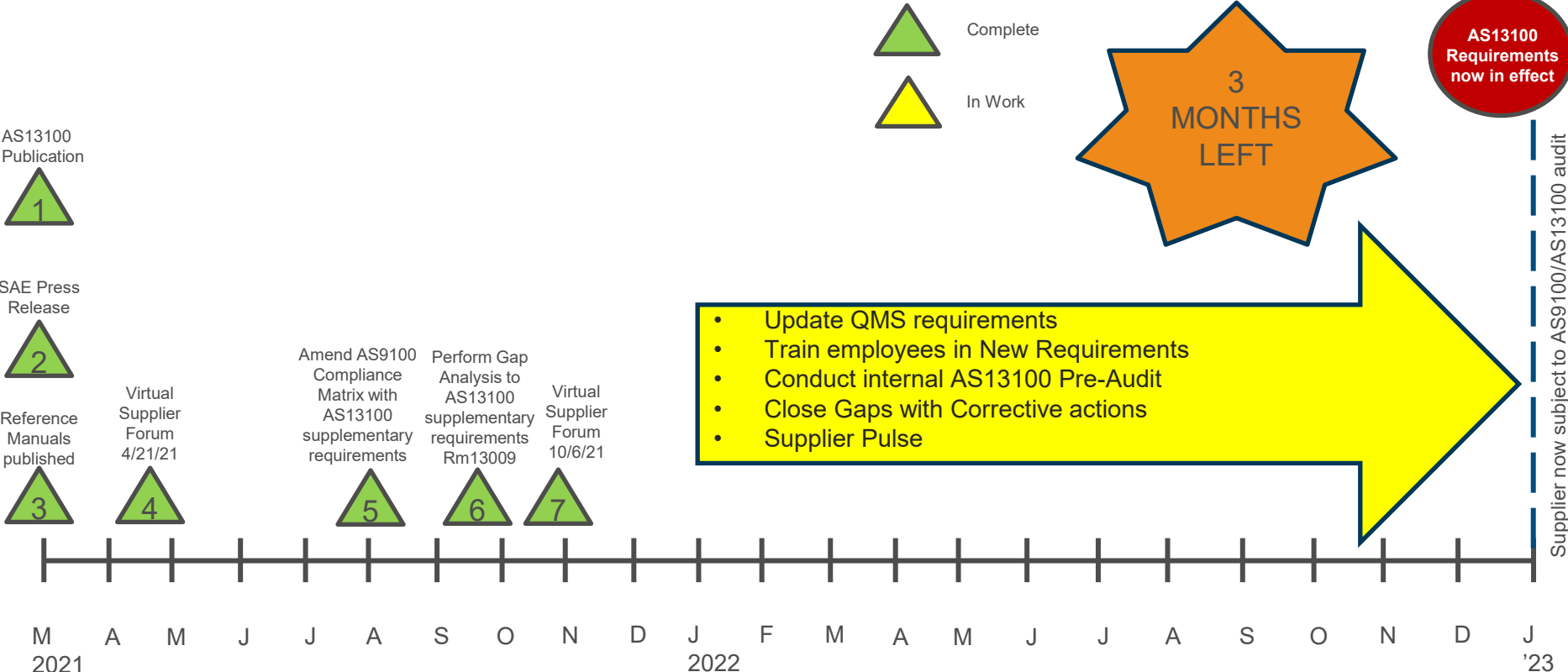
Target: December 31,
2022 - Transition Complete

AESQ - Aerospace Engine Supplier Quality Strategy Group

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AESQ Deployment Team Milestone Plan

Key milestones to achieve compliance to AS13100 by 12/31/2022



Committed to AS13100 compliance on December 31, 2022



All OEMs have released supplier quality requirements invoking AS13100

What can I expect on January 1st, 2023 when AS13100 becomes contractual?

- AESQ members will be checking compliance with their own suppliers individually
- All suppliers will need to be able to demonstrate compliance to AS13100
 - Best method to do that is to complete the RM13009 Self-Assessment and provide a copy to AESQ customers that request it along with any gaps that were identified and the plan/timetable to close those gaps.
 - Producing an Annual Audit Report outlined in AS13100 Section 9.2.5 and described in RM13005 covering 2022 audits, while not technically required, would also be a good way to demonstrate to all AESQ customers that internal and sub-tier audits are under control
- AESQ members may request to see each supplier's 2023 internal and supplier audit plans meeting the requirements of AS13100
- AESQ members may begin to audit to the requirements of AS13100 in order to confirm compliance with high-risk suppliers

AS13100 Audit Checklist

The AS13100 Quality audits team is also working on an improved AS13100 Self-Assessment checklist and hopes to have it published by end of October.

AS13100 Chapter A Master Audit Checklist

Section	Paragraph	Requirement Description	AS13100 Reference Materials	Auditor Guidance	Organization Internal Document Reference with Objective Evidence of Compliance	Compliance Level			Auditor Comments	Opportunities for Improvement	Add'l OEM Requirements						
						Conforming	Non-Conforming	Not Applicable			Not Evaluated	Boeing	GE	GM	Honeywell	MTU	SAE
4.3.3	1	Certification requirements - Table 2		Ensure the Organization meets the minimum requirements of Table 2. Note: individual AESQ members may have differing requirements.								X					
4.3.4	1	Access to Oasis and Nadcap information															
4.3.5	1-3	Annual AS13100 compliance assessment	RM13009	Look for evidence of a self assessment in the last 12 months and that any gaps have been addressed The RM13009 self-assessment checklist or a copy of this checklist are preferred but not mandatory								X					
4.4.3	1	Human Factors included in QMS	RM13010	Human Factors programs at Organizations may not be specifically called Human Factors - look to see if the main contents of a Human Factors program are present at the Organization: • Training of employees. • An open reporting culture, encouraging the sharing of mistakes without fear of inappropriate retribution. • Considering Human Factors in investigations.													
5.2.1.1	1																

Working Draft Only

Goals include:

- Include guidance, where applicable, both to describe objective evidence needed or to guide Auditors in interpreting the section’s “shall” consistently across different Auditors/AESQ members
- Include references to RM documents for more information
- Include an indicator that an AESQ member has additional requirements to each question in their own documents

AESQ 2022 SUPPLIER SURVEY UPDATE



ELIZABETH PACE
ASSOCIATE DIRECTOR, SUPPLIER QUALITY
RAYTHEON TECHNOLOGIES

Survey Overview



August 2021: First survey of suppliers on the general knowledge of AS13100 and the AESQ

- 158 respondents
- Familiar with AESQ for existing AS13000 series documents
- Basic AS13100 familiarity

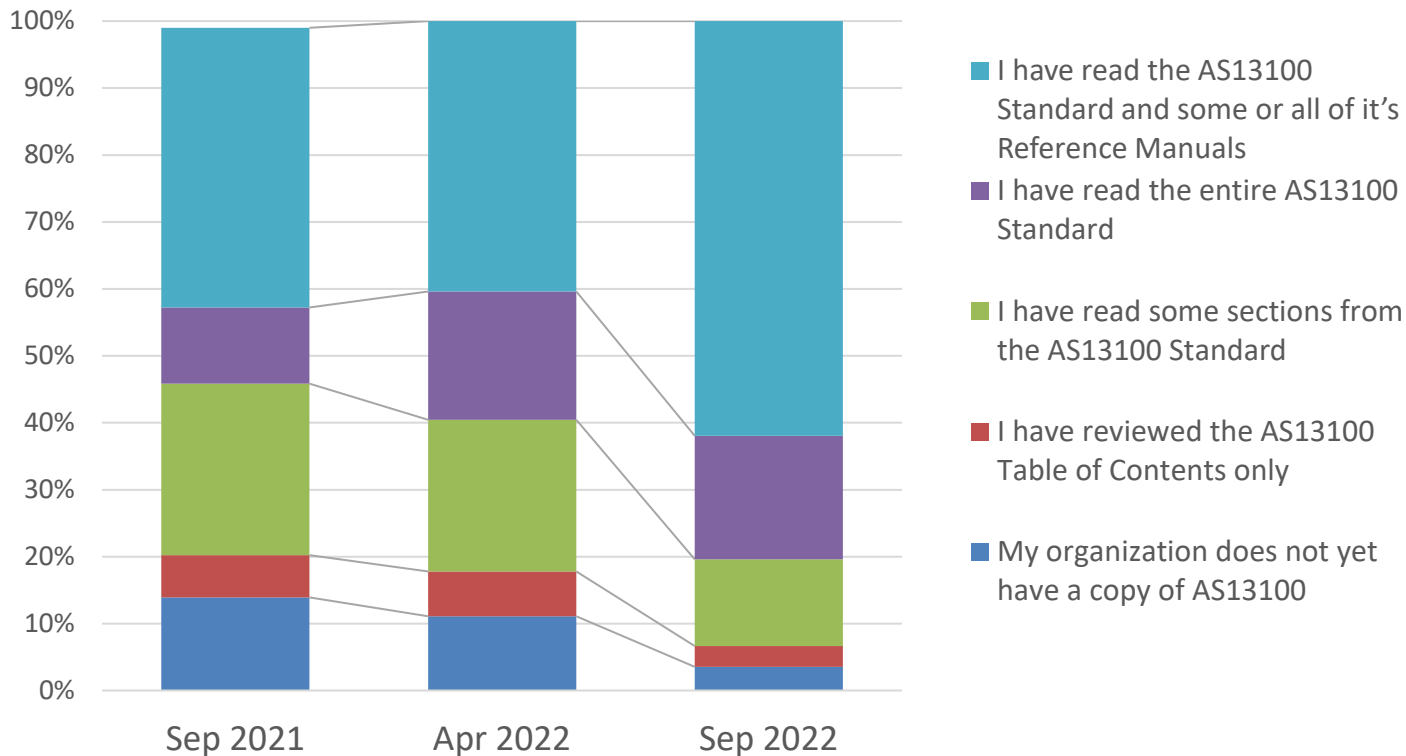
April 2022: Follow up survey targeted to better understand the aero-engine supply base's AS13100 implementation status

- 13 questions, both objective and open-ended
- 482 respondents to date
- 608 comments and suggestions analyzed

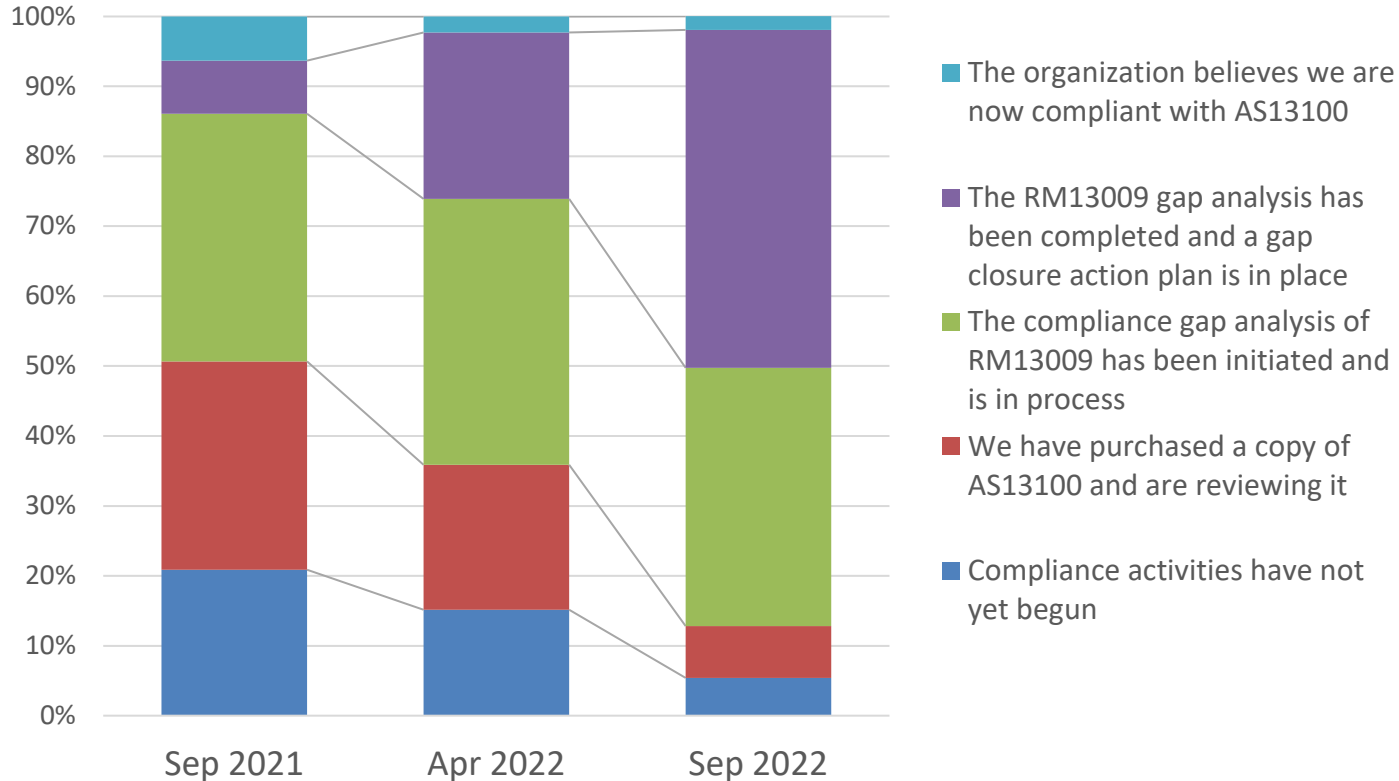
September 2022: Survey targeted to develop plans to help suppliers for Q4

- Same questions from April to build trend and collect feedback on deployment
- Develop plans based off the feedback and help suppliers are asking for
- 255 respondents to date

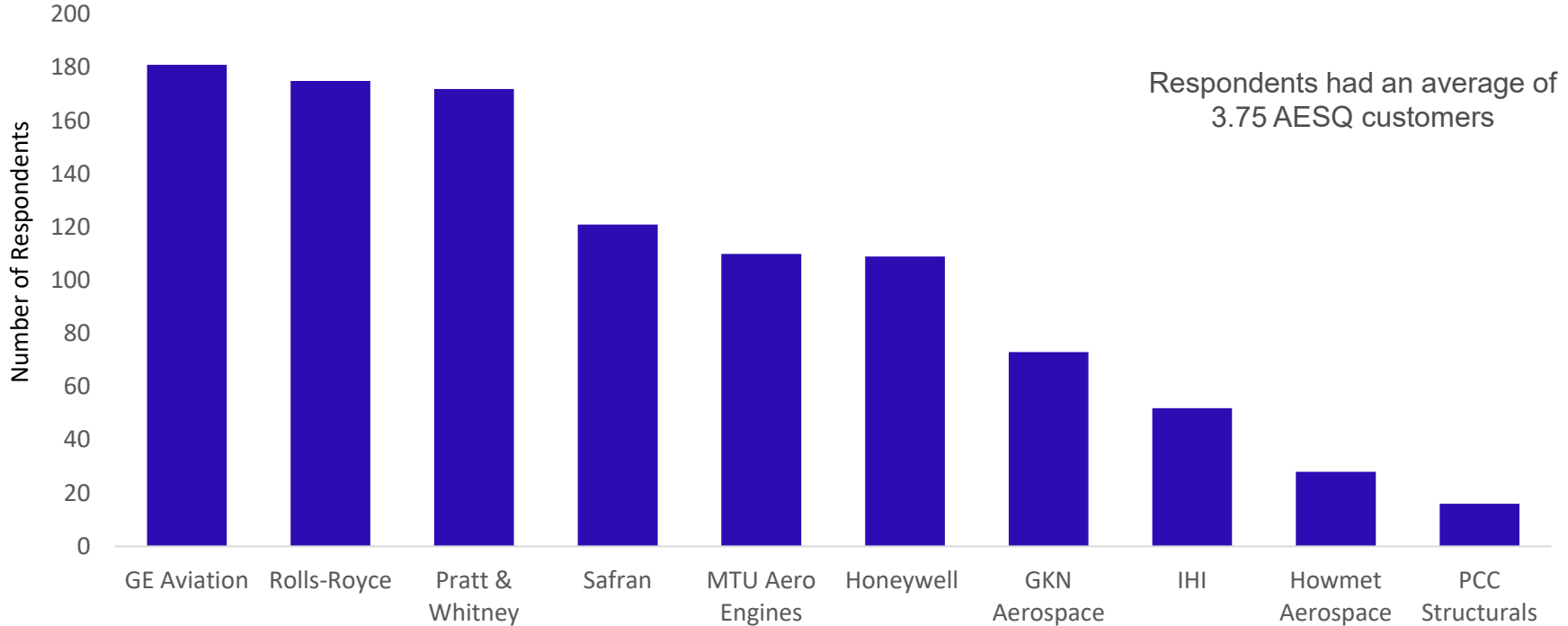
AS13100 Familiarity



Implementation Status Evolution

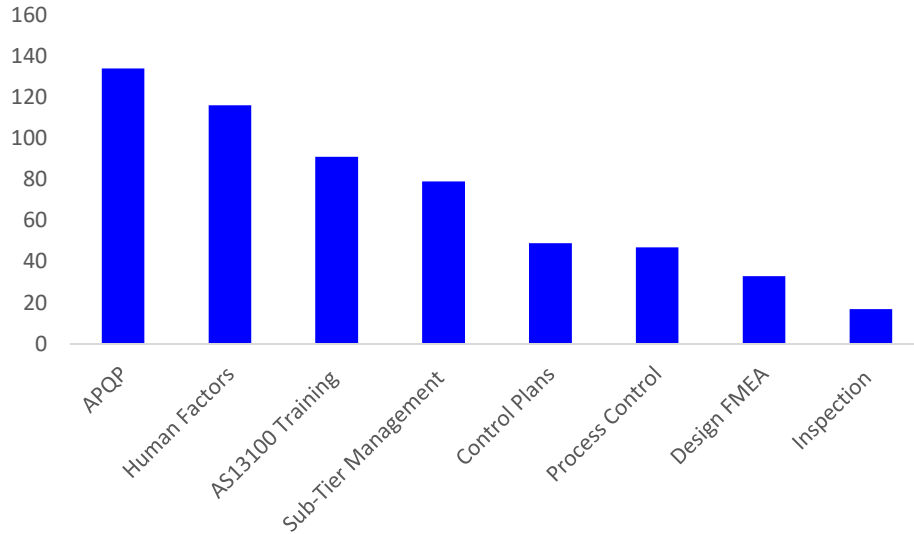


Respondent's Customers



Resources are available for implementation concerns

Implementation Concerns



Subject Matter Interest Groups
Promoting the effective deployment of Key Quality Subjects across the AESQ Supply Chain.

AESQ Subject Matter Interest Groups

- Advanced Product Quality Planning (APQP) & Production Part Approval Process (PPAP)
- Design Work & Production Repair & Rework
- Sub Tier Management
- Human Factors
- DPRV Training
- First Article Inspection

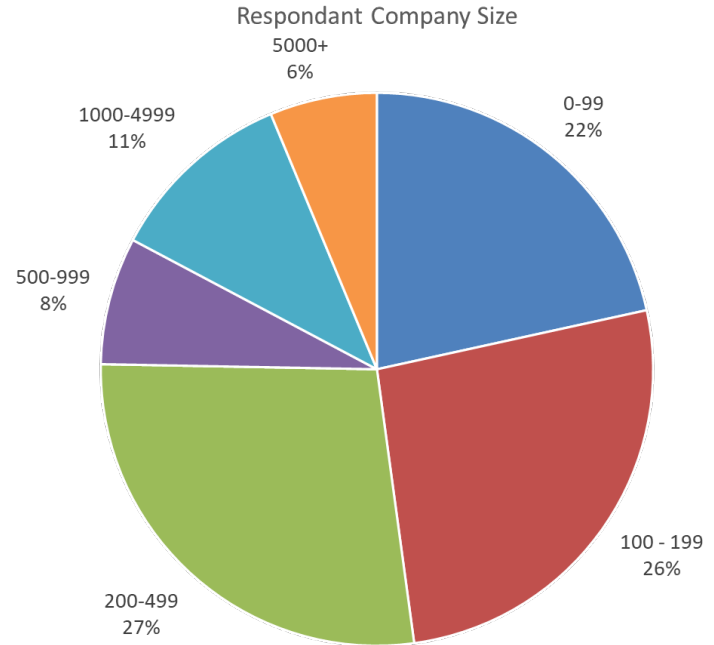
AESQ Reference Manual
Supporting AS13100™ Standard

AESQ™ Defect Prevention Quality Tools to Support APQP & PPAP Subject Matter Interest Group

Smaller businesses are asking for help in implementation

AESQ can help:

- Member companies will partner with their suppliers to close gaps
- Communities of Practice on LinkedIn are available
- Best Practice Examples from three suppliers today



Training requirements and how the AESQ can help

Intent:

- Company needs to understand the requirements of the standard for deployment

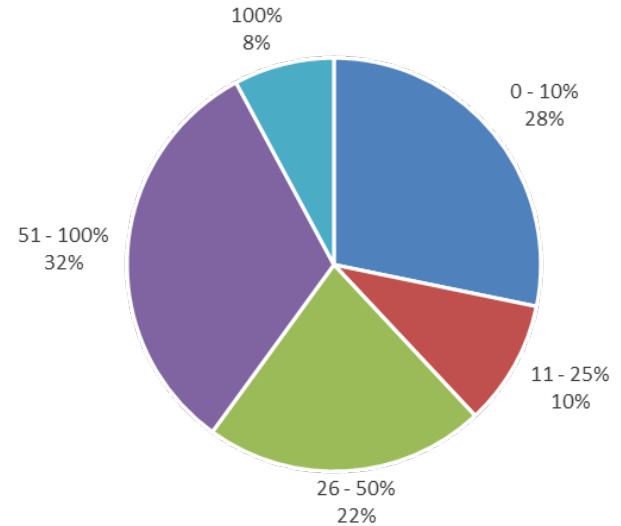
Expectations:

- People shall complete the 3 Day Foundations training. If not trained by year end, the Foundations training will need to be in the closure plan.

How can the AESQ help?

- More Live training sessions (Oct)?
- Options to certify a companies training?
- Auditor training class from AESQ?
- Do we want a COP of deployment to smaller co.?

Training Plan Completion



In response to your feedback....

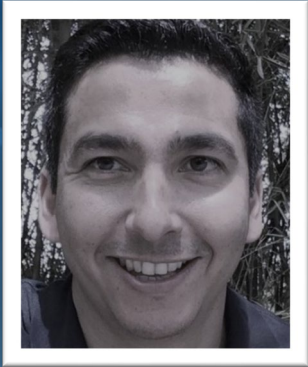


In today's event you will see:

- Training overviews and opportunities
- How to get involved in AESQ
- FAQs and places to ask questions (highlights of the Communities of Practice on LinkedIn)
- Best practice examples from three partner suppliers

APQP AND PPAP

ADVANCE PRODUCT QUALITY PLANNING
PRODUCTION PART APPROVAL PROCESS



RICARDO BANUELAS
HEAD OF CONTINUOUS IMPROVEMENT
ROLLS-ROYCE

AS13100 APQP and PPAP

REQUIREMENTS ARE ACHIEVABLE THROUGH ALIGNMENT OF BEST PRACTICES.

Requirements

V

Best Practice

AS9145 Published 2016

AS13100 Published 2021



AS13100 APQP & PPAP

AS9145

AS13100 APQP
& PPAP

AS13100 /
RM13145
APQP &
PPAP



RM13145

RM13145
Advanced Product Quality Planning (APQP) and
Production Part Approval Process (PPAP) within
Aerospace

RM13xxx's

Planning (APQP) and
Process (PPAP) within

Subject Matter
Interest Group

Subject Matter
Interest Group

SMIG's



SMIG


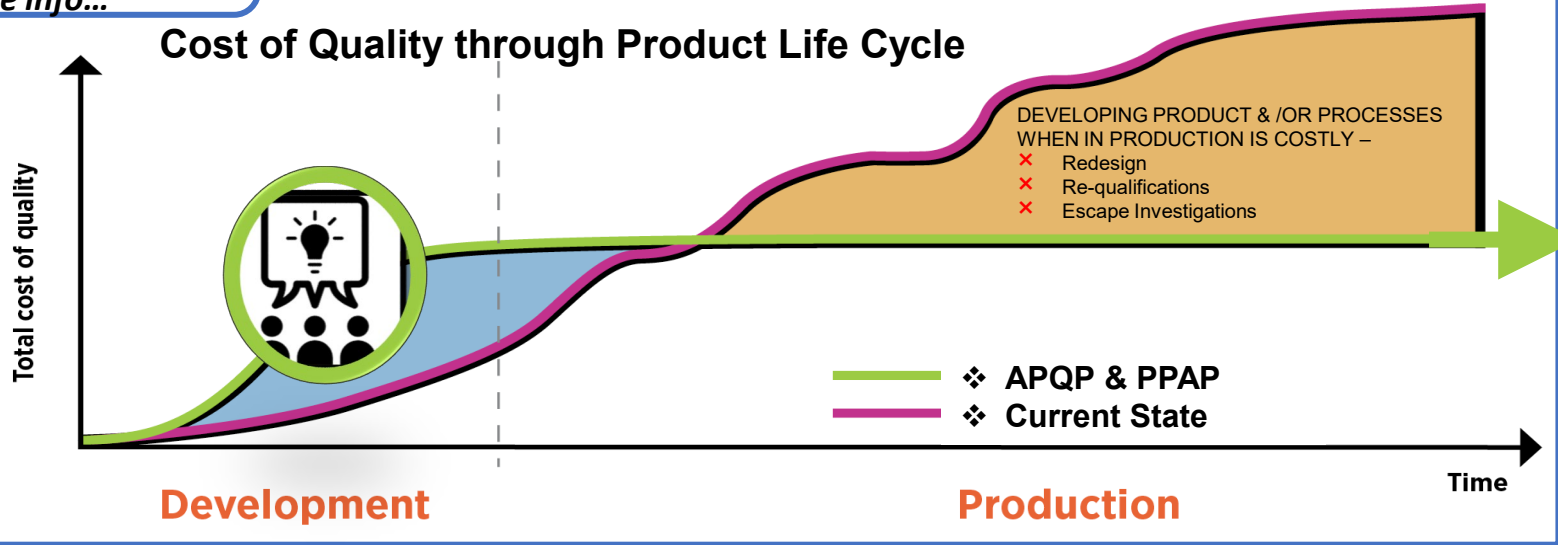
Why APQP & PPAP for Aerospace?



Source info...

The primary objective is to **improve quality and reduce cost**.
Higher quality is synonymous with **increased product safety**.

Cost of Quality through Product Life Cycle



Proactive tools **focuses cross-functional teams on risk identification & mitigation** early in the process.

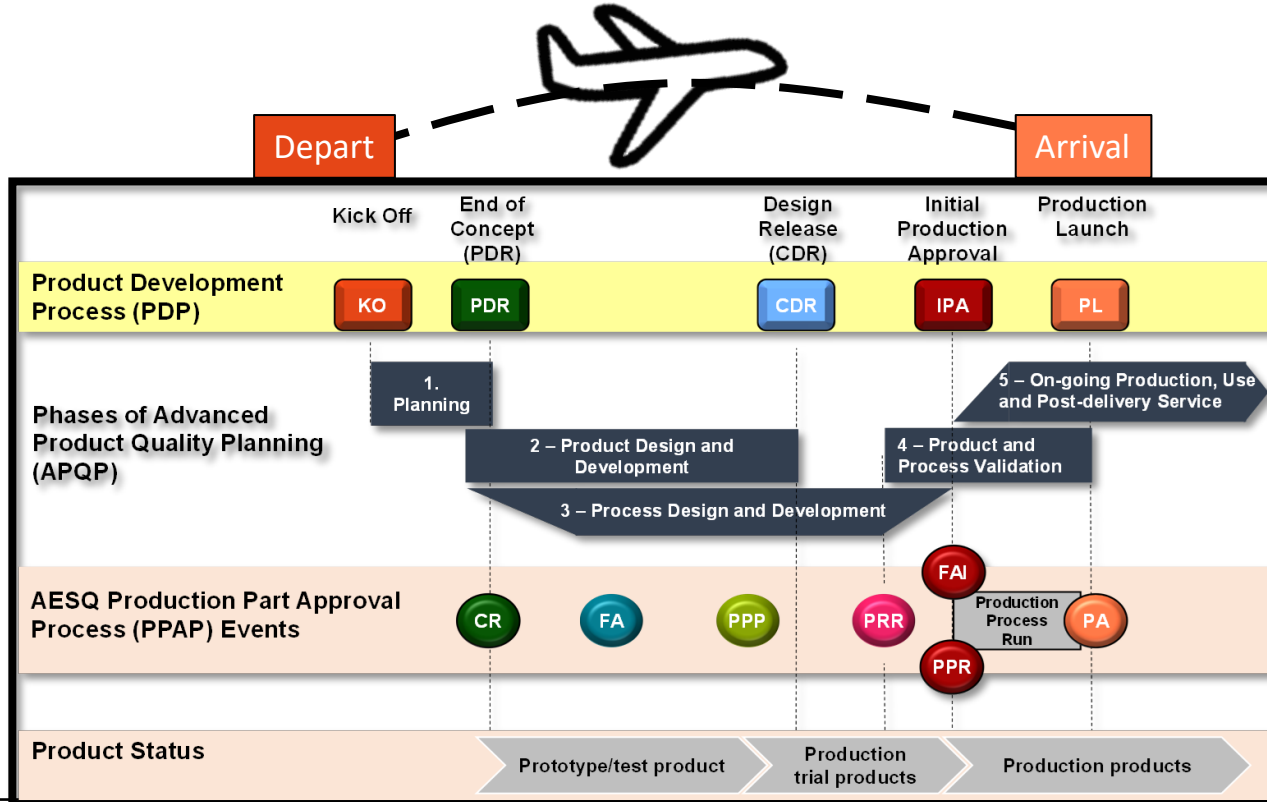


- Products reach **faster maturity with fewer engineering changes and defects** in the early stages of production & product use.
- Provides a **foundation for successful ongoing change management** – design and/or manufacturing change, Works Transfers

AESQ – Aerospace Engine Supplier Quality Strategy Group

View APQP as a Flight

OUR FLIGHT PATH FOR MANAGING PRODUCT AND / OR PROCESS CHANGE

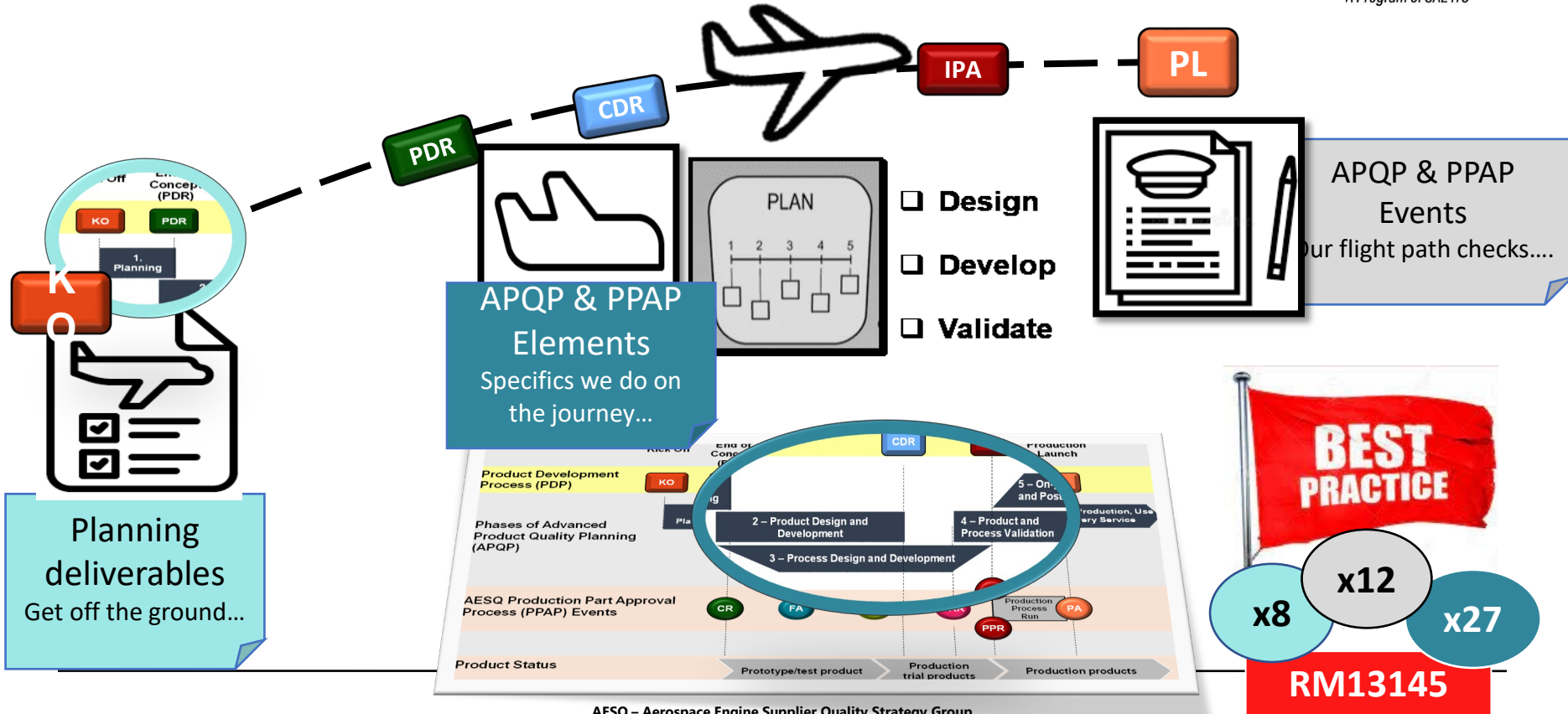


AESQ – Aerospace Engine Supplier Quality Strategy Group

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The APQP Flight Path

OUR FLIGHT PATH FOR MANAGING PRODUCT AND / OR PROCESS CHANGE



AESQ – Aerospace Engine Supplier Quality Strategy Group

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Leadership Test

Topic

Question

Referring to Planning deliverables (x8), APQP & PPAP Events (x12) and APQP & PPAP Elements (x27).

Referring to APQP design, development and validation activities for product & processes.

Referring to the use of APQP & PPAP Events – your flight path checks.

Are each and everyone required to be used every time? (NPI, Works transfer, manufacturing changes)

Should these solely be delivered by one function within your business?

Should these be an integrating part of your organisations Project Management & Review structures?



AESQ – Aerospace Engine Supplier Quality Strategy Group

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J&L MACHINE COMPANY AS13100 IMPLEMENTATION STRATEGY



SEAN KEANE
DIRECTOR OF ENGINEERING
J&L MACHINE COMPANY INC.



J&L Machine

COMPANY, INC.

50 & 62 Batson Drive Manchester, CT 06042

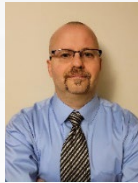




J&L Machine

COMPANY, INC.


50 & 62 Batson Drive Manchester, CT 06042



Sean Keane
Director of Engineering
J&L Machine Co. Inc.



About Us

- J&L Machine Co. Inc. is a self-release Tier 1, Type 1 manufacturer of flight critical and major rotating parts, servicing customers in both military and commercial aviation, as well as ground power applications.
 - Founded in 1979 and located in a recently expanded manufacturing facility in Manchester, CT.
 - 58 Employees on 2 shifts
 - 52,000 total square foot facility housed with the latest technology for precision machining and inspection.
- 

Capabilites



CNC Turning Equipment – 26 Total	CNC Milling Equipment – 14 Total
2 × Mori Seiki SL-8 40" swing	1 x CNC Bridgeport
1 × Mori Seiki SL-6 37" swing	1 × Mori Seiki MV-65 5 Axis
1 × Slant 7 36" swing	1 × Mori Seiki MV-55 4 Axis
1 × CNC Bullard	1 × Deckle Maho DMU 125 P 5
12 × Johnford ST 40B 31" swing	1 × Matsura MC-800VGII 5 Axis
4 × Johnford ST 40CX 39" swing	1 × Nigata HN63P 5 Axis
2 X Johnford ST 40	2 x DMG Mori DMU 65
1 x You Ji	1 x DMG Mori DMU 85
2 x DMG Mori SL-603/1000	1 x Mori Seiki NV-7000
	2 x Mori Seiki DV-5100
	1 x Mori Seiki MNV-5000
	1 x Haas

Capabilites

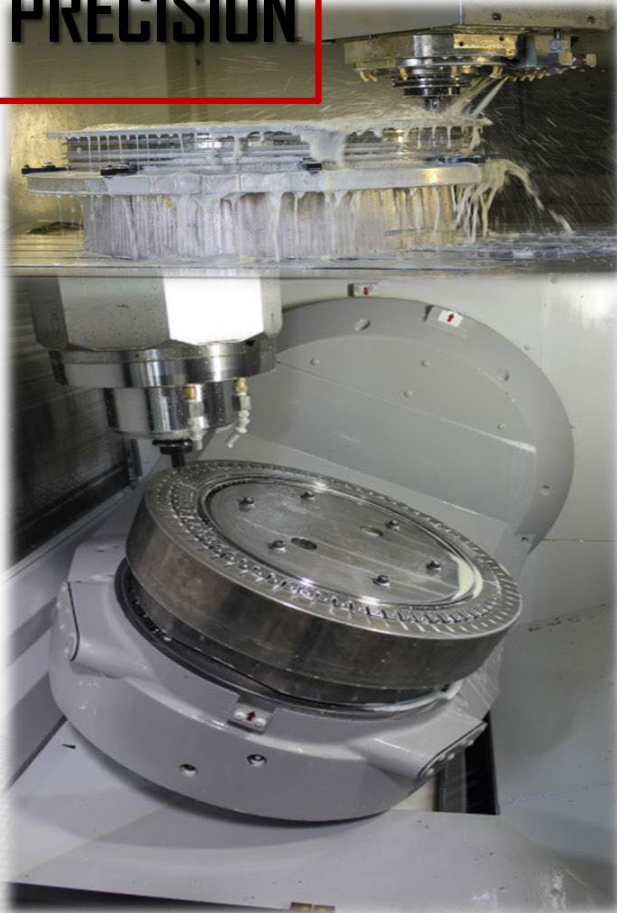


Manual Milling & Turning Equipment	Miscellaneous and Special Process
4 × Bridgeport Model 6-X005	2 × Micromatic 723 Hone Machine
1 × Mazak Engine Lathe 44" Swing	1 x Barnes Hone HV-1000
4 × Mori Seiki MH-1000G 33" Swing	2 × Sutton Barrel CENTRI-FLOW
1 × Mori Seiki MH-850 19" Swing	1 × Schenck Static Balancing Machine
5 × VTL Bullard 44" Thru 56" Swing	1 × JRI Part Wash Machine
1 x VTL Bullard (small)	1 × Zeiss Acura CMM
	3 X Zeiss Contura CMM
	1 x J & L Meteorology Optical Comparator
	3 × 2D Data Matrix Dot Peen Marking
	6 × Trimos Setting Instruments –
	Butterfly polish (manual and auto)
	Assembly

PRECISION



J&L Machine
COMPANY, INC.



ACCURACY



J&L Machine
COMPANY, INC.



AS13100

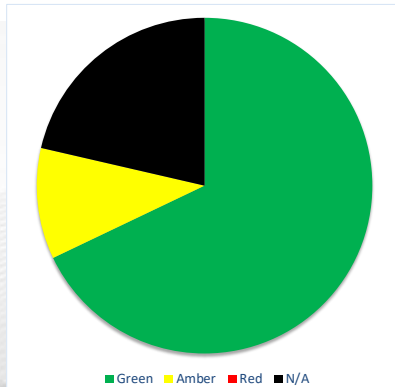
- Systematic way of controlling your process.
- J&L has used AS13100 tools for 18 years as part of our management system
 - Contract Review, identifying risk and mitigating potential issues prior to production
 - PFD, PFMEAs, and Control Plans for all KCs, PPAP, and new product.
 - GR&R for all Key Characteristics
 - Capability analysis for all Key Characteristics
 - Manage your suppliers

AS13100 Self Assessment

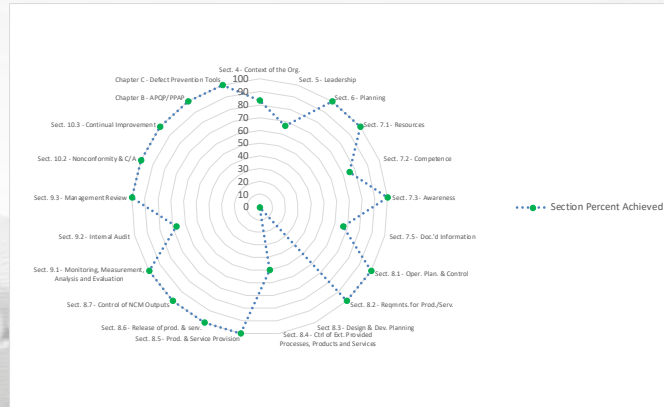
Self Assessment Tool Results Summary

Organization Name:	J&L Machine Co. Inc.	Date:	9/27/2022
Completed By:	Sean Keane	Version:	N/C

Proportional View of Reds, Ambers and Greens



RADAR Chart View of Compliance %

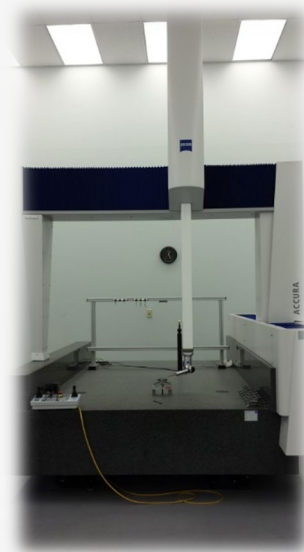


Planning

- Contract Review – Minimize your risk
 - Engineering, Production, Quality completes the contract review.
 - Consults with machine operators
- Items of risk are discussed during all hands meetings, production meetings, management reviews, and if necessary with the customer.
- Reviewing single points of failure
- Start your PFD and PFMEA

Support

- Machine Maintenance is vital
 - Onsite maintenance
 - Contracted machine support
- 6S and climate controlled work environment
- Training – Skills Matrix
- Include people involved
 - Development of process
 - Improvements
 - Corrective actions
- MSA important to understand the capability of your gages
- Records retention and retrieval must be easily accessible



Operations

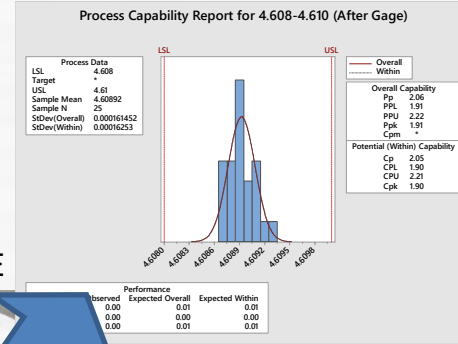
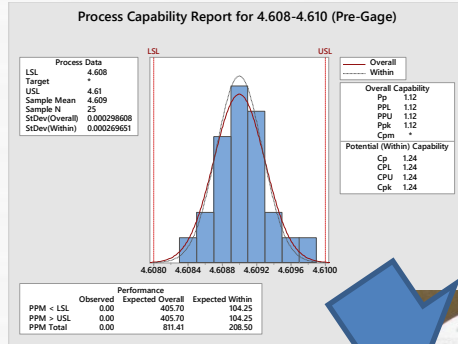
- Keep your product and your employees safe
- Keep a good relationship with your customer and have an open dialogue
- J&L uses NX, Solidworks, Mastercam for developing programs and operation sheets
- **NO VERBAL AGREEMENTS OR WORK INSTRUCTIONS**

Improvement

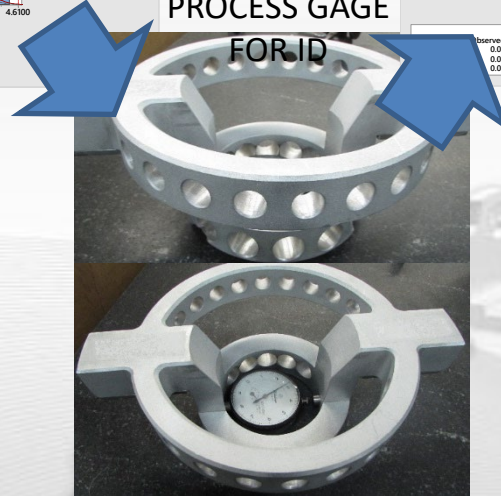
Tools to help with 8D (Root Cause and Corrective Action) Process

- PPAP (Production Part Approval Process)
- Six Sigma
- Lean
- 6S (Sustain, Standardize...)
- VSM (Value Stream Mapping)
- TPM (Total Preventive Maintenance)
- Six Sigma, SPC (statistical process control) and Process Certification
- Capacity Analysis

Improvement



NEW IN-
PROCESS GAGE
FOR ID



Before
Cpk 1.24

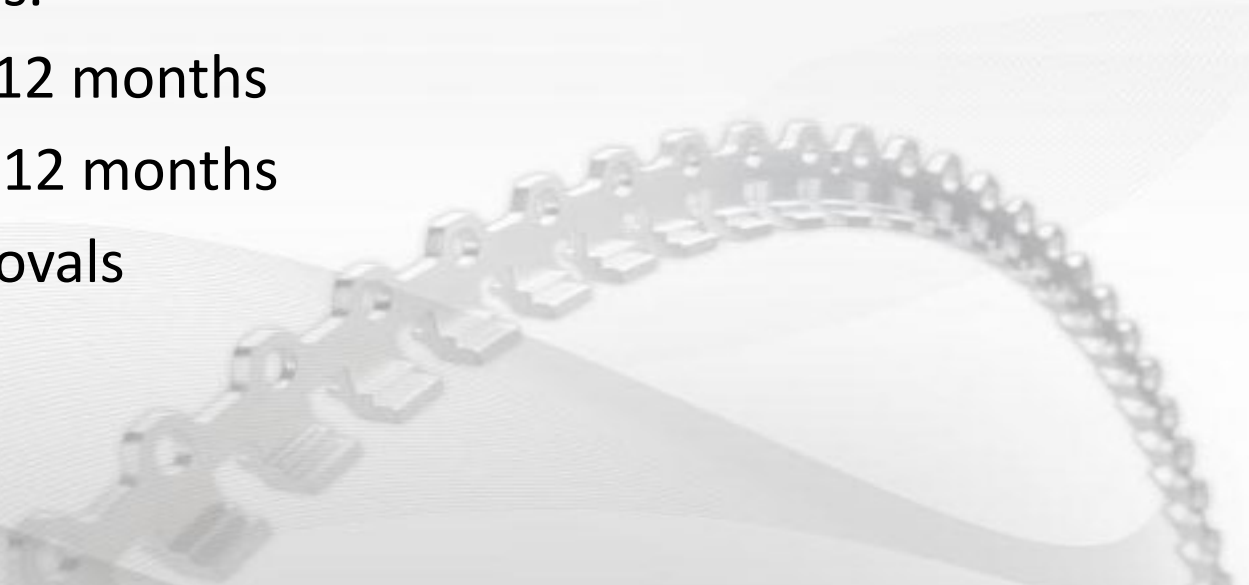
After
Cpk 1.90

Results

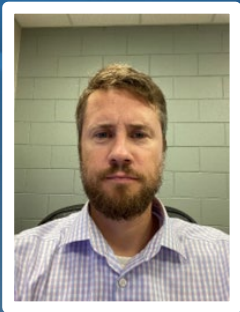
SATISFIED CUSTOMER



Results

- 98% On-time deliveries for the last 6 months
 - 86% Compliant per AS13100 Checklist, gaps are mostly procedure updates.
 - 0 Escapes for the 12 months
 - 2 QNs for the last 12 months
 - 30 Full PPAP Approvals
- 

SKF AS13100 IMPLEMENTATION STRATEGY



BRANDEN J. WORKMAN
SENIOR QUALITY ASSURANCE NORTH AMERICA
SKF AEROSPACE

SKF solutions for airframe, helicopter, engine and gearbox applications

Aeroengine bearings

- Custom-engineered solutions for aircraft powerplants and transmission equipment
- Ball bearings, cylindrical, taper and spherical roller bearings and thin section bearings – from 8 mm i.d to 800 mm o.d.
- Thin section bearings from 19 mm to 1 016 mm i.d.
- Hybrid bearings (ceramic rolling elements), integrated bearing assemblies
- Specialty balls – steel and ceramic



Airframe bearings

- Custom-engineered solutions for "integrated bearings"
- Wide range of solutions for airframe bearings such as plain, ball and roller bearings



Airframe units

- Wide range of airframe units based on composite technology and bearing integrated solutions
- Integrated and concurrently engineered solutions of bearings and composite solutions

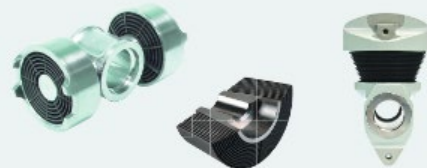


Airframe composite rods

- Composite rods for structural and motion control applications

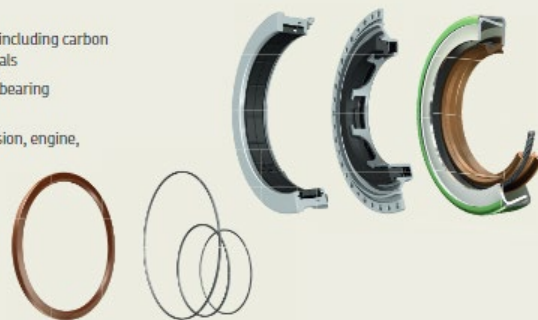
Elastomeric solutions

- Bearings, isolators and dampers
- Main and tail rotor bearings, driveline gimbals, gearbox isolators and more



Sealing solutions

- Main-shaft bearing compartment seals including carbon face seals and carbon circumferential seals
- Metallic and non-metallic sealing rings, bearing clamber rings
- Radial lip shaft seals: gearbox, transmission, engine, oil and grease seals
- Aerospace gaskets and boots
- Linear motion/fluid power seals



AS13100 Implementation Strategy - General

SKF Aerospace is comprised of six North American and three European sites that support the AESQ community

The nine sites manufacture five distinctly different product types; each site / product line has its own unique challenges to implement

Similar to any project of this size developing a robust plan is paramount

Our approach was to perform the gap analysis at the 'corporate level' first ; and each individual site level second

RM13009 self assessment tool was the roadmap used for this plan development

The RM13009 self assessment is a starting point; modify, or adjust, the template as needed to suite your business

AS13100 Implementation Strategy – RM13009

What worked for SKF was to:

- Add a row for each specific requirement; not just the high-level clause
- Add a row for each specific customer specific requirement (SABRe4, ASQR-01, etc)
- Add columns for who owns each specific review step, what document(s) contain or will contain the requirement, and determining if each specific clause will be incorporated as part of the entire QMS or just AESQ applicability

Clause	Clause Title	Organization Process Reference (or comment)	Compliance Status	Currently in Aero Qd (Y/N/NA)	Incorporate into Aero Qd or supplement (Standard/Supplement/NA)	Comments	Review Assigned To
5.3.1	Organizational Roles, Responsibilities and Authorities - Supplemental Requirements	G0100	N/A				
5.3.1	Personnel responsible for conformity to product requirements shall have the authority to stop and correct quality problems.	G0100	A	Y	Standard	G0100 to be updated to clearly mention the reqmts	Edmond
5.3.1	Where the process design prevents immediate shutdown upon detection of a quality problem, then the product or service shall be contained so that it is prevented from being delivered to the customer.	P0446	G	N	Standard	§ 4.1 covers this requirement	Edmond
5.3.1	Where production is run across different shifts there shall be personnel identified that are accountable for ensuring conformity to product requirements.	G0100	A	Y	Standard	G0100 to be updated to clearly mention the reqmts	Edmond

AS13100 Implementation Strategy – Step 1

For SKF Aerospace Chapter A [AS13100 + specific customer requirements] has 428 applicable requirements

The first hurdle is getting past the ‘sticker shock’

A thorough review revealed many of the requirements were already fully, or partially, built into our QMS

The number of gaps identified was alarming, but what was more concerning was the magnitude of some of the gaps

AS13100 Implementation Strategy – Step 2

The second hurdle is developing the plan to address the large magnitude gaps; with initial focus on the gaps outside of Quality's historical influence, or control (i.e., Top Management, Supply Chain, Design, Human Resources)

Quality Assurance was responsible to ensure each area understood what exactly their required improvements were

Next, each responsible area had to create their action plan to comply; Quality Assurance had to assist with this plan development

Not every requirement is created equal – prioritization is critical – each plan has to consider effort to achieve compliance versus the value

At this point, a complete *Compliance Plan* can be created

AS13100 Implementation Strategy – Step 3

To *accelerate the change* focus started on the low effort – high value improvements

These improvements typically involved standardization amongst the different sites or departments – eliminating redundancy [ex. standardizing human factor incorporation, defining audit types and applicable template, and utilizing applicable Reference Manual forms]

<https://aesq.sae-itc.com/supplemental-material>

Reference Manual	Associated Forms
RM13000	Problem Solving Methods Including 8D <ul style="list-style-type: none"> • 8D Interactive Tool (PowerPoint) • 8D Reporting Template (Power Point) • 8D Word Form (Word) • 8D Template (Excel) • 8D Template (PowerPoint)
RM13002	Alternate Inspection Frequency Plans <ul style="list-style-type: none"> • Alternate Inspection Frequency Plan Worksheet (Excel)
RM13003	Measurement Systems Analysis
RM13004	Defect Prevention Quality Tools <ul style="list-style-type: none"> • RM13004 Template and Examples (Excel) • DFMEA Template (Excel)
RM13005	Quality Audit Methods <ul style="list-style-type: none"> • Appendix B Risk Assessment (Excel) • Appendix C Quality System Audit (Word) • Appendix D Production Process Audit (Excel) • Appendix E Management Review (PowerPoint) • Appendix F Annual Audit Report (Excel)
RM13006	Process Control Methods <ul style="list-style-type: none"> • Appendix A Assessment Checklist (Excel) • Appendix B Process Capability Plan (Excel) • Appendix C Training Syllabus (Word)
RM13007	Sub Tier Management
RM13008	Design Work
RM13009	Compliance Assessment <ul style="list-style-type: none"> • Compliance Assessment Workbook (Excel)
RM13010	Human Factors <ul style="list-style-type: none"> • Appendix 2 Investigation Human Factor Checklist (pdf)

AS13100 Implementation Strategy – Step 4

High effort – high value improvements are what will drive the Zero Defect approach – proactive tools such as MSA, Cpk, FMEAs all support this effort

Focus on part number specific actions, for the proactive tools, versus part family will greatly impact resources, but should hopefully provide long term value

These activities must be viewed as a marathon and not a sprint

AS13100 Implementation Strategy – Struggles

Implementation effort has encountered many struggles along the way

- Supply Chain understanding / acceptance
- Attempts to justify implementation cost versus return on investment
- Need to develop different solution for the same requirement across different sites / different product lines
- Intermittent demand and low quantity part numbers

AS13100 Implementation Strategy

You are not alone!

No one individual, no one site, no one company has the perfect approach

Continue to review the AESQ Supplier Forum materials, attend your Prime customer's periodic webinars, contact your colleagues within the industry, etc.

Collaboration is key

SKF®

PARKER MEGGITT AS13100 IMPLEMENTATION STRATEGY



STEVE MCMULKIN
HEAD OF MANUFACTURING QUALITY
PARKER MEGGITT

AS13100 Deployment Strategy

AS13100 – Parker Meggitt Group implementation



ENGINEERING YOUR SUCCESS.

Agenda

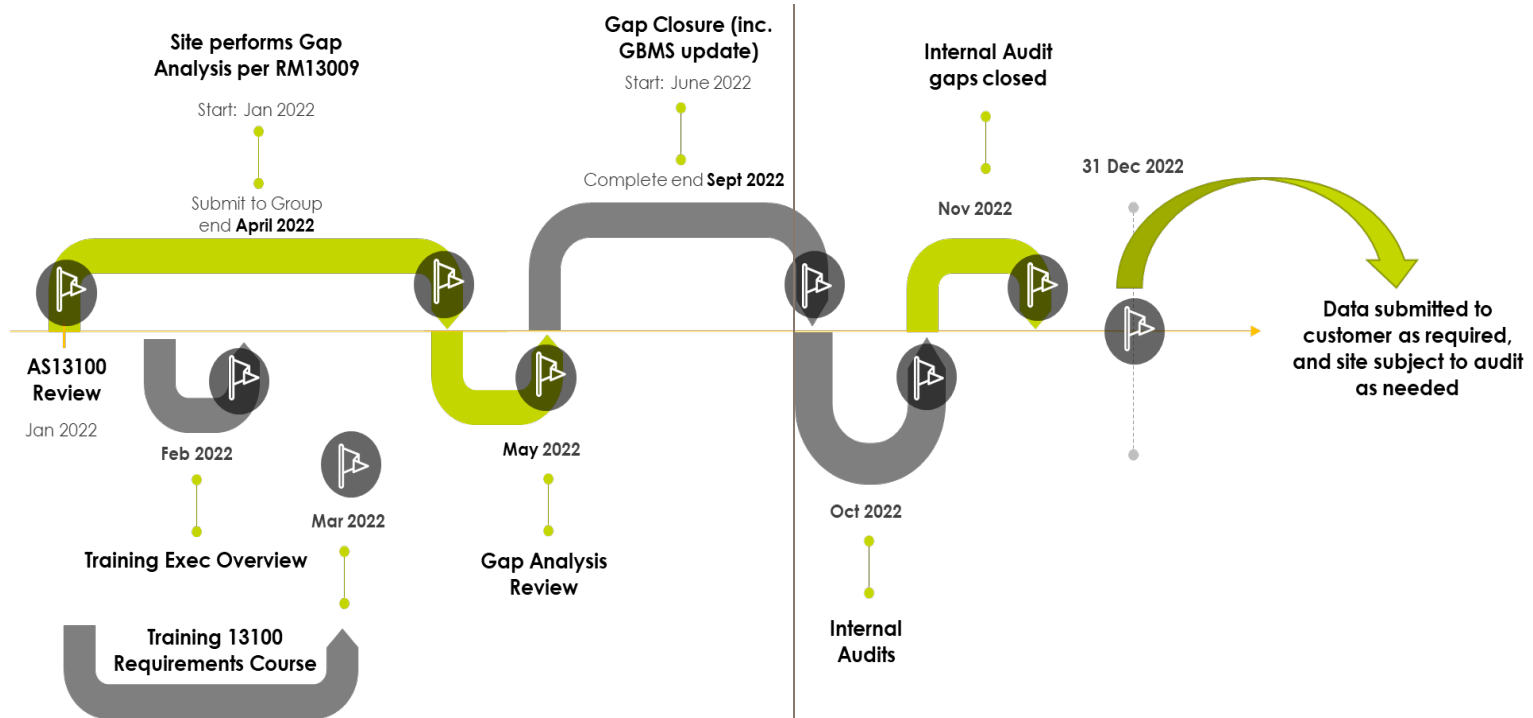
- Parker - Meggitt site coverage
- Timeline
- Milestone Status by Site
- Cumulative performance
- % Compliance by sites
- Combined compliance
- Key Risks / Gaps
- Training
- Summary
- Next steps

Parker - Meggitt Sites

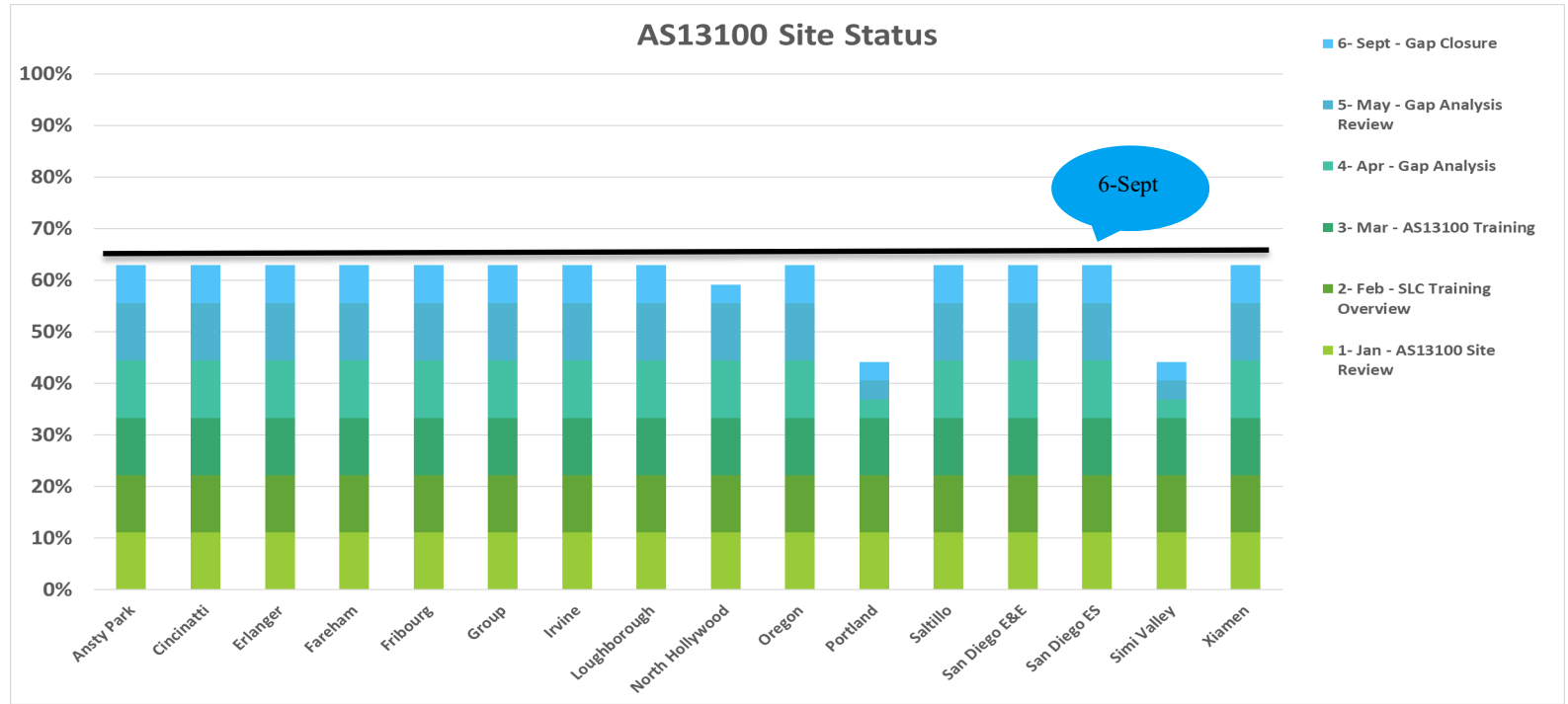
Site	Quality Rep
Ansty Park	Pepe Elsworth
Cincinatti	Jim Morano
Erlanger	Eric Carter
Fareham	Tom Williams
Fribourg	Stéphane Marchetti
Loughborough	Les Elphee
Irvine	Cynthia Melchior
North Hollywood	Ramon Williams
Oregon	Jeff Bryson
Portland	Justin Hackett
Saltillo	Daniel Mendoza
San Diego E&E	Chris Harris
San Diego ES	Emmanuel DeBrand
Simi Valley	Greg Lewin
Troy	Sandy Hendrickson
Vietnam	Thao Nguyen
Xiaman	Amanda Wang



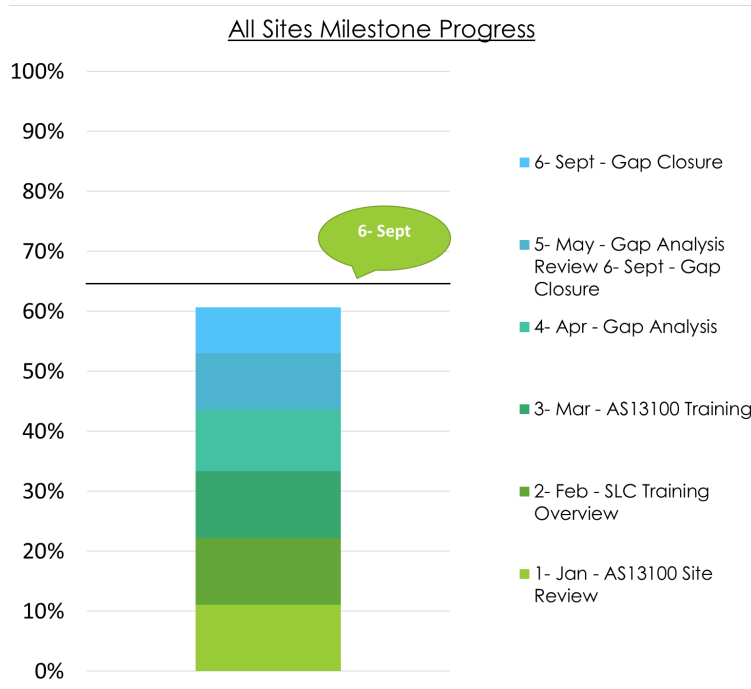
Parker - Meggitt AS13100 Timeline



Milestone Status By Site

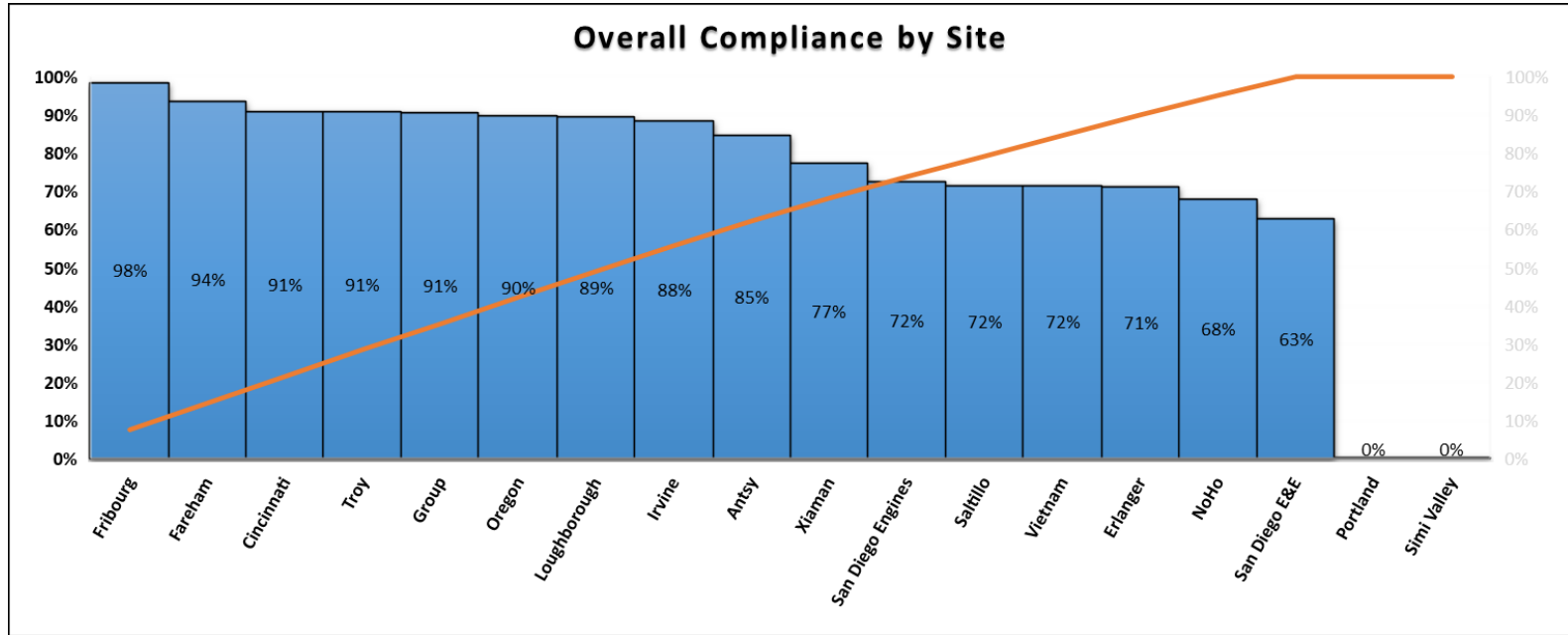


Cumulative Performance



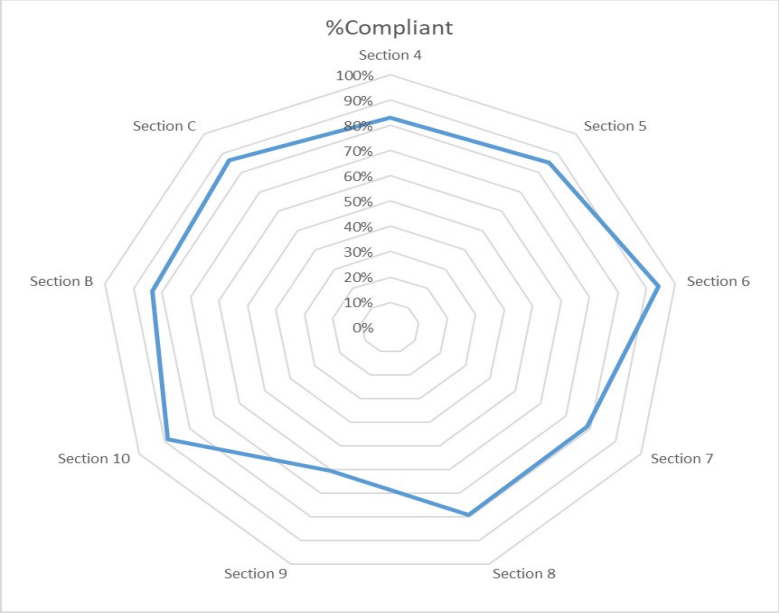
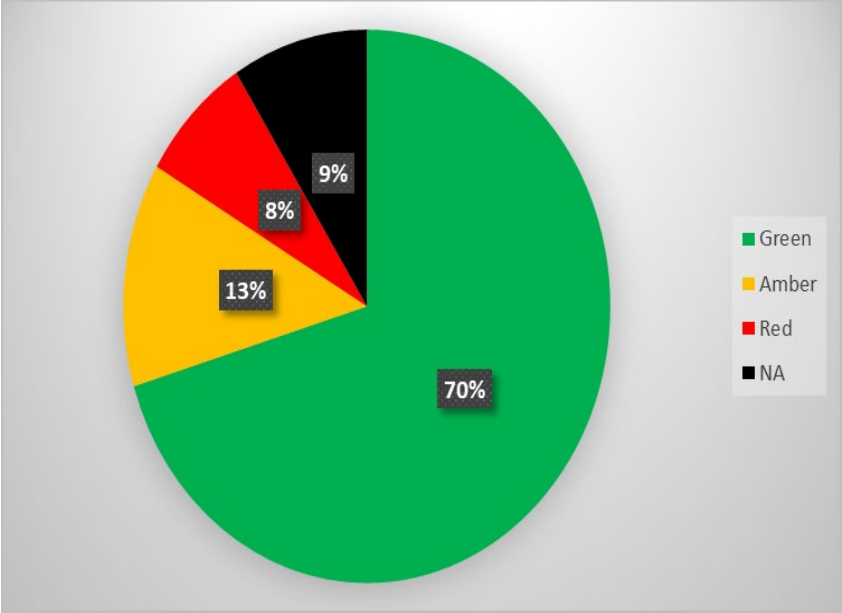
- All sites are at 61% to the milestones, should be at 66%
- 2 sites currently have not submitted their gap analysis bringing the % down
- Documents recently released at the Group level are driving training and communication and will close quite a few gaps

% Compliance by Site submissions (RM13009)



Combined AS13100 compliance

Overall Compliance All Sites

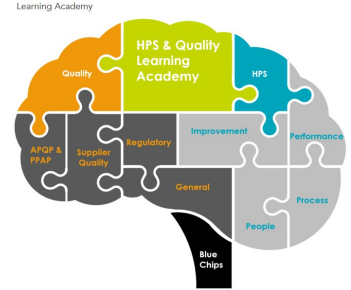


Key Risks/Gaps

Section	Description	Action
4.4.3	Quality Management System and its processes - Supplemental Processes: Human Factors	Release of MQA-1 Quality Manual
5.2.1.1	Establishing the QP - Human Factors	Release of MQA-33 Human Factors
7.1.5.1.1	MSA	MSA not currently being performed on quite a few sites, retrain on material
7.1.5.1.2	Conduct MSA	
7.1.5.1.3	Confirm Acceptance of MSA	
7.1.5.1.4	Agree Improvement Actions -MSA	
7.2.4	AESQ Quality Foundation Training	Parker Meggitt 3 - Day Foundations Course Being Launched
7.3.1	Human Factors Awareness	MTR-31 Human Factors Training Underway
7.5.3.4	Damage to Records - Inform Customer	MQA-20 Updated
8.5.1.2.1	Validation and Control of Special processes - Supplemental Requirements	Sampling of NDT - MQA-31 Inspection Under Revision
9.2.5	Annual Audit Report	Being Conducted Monthly - Sites Need Rolled up Performance
9.3.2.1	Management Review Inputs - Supplemental Requirements	Human Factors To Be Considered - no current metric
19.1	Pre-Launch Control Plan	To Be Instituted On Next New Project/Design

Training

- Level one – SAE Executive overview, completed by all applicable sites
- Level two – SAE AS13100 requirements course (10 hours approx.), completed by all applicable sites
- Level three – SAE 3 day Quality foundations course, Completed by Group Head of Manufacturing Quality
 - Parker Meggitt will deliver equivalent 3 day quality foundations course for applicable sites (Pilot course TBC for end of Nov 2022 @ Ansty Park)
 - Parker Meggitt has its own Learning academy and all required training is available. Approx. 800 Meggitt engineering professionals have been trained this year in all 14 foundation course modules



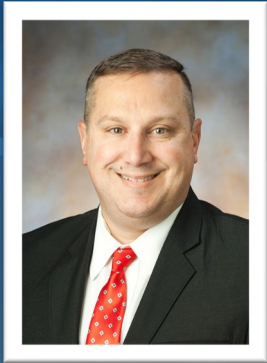
Parker- Meggitt AS13100 Summary

- Monthly site leadership review ongoing
- Monthly Group review with sites is ongoing
- GE - AS13100 Quarterly reviews
- Milestone Tracker – reported monthly
- Gap closure is aided by GBMS updates

Next steps

- Group Quality to Continue to work with sites to mitigate risks & close Gaps
- Complete Gap assessment audits
- Deliver pilot AESQ equivalent 3 day foundations course to all applicable sites
- Share best practices /lessons learned with all applicable sites

TRAINING OVERVIEW



EARL CAPOZZI
ASSOCIATE DIRECTOR, DISCIPLINE CHIEF
QUALITY & PROCESS ENGINEERING / SUPPLIER QUALITY
PRATT & WHITNEY



Introducing SAE AS13100 The New Industry Standard for Quality

This exciting new standard creates a common language for quality throughout the supply chain. Watch our video series for executive perspectives from across the industry, and learn how compliance is critical to your company's success.

Training Program Goals



Support deployment and adoption of AS13100



Knowledge to design, maintain & assess business processes to meet intent of standard



Focus on key concepts, impact to compliance and customer requirements and benefits to business performance



Simplify and clarify the requirements with a standardized training approach

AS13100 TRAINING SUMMARY

7.2.4 AS13100 Requirements Training and AESQ Quality Foundations Training - Supplemental Requirements

The organization shall ensure that Quality Leaders with responsibility for deploying the requirements of AS13100 within the organization are trained in the requirements of AS13100 and related Quality Management Standards through an AESQ approved AS13100 Requirements training course. This course is also recommended for functional leaders responsible for creating or managing processes that are impacted by AS13100 Requirements.

In addition, the organization's Quality Leaders with responsibility for supporting the design, manufacturing, and assembly operations via AS13100 shall undergo training in the AESQ Quality Foundations Training course. This course is also recommended for design engineering, manufacturing engineering and operations roles.

Equivalent training that meets the AESQ AS13100 Requirements and Quality Foundations course syllabi shall be approved by the AESQ.

Required Training

Delegated Product Release Verification (DPRV)

DPRV personnel shall be trained and certified in accordance with **AS13001 Delegated Product Release Verification Training Requirements**

(7.2.3) Requirement since 2015

AESQ AS13100 Quality Requirements Course

The organization shall ensure that Quality Leaders with responsibility for deploying the requirements of AS13100 within the organization are trained in the requirements of AS13100 and related Quality Mgmt. Standards through an **AESQ approved AS13100 Requirements** training course.

(7.2.4) Requirement since 2021

AESQ Quality Foundations Course

The organization's Quality Leaders with responsibility for supporting the design, manufacturing, and assembly operations via AS13100 shall undergo training in the **AESQ Quality Foundations** Training course.

(7.2.4) Requirement since 2022

DPRV AS13001 Revision A




Certified by Probitas Authentication™ an independent third party. They track attendees and maintain everyone's ongoing credentials and record against the requirements.

In the aerospace industry, the [Delegated Release Process Verification](#) process establishes a uniform set of requirements by which a supplier may be granted authority to ship product. This removes or minimizes source and/or receiving inspection by the delegating organization, or their third-party representatives.

Successful completion of this course satisfies the respective customer training requirement for initial self-release delegate qualification.



LEVEL ONE

AS13100 Executive Overview 

Launched Q3 2020

No cost

Five Part Video Series, 35 minutes
Executive perspectives from across the industry detailing why compliance is critical to your company's success

LEVEL TWO

AS13100 Requirements 

Launched Q2 2021

\$399

LEVEL THREE













AS13100 Quality Foundations 

Launched Q1 2022

\$1095

LEVEL FOUR

In-Depth Courseware

8D Problem Solving RM13000 	Measurement System Analysis RM13004 	FMEA & Control RM13004 	Human Factors RM13010 	APQP / PPAP (incl. AS9145) RM13145 	AS9100 Lead Auditor Training 	Internal Auditor RM 13005 	Lead Auditor RM 13005 
ISO 14001 Lead Auditor 	AS9100 D Internal Auditor 	AS9100 Standard Training 	AS9100 Auditor Training 				

This exciting new standard creates a common language for quality throughout the supply chain.

Watch this free video series with executive perspectives from across the industry and how compliance is critical to your company's success:

1. The Aerospace Industry
2. Formation of AESQ
3. The Need for AS13100
4. Overview of AS13100
5. Summary



SCAN ME

On ongoing series of short videos: *Live and On Demand*

Executive perspectives from across the industry detailing how AS13100 compliance will affect these topics:

No
cost

AS13100
APQP and PPAP
for Supply Chain
To RM13145

AS13100
Design FMEA
to RM13004

AS13100
What Makes a
Good 8D?
RM13000

AS13100
First Article
Inspection (FAI)
to RM13102



SCAN ME

AS13100 REQUIREMENTS COURSE OVERVIEW

- ✓ **Required** for Quality Leaders with responsibility for deploying the requirements of AS13100.
- ✓ **Recommended** for functional leaders responsible for creating or managing processes that are impacted by AS13100.



SCAN ME

Is this On Demand Course for You?

- ✓ Individuals accountable for defining the organization's processes or developing its quality management system to meet customer, regulatory, and industry requirements.
- ✓ Quality Leaders and those leaders from other functional areas:

Design

Business

Program
Management

Engineering

Manufacturing

Auditors

Operations

Purchasing

This course is On Demand, and includes 10 modules aligned to the AS13100 Standard:

- Introduction to AS13100 (Intro to Section 3)
- **Chapter A:** 9100 Quality Management System – Requirements for Aviation, Space and Defense Organizations – AESQ Supplemental Requirements
- **Chapter B:** AS9145 Advanced Product Quality Placement (APQP) and Production Part Approval Process (PPAP) – AESQ Supplemental Requirements
- **Chapter C:** Core Defect Prevention Quality Tools to Support APQP and PPAP – Supplemental Requirements

QUALITY FOUNDATIONS COURSE OVERVIEW

- ✓ **Required** for Quality Practitioners with accountability for deploying the requirements of AS13100.
- ✓ **Recommended** for functional practitioners responsible for creating, managing or deploying processes that are impacted by AS13100.

Exception for GE Suppliers who have prior attendance in Supplier Orientation or QF204/GE Aviation Supplier Training.



SCAN ME

SAE AS13100 Quality Foundations Course Overview

- ✓ This three-day course is offered either online, or on-ground.
- ✓ Key quality systems, processes and methodologies to show how they work as part of a system focused on **defect prevention**.
- ✓ Supports quality professionals, at all levels in the organization, to understand how these tools and processes work and what are the characteristics of **successful deployment**.
- ✓ Recommended for functions with accountability for the quality of the design, production, assembly and test areas of the organization.



Is this Course for You?

- ✓ Individuals operationalizing the organization's processes and deploying its quality management system to meet customer, regulatory, and industry requirements.
- ✓ Quality practitioners and those from other functional areas:

Design

Business

Program
Management

Engineering

Manufacturing

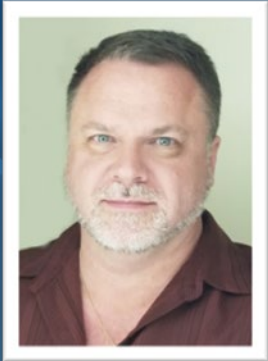
Auditors

Operations

Purchasing

The intent is, at a minimum, site quality leaders will attend training.

AS13100 LEAD AUDITOR AND INTERNAL AUDITOR TRAINING



JIM WILSON
SENIOR MANAGER, SUPPLIER QUALITY
ASSURANCE AND DEVELOPMENT
PRATT WHITNEY

AS13100 Internal and Supplier Audit Requirements

Background

- Prior to AS13100, Organizations were mostly left to their own to design and execute internal audit and supplier surveillance audit plans
 - Largely followed the AS9100 (or other certification) audit trail
 - Some incorporation and flowdown of customer-required audits
 - Basic sub-tier surveillance and varying greatly between suppliers

AS13100 Audit Types

- Four distinct internal and supplier audit types are identified in AS13100:
 - Quality System audits
 - Production Process audits
 - Product audits
 - Special Process audits

AS13100 Auditor Training Requirements

Background

- At the same time as identifying the four audit types, the AESQ has the goal of improving the quality of internal and supplier Auditor qualification and training
- Minimum Auditor qualifications were set for:
 - Initial training (table 5)
 - Overall experience (table 6)
 - Maintaining qualification (table 7)

AS13100 Auditor Training Requirements

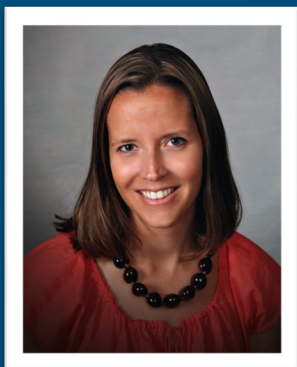
RM13005 improvements under review

- Correcting significant grammar, punctuation, and spelling issues
- Improving the interpretation of the Lead Auditor and Internal Auditor training requirements
- Examining the expectation by the AESQ members for what activities Lead Auditors are responsible for
- Reviewing the ongoing Auditor certification requirements for Special Process Auditors (e.g. # audits per year)
- Addressing requirements for suppliers not certified to AS9100

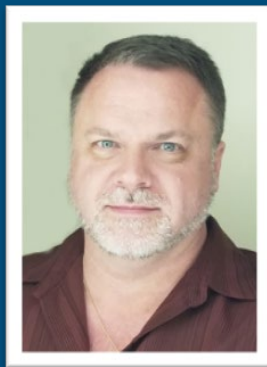
OEM REQUIREMENTS SESSION



Larry Bennett
GE Aviation



Tracey Lockhart
Rolls-Royce



Jim Wilson
Pratt & Whitney
Canada



Denis Pottier
Safran Aircraft
Engines



Catherine Catarina
Safran Aircraft
Engines

GE AVIATION



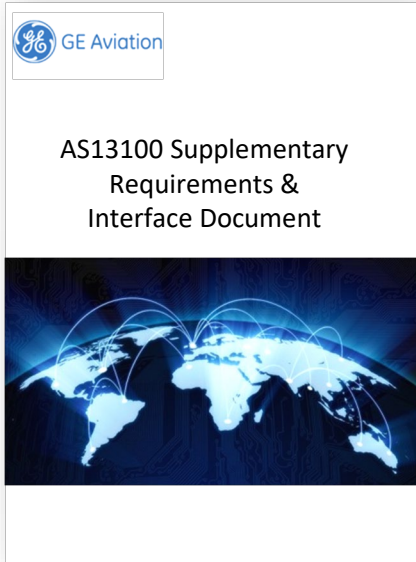
LARRY BENNETT

CONSULTING ENGINEER, GLOBAL SOURCING QUALITY
SUPPLY CHAIN DIVISION
GE AVIATION

AESQ – Aerospace Engine Supplier Quality Strategy Group

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AS13100 Customer Specific Requirements – GE Unique



Intro

GE S-Specs – Quality Requirements – Special Processes

Section 4

Priority parts review

Affiliate requirements

Section 8

Order of precedence

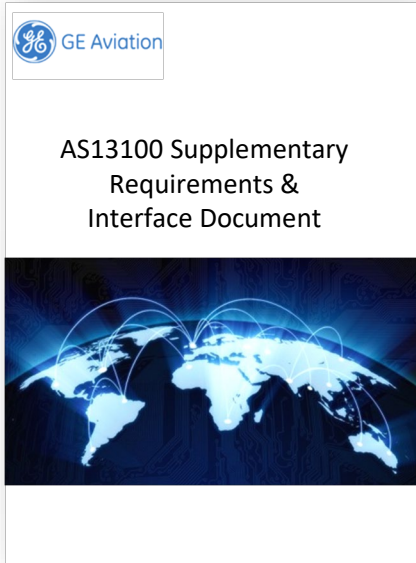
Change in design – electronic application

Source Problem Reports

Purchased raw material – testing requirements

Fastener supplier requirements

AS13100 Customer Specific Requirements – GE Unique



Section 8 (Continued)

APQP – Applicability based on manufacturing complexity/risks

Serialization – numbering

Hardware Release – DSQR

Electronic nonconforming material process

Section 9

Alternate inspection – electronic application

Product Audit requirements

Section 16

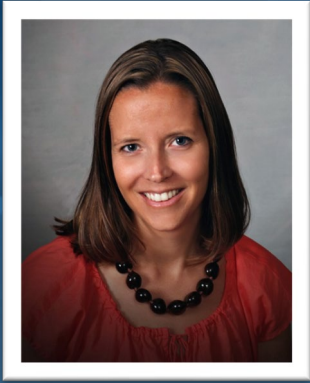
FAI per S-1002

PPAP – submission based on manufacturing complexity/risk

Section 17

PPAP submission- electronic application/process

ROLLS-ROYCE



Tracey Lockhart
Head of Quality and Continuous
Improvement, Defence
Rolls-Royce

AS13100 Customer-Specific Requirements; Rolls-Royce

SABRe 3; Full compliance to all previous requirements

Section 4.3 Determining the Scope of the Quality Management System

New supplier approval type and AS13100 compliance

- *Acceptable Compliance by End 2022; AS13100 Self Assessment and a Plan to close the gaps to the agreed timeframe in place*

Section 6 Actions to Address Risks and Opportunities

Comply with the Rolls-Royce Supplier Enhanced Cyber Security Standard

Section 8.1.3 Product Safety

Conduct training every 4 years on product safety supported by Product Safety Awareness Briefing pack developed by Rolls-Royce

Section 9.1.1.1 Monitoring and Measurement of the Manufacturing Process

Achieve the Process Minimum Standards using the Benchmarking Assessment Tool for applicable processes

- *Acceptable Compliance by End 2022; Required process minimum standard agreed with RR and a plan in place to complete the assessments by end of 2023*

Section 10.3 Continual Improvement

Demonstrate a commitment to zero defects by establishing the appropriate improvement plans and programmes

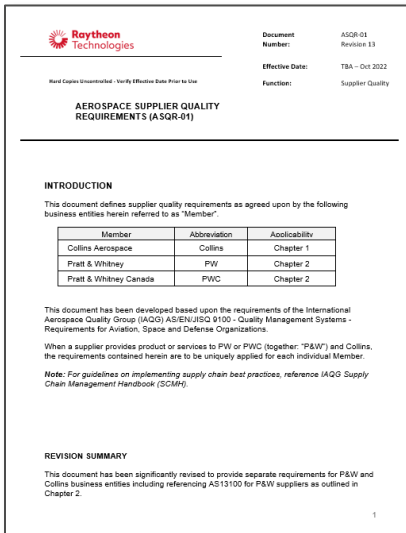


PRATT & WHITNEY



Jim Wilson
Sr. Manager, Supplier Quality, & Development
Pratt & Whitney Canada

AS13100 Customer-Specific Requirements – P&W



ASQR-01



Intro

Clarification of AS13100 and the RM's

Section 4

60 days to incorporate new requirements

Deliverable software to ASQR-07.5 (and non-deliverable in Section 8)

Multiple additions to QMS Certification Requirements Table 2

Section 7

Significant-Out-Of-Tolerance on M&TE equipment

Table 4: MSA Acceptance Limits – new Gage R&R acceptance levels

P&W DPRV program requirements

Retention period starting date

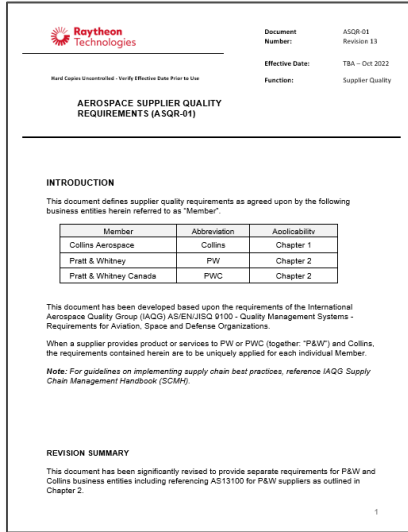
Retention on radiographs of non-serialized parts

Section 8

Critical parts per ASQR-09.1

P&W-specific forms to communicate

AS13100 Customer Specific Requirements – P&W



ASQR-01



Section 8 (cont.)

Handheld spectrometry only on request

Operator self-verification programs needing P&W approval

Section 9

Sampling to ASQR-20.1 and alternate inspection approvals

Product and Production Process Audits included in risk analyses only

Section 10

Verification of corrective actions – 3 manufactured lots

Temporary Key Characteristics

Section 17

PPAP submission- submission, approval, deferral, and element contents

Section 18

Not applicable to P&W

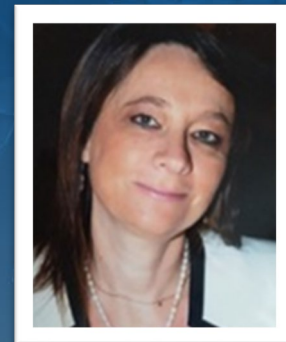
Section 21

Initial Process Capacity studies requirements

SAFRAN AIRCRAFT ENGINES



Denis POTTIER
Head of the Purchasing Quality
Assurance Department
Safran Aircraft Engines



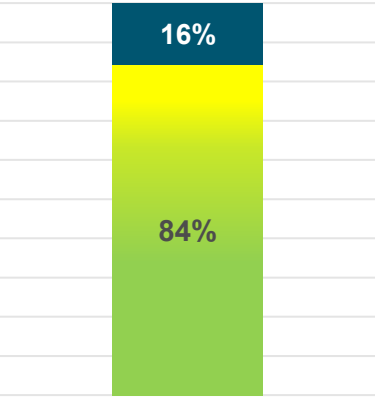
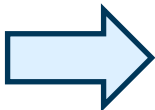
Catherine CATARINA
Supplier Management
System Coordinator
Safran Aircraft Engines

Gaps Analysis AS13100 vs SAFe

AS13100 Requirements	Chapter A AS9100 Rev D Supplemental Requirements										Chapter B APQP & PPAP AS9145 Supplemental Requirements									Chapter C Defect Prevention Quality Tools to Support APQP & PPAP									
	Clause Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	DFMEA	Product KCs	Process Flow Diag.	PFMEA	Process KCs	Control Plan	MSA	Process Capability	
More SAFe				✓	✓		✓	✓	✓	✓																			



SAFe vs AS13100



■ Covered ■ Not Covered

Examples

- Section 7.2.1**
Requires organizations to provide On the Job Training
- Section 7.2.(2&4)**
AS13100 Requirements training and AESQ Quality Foundations Training
- Section 8.5.1.1.1**
Control of Equipment, Tools, and Software - Supplemental Requirements

More SAFe versus AS13100: *Some examples*

Chap. 5 Corporate Social Responsibility



Chap.7 Regulatory watch process



Chap.8 Obsolescence



Chap.10 Scrap rate



Chap.8 Low-carbon



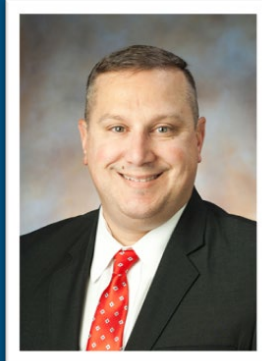
AS13100 FAQ PANEL SESSION



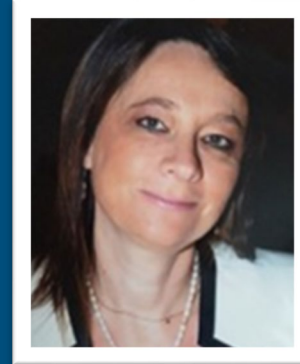
Barrie Hicklin
Honeywell



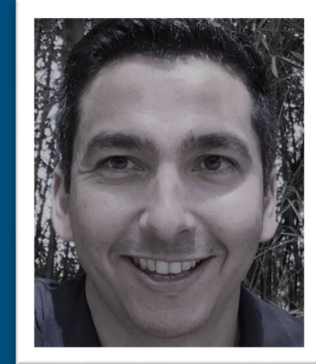
Larry Bennett
GE Aviation



Earl Capozzi
Pratt & Whitney



Catherine
Catarina
Safran Aircraft
Engines



Ricardo Banuelas
Rolls-Royce

ZERO DEFECTS JOURNEY



Barrie Hicklin
SR. DIRECTOR, QUALITY SYSTEMS &
REGULATORY COMPLIANCE
HONEYWELL AEROSPACE

slido



**Does your company
formally recognize Zero
Defects as a goal?**

① Start presenting to display the poll results on this slide.

slido



How would you assess your capability to assess a programme of Zero Defects?

① Start presenting to display the poll results on this slide.

slido



What do you see as your greatest barrier?

① Start presenting to display the poll results on this slide.

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What would help you most?

① Start presenting to display the poll results on this slide.

AESQ

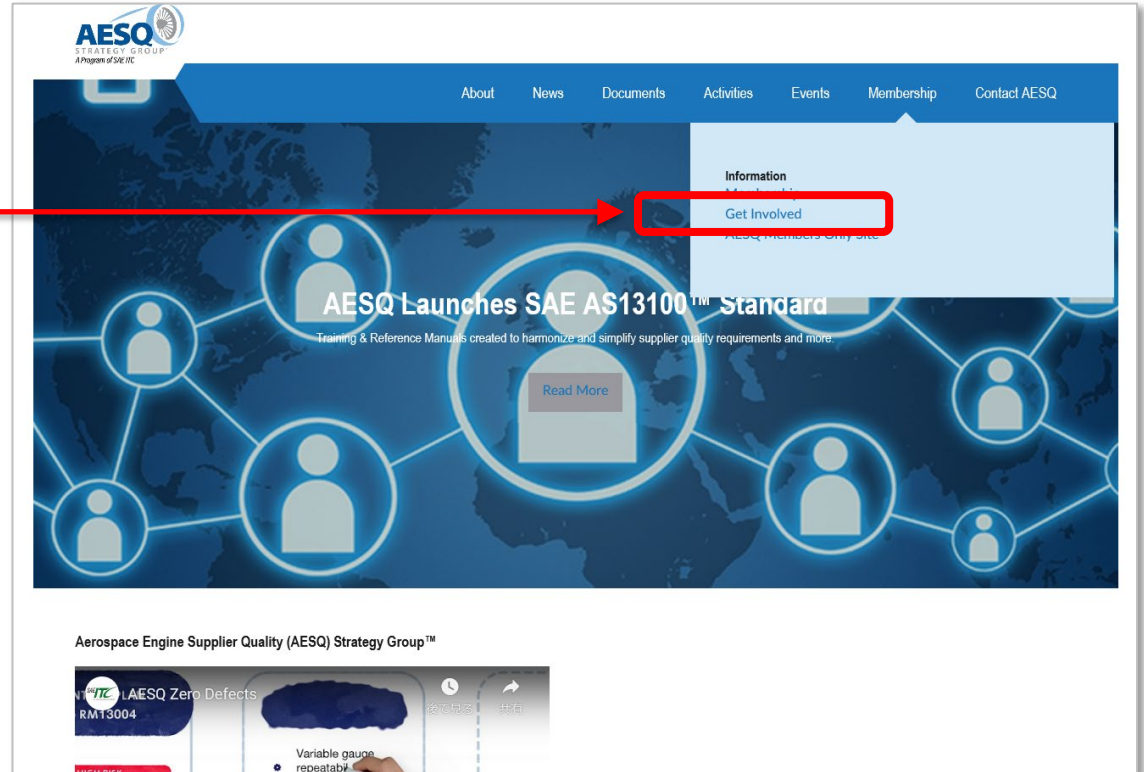
HOW TO GET INVOLVED



HELEN DJAKNEGREN
DIRECTOR SUPPLIER QUALITY & DEVELOPMENT
GKN AEROSPACE

“Get Involved” with AESQ

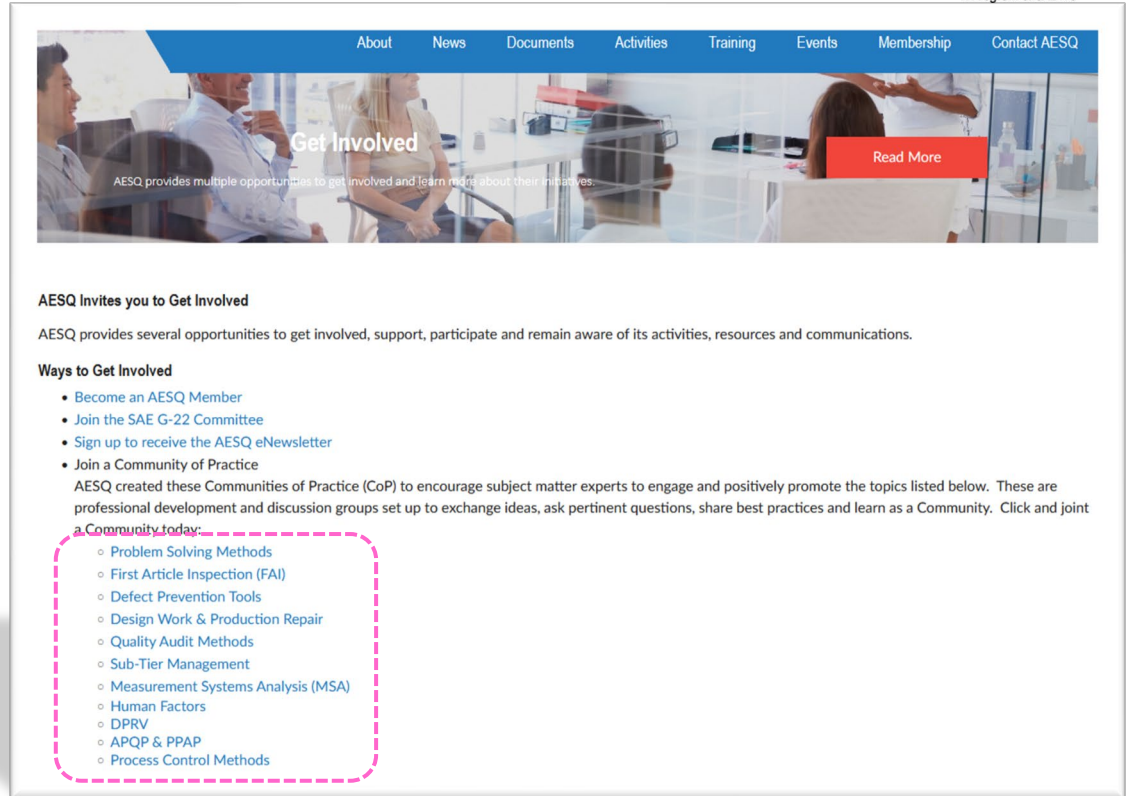
- Go to AESQ Homepage
<https://aesq.sae-itc.com/>
- Click “Get Involved”



“Get Involved” Options

1. Sign up to receive AESQ eNewsletter
2. Become an AESQ Member
3. Join the SAE G-22 Committee
4. Join a Community of Practice on LinkedIn

Click on the appropriate link for additional information



The screenshot shows the top navigation bar of the AESQ website with links for About, News, Documents, Activities, Training, Events, Membership, and Contact AESQ. Below the navigation is a hero image of people in a meeting with the text 'Get Involved' and 'AESQ provides multiple opportunities to get involved and learn more about their initiatives.' A red 'Read More' button is visible on the right. The main content area has the heading 'AESQ Invites you to Get Involved' followed by a paragraph: 'AESQ provides several opportunities to get involved, support, participate and remain aware of its activities, resources and communications.' Below this is the section 'Ways to Get Involved' with a bulleted list: 'Become an AESQ Member', 'Join the SAE G-22 Committee', 'Sign up to receive the AESQ eNewsletter', and 'Join a Community of Practice'. A paragraph follows: 'AESQ created these Communities of Practice (CoP) to encourage subject matter experts to engage and positively promote the topics listed below. These are professional development and discussion groups set up to exchange ideas, ask pertinent questions, share best practices and learn as a Community. Click and join a Community today:'. A pink dashed box highlights the following list of topics: 'Problem Solving Methods', 'First Article Inspection (FAI)', 'Defect Prevention Tools', 'Design Work & Production Repair', 'Quality Audit Methods', 'Sub-Tier Management', 'Measurement Systems Analysis (MSA)', 'Human Factors', 'DPRV', 'APQP & PPAP', and 'Process Control Methods'.

About News Documents Activities Training Events Membership Contact AESQ

Get Involved

AESQ provides multiple opportunities to get involved and learn more about their initiatives.

[Read More](#)

AESQ Invites you to Get Involved

AESQ provides several opportunities to get involved, support, participate and remain aware of its activities, resources and communications.

Ways to Get Involved

- [Become an AESQ Member](#)
- [Join the SAE G-22 Committee](#)
- [Sign up to receive the AESQ eNewsletter](#)
- [Join a Community of Practice](#)

AESQ created these Communities of Practice (CoP) to encourage subject matter experts to engage and positively promote the topics listed below. These are professional development and discussion groups set up to exchange ideas, ask pertinent questions, share best practices and learn as a Community. Click and join a Community today:

- [Problem Solving Methods](#)
- [First Article Inspection \(FAI\)](#)
- [Defect Prevention Tools](#)
- [Design Work & Production Repair](#)
- [Quality Audit Methods](#)
- [Sub-Tier Management](#)
- [Measurement Systems Analysis \(MSA\)](#)
- [Human Factors](#)
- [DPRV](#)
- [APQP & PPAP](#)
- [Process Control Methods](#)

“Get Involved” – Join a Community of Practice

Community of Practice	Members
Problem Solving Methods	263
First Article Inspection (FAI)	239
Defect Prevention Tools	366
Design Work & Production Repair	127
Quality Audit Methods	251
Sub-Tier Management	167
Measurement Systems Analysis (MSA)	188
Human Factors	124
DPRV	178
APQP & PPAP	319
Process Control Methods	90
Compliance Assessment	1
Alternate Inspection Frequency	7

LinkedIn Groups for each Community of Practice is now open for anyone to join.

The image displays three screenshots of LinkedIn group pages. The first screenshot shows the 'AESQ Human Factors (RM13010) Community of Practice' with 50 members. The second screenshot shows the 'AESQ APQP & PPAP (RM13145) Community of Practice' with 191 members. The third screenshot shows the 'Industry Program Manager at SAE International' group with 187 members. Each screenshot includes a header with the group name and member count, a description of the group's purpose, and a list of members.

“Get Involved” – Sign up to Receive AESQ’s eNewsletter

- Issued monthly
- Learn about AESQ’s current activities
- Complete online form to begin receiving



Connect with AESQ via the Monthly eNewsletter and LinkedIn for the latest on AS13100 and related initiatives.

Aero Engine Supplier Quality News

Recent News
1 - 12

AESQ eNewsletter 2022 August
2022-07-31 A monthly newsletter from AESQ
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Pratt & Whitney Spotlight & Testimonial – 15 April 2022
2022-04-15

AESQ eNewsletter 2022-07-21
2022-07-21 newsletter from AESQ
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AESQ eNewsletter 2022-04-15
2022-04-15 newsletter from AESQ
Read more...

AESQ Supplier Forum – AS13100 Deployment
Thursday 6 October 2022 | 8:30 am – 4:30 pm
Ralls-Royce Victory Building
2601 W Raymond Street | Indianapolis, Indiana 46143 USA

AESQ Supplier Forum – AS13100 Deployment
Friday 21 October 2022 | 8:30 am – 4:30 pm
SAFRAN Training Center
32 Rue de Vilpéchin, 91500 Massy, France

AESQ Supplier Forums: Indianapolis & Massy

AESQ offers two opportunities to attend Supplier Forums to learn more about the [SAE AS13100™ AESQ Quality Management System Requirements for Aero Engine Design and Production Organizations Standard](#) and

“Get Involved” – Become an AESQ Member

2 Membership Levels:

AESQ Strategy Group Member – specified in the AESQ Charter due to their critical support resulting in the establishment of the AESQ Strategy Group.

AESQ Member –

- Open to organizations engaged in the Aero Engine supply chain.
- Required to participate in the work of AESQ by providing resources to support AESQ working groups.
- Representatives shall be senior leaders from the organization or subject matter experts in a relevant area.



The screenshot shows the AESQ website's "Membership Opportunities" page. The page features a navigation bar with links for About, News, Documents, Activities, Events, Membership, and Contact AESQ. Below the navigation bar is a large image of silhouettes of people in a meeting, with the text "Membership Opportunities" and "Read more" overlaid. The main content area includes sections for "Membership Overview", "Membership Benefits & Levels", "Membership Benefits", "Membership Levels", and "Annual Membership Dues".

Membership Overview
AESQ welcomes new members. AESQ membership is open to organizations that are engaged in the Aero Engine supply chain.

Membership Benefits & Levels

Membership Benefits

- Contribute to the work of the AESQ and support its working groups
- Participate in Supplier Forums for dialog on industry optional approaches for implementation of quality requirements.
- Gain visibility and recognition on AESQ's website
- Have a voice in promoting the development of voluntary consensus standards addressing aero engine supplier quality concerns benefiting your company
- Greater networking opportunities with other companies and business opportunities
- Participate in Subject Matter Interest Groups
- Join the Communities of Practice Conversations on LinkedIn

Membership Levels

- **AESQ Strategy Group Member** - AESQ Strategy Group Members are specified in the AESQ Charter due to their critical support resulting in the establishment of the AESQ Strategy Group.
- **AESQ Member** - AESQ Membership is open to organizations that are engaged in the Aero Engine supply chain. Member organizations are required to participate in the work of the AESQ by providing resources to support the AESQ working groups. Representatives from AESQ Member organizations shall be senior leaders from the organization or subject matter experts in a relevant area.

Annual Membership Dues
Applications for AESQ Membership shall be review by the AESQ Steering Group in accordance with the AESQ Charter. Once approved, continued membership is dependent upon active participation in the working groups and payment of membership dues.

- AESQ Strategy Group Membership - \$8,000 per organization per annum
- AESQ Membership - \$1,000 per organization per annum

[Membership Application](#)

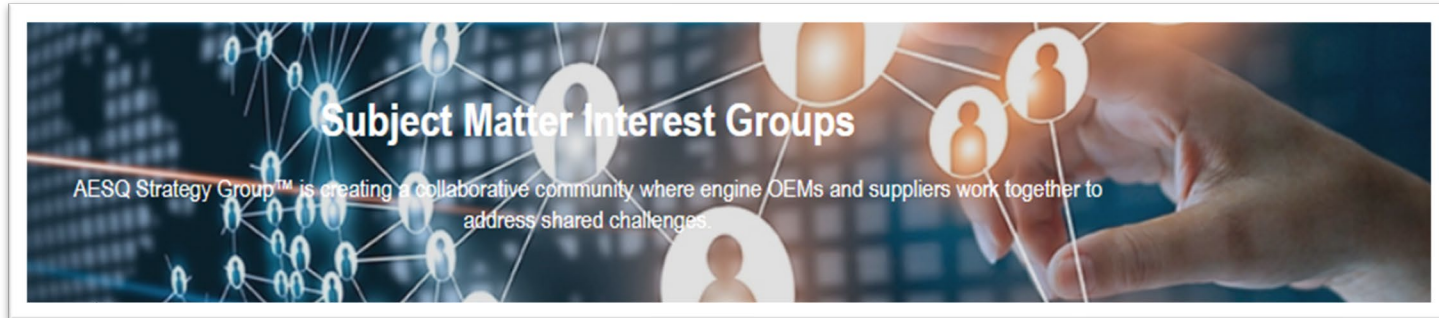
For more information, please contact info@aesq.sae-itc.org.

[Complete Membership Application at bottom of page](#)

“Get Involved” – Subject Matter Interest Groups

- Follow AESQ’s Subject Matter Interest Groups
- Sign up for a Subject Matter Interest Group Webinar

AESQ Subject Matter Interest Groups	
Advanced Product Quality Planning (APQP) & Production Part Approval Process (PPAP) RM13145	Defect Prevention Tools to Support APQP & PPAP RM13004
Design Work & Production Repair & Rework RM13008 & RM13011	Measurement Systems Analysis (MSA) RM13003
Sub Tier Management RM13007	Process Control Methods RM13006
Human Factors RM13010	Problem Solving Methods RM13000
DPRV Training RM13001	Quality Audit Methods RM13005
First Article Inspection RM13102	Alternate Inspection Frequency RM13002



AESQ – Aerospace Engine Supplier Quality Strategy Group

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“Get Involved” – Additional Options

- Attend AESQ Events (Supplier Forums, Webinar) or Watch Video Online
- Take a AS13100 Training Course
- Download Reference Manuals
- Watch the “Zero Defects” Video



SUMMARY & CLOSE



BARBARA NEGROE
EXECUTIVE SOURCING QUALITY LEADER
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AESQ – Aerospace Engine Supplier Quality Strategy Group

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