Welcome & Introductions

100+ Individuals Registered from 19 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 practices
• Provide feedback to the AESQ
• Develop a network of practitioners and Subject Matter Experts
Introducing AS13100: AESQ Quality Management Requirements

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 streamlining the business operations of suppliers with multiple sites, the primary intent of this new standard is to improve overall product quality by focusing on the key systems and processes currently deemed essential to ensure engine product quality.

AESQ Supplier Forums: Focus on AS13100 Deployment

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

“Although created by the Aero Engine Supplier Quality (AESQ) in conjunction with the SAE 9.23 Aero Engine Supplier Quality Standards Committee, this standard and supporting materials will benefit any organization, in any industry.”

Dr. Ian Rogers
Executive Director, Rule-Reign of AESQ Chair
Housekeeping

- Be on time
- Coffee & Lunch Breaks
- Emergency Exit
- Toilets
- Silence Cell Phones
- No Smoking

Today’s event is being recorded and will be available on the AESQ website for viewing

Except in designated areas outside
## Agenda

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<td>Markus Braig, Director Quality Supply Chain and MRO, MTU Aero Engines</td>
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<td>Keynote Address</td>
<td>Dr. Silke Maurer, Member of the Executive Board, Chief Operating Officer,</td>
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<td>MTU Aero Engines</td>
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<td>AESQ Overview, Vision &amp; Objectives</td>
<td>Denis Pottier, Head of the Purchasing Quality Assurance, Safran Aircraft</td>
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<td>AS13100 Overview</td>
<td>Helen Djäknegren, Director Supplier Quality &amp; Development, GKN Aerospace</td>
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<td>Deployment Update</td>
<td>Uzam Khan, Supplier Quality Executive, Civil Aerospace Operations, Rolls-Royce</td>
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<td>Jim Wilson, Sr. Manager, Supplier Quality, &amp; Development, Pratt &amp; Whitney Canada</td>
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</table>
## Agenda

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<tr>
<td>Best Practices for Human Factors</td>
<td><strong>Steve Roebuck</strong>, Head of Certification, Rolls-Royce</td>
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</table>
| Supplier Success Story with Aubert & Duval | **Pierre Castagnos**, Directeur Qualité Progrès et Client / Progress and Customer Quality Director, Aubert & Duval  
**Gilles Bresson**, Responsable Compliance Système Qualité, Surveillance et Prévention / Quality System Compliance Manager, Aubert & Duval |
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<td><strong>Subject Matter Interest Group (SMIG) Breakout Sessions</strong></td>
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<td>1. Problem Solving (RM13000)</td>
<td>Jun Sakai, IHI</td>
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<tr>
<td>2. Alternative Inspection (RM13002) and MSA (RM13003) and Process Control (RM13006)</td>
<td>Marnie Ham, GE</td>
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<td>3. Defect Prevention (RM13004)</td>
<td>Ebru Cetin, MTU</td>
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<tr>
<td>4. Compliance Assessment (RM13009) and Quality Audit Methods (RM13005)</td>
<td>Jim Wilson, Pratt &amp; Whitney</td>
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<td>5. Sub-Tier Management</td>
<td>Helen Djäknegren, GKN</td>
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<tr>
<td>6. Human Factors (RM13010)</td>
<td>Beata Tarczon, MTU</td>
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<tr>
<td>7. FAI (RM13102)</td>
<td>Klaus Dietershagen, MTU</td>
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<tr>
<td>8. Training</td>
<td>Earl Capozzi, Pratt &amp; Whitney</td>
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GROUP PHOTO & LUNCH
## Agenda

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<td>Keynotes</td>
<td><strong>Thomas Frank</strong>, SVP Corporate Quality, MTU Aero Engines &amp; <strong>Alfred Höpp</strong>, Director Supplier Management Forgings and Technology, MTU Aero Engines</td>
</tr>
<tr>
<td>Training Overview</td>
<td><strong>Earl Capozzi</strong>, Associate Director, Discipline Chief, Quality &amp; Process Engineering/Supplier Quality, Pratt &amp; Whitney</td>
</tr>
<tr>
<td>Breakout – Zero Defects Game</td>
<td><strong>Uzam Khan</strong>, Supplier Quality Executive, Civil Aerospace Operations, Rolls-Royce</td>
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- BREAK -
# Agenda

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<td><strong>AS13100 FAQ Panel</strong></td>
<td><strong>MODERATORS:</strong></td>
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<td></td>
<td>Barrie Hicklin, Sr. Director, Quality Systems &amp; Regulatory Compliance, Honeywell Aerospace</td>
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<td>Markus Braig, Director Quality Supply Chain and MRO, MTU Aero Engines</td>
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<td><strong>PANELISTS:</strong></td>
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<tr>
<td></td>
<td>Barbara Negroe, Executive Sourcing Quality Leader, GE Aerospace</td>
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<td>Earl Capozzi, Associate Director, Discipline Chief, Quality &amp; Process Engineering/Supplier Quality, Pratt &amp; Whitney</td>
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<td>Florence Augeard, Supplier Quality Assurance Manager, Safran Aircraft Engines</td>
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<td>Marnie Ham, Consulting Engineer, GE Aerospace</td>
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<tr>
<td>AESQ How to Get Involved</td>
<td>Jun Sakai, Chief Engineer, IHI Corporation</td>
</tr>
<tr>
<td>Summary &amp; Close</td>
<td>Lisa Claveloux, Sr. Director, Quality, Pratt &amp; Whitney</td>
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</table>
MTU Welcome

MARKUS BRAIG
DIRECTOR QUALITY SUPPLY CHAIN AND MRO
MTU AERO ENGINES
How to answer Slido Live Polling questions:

Cell Phones:
1. Scan the QR Code
2. Enter the Passcode 122xsj

Laptop:
1. Go to slido.com
2. Enter #3593 254

Join at
slido.com
#3593 254

🔍 Passcode: 122xsj
How to Use Slido Live Polling App?

- **Answer Live Poll Questions**
- **Add Your Own Questions**
- **“Like” Questions**
What is the name of the city where you live?
Have you attended previous AESQ Supplier Forums?

Start presenting to display the poll results on this slide.
What function are you in?

Start presenting to display the poll results on this slide.
Aerospace Engine Supplier Quality Group (AESQ) Overview

DENIS POTTIER
HEAD OF THE PURCHASING QUALITY ASSURANCE
SAFRAN
AS13100 OVERVIEW
WHAT PROMPTED AESQ TO FORM? – VIEW FROM 2013

Unprecedented production ramp ahead

Expanding global supplier footprint and increasing supplier engine content

Common supply base, multiple OEM customers

Customers required engine OEM’s to improve management of supply base

Aerospace Engine Supplier Quality [AESQ] group formed to supplement AS9100, and later AS9145, for critical safety nature of engines
AS13100 OVERVIEW
AERO ENGINE REQUIREMENTS FLOWDOWN

- Differing supplemental requirements to AS9100 [Regulatory, Customer, business] and guidance albeit with largely the same intent

- Creates a common set of supplemental requirements
- Simplifies the compliance for suppliers with multiple customers
- Common reference materials to support understanding, efficiency, and effective deployment of foundational quality tools
AESQ Overview
AEROSPACE ENGINE SUPPLIER QUALITY GROUP

Vision

To enable and accelerate the achievement of Zero Defects and a quality first culture across the global aero engine supply chain.

So that:
• Safety is assured
• Disruption is reduced
• Cost of Poor Quality is eliminated

Thru:
• Collaboration and shared learning
• Development of capability and expertise
• Implementation of simplified and common standards
AS13100 OVERVIEW

WHY IS AS13100 IMPORTANT

• All engine manufacturers are driving process control through APQP (Advanced Product Quality Planning)

• Despite the same foundational requirements, each were flowing different terminology, processes and tools

• Needed simpler and more consistent guidance for the supply base

• Asked for a forum to share best practices from across industry

• Needed to challenge current acceptance thresholds- raising the bar of performance for the whole industry, ex. product safety

• Essential to accelerate supplier capability through common development & training

Improving Safety & Quality Remained a Key Challenge
AESQ Consortium Company Members

AESQ Steering Group Members

AESQ Contributing Members

Cincinnati Thermal Spray
Collins Aerospace
Consolidated Precision Products
ITP Aero

Parker Meggitt
Rolled Alloys
Solar Atmospheres
Woodward
AESQ Steering Group Members

Barbara Negroe
Executive Sourcing Quality Leader
GE Aerospace

Lisa Claveloux
Sr. Director Quality
Pratt & Whitney

Helen Djäknegren
Director Supplier Quality & Development
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Safran Aircraft Engines

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

Markus Braig
Director Quality Supply Chain and MRO
MTU Aero Engines

James Clifton
Global Quality Director
Precision Castparts Corp.

Osa Omoruyi
VP Quality
Howmet Engine Systems

Jun Sakai
Chief Engineer
IHI Corporation
Defect Prevention Tools Must Work as a System
AS13100 Overview Structure & Key Highlights

HELEN DJÄKNEGREN
DIRECTOR, SUPPLIER QUALITY & DEVELOPMENT
GKN AEROSPACE
AS13100 Creation Process

OEM Unique Requirements

Engine Maker Supplier Requirements pre AS13100 introduction

Harmonized Requirements

Existing & WIP AESQ Standards

Supporting Guidance & Best Practice Material

Future Engine Maker Supplier Requirements

Overall Number of Requirements reduced by >50%

Starting Point
September 2018
**AS13100 Structure**

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<tr>
<th>Clause Number</th>
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<tbody>
<tr>
<td><strong>AS13100 Requirements</strong></td>
<td>Chapter A ISO9001/AS9100 Rev D Supplemental Requirements</td>
<td>Chapter B APQP &amp; PPAP AS9145 Supplemental Requirements</td>
<td>Chapter C Defect Prevention Quality Tools to Support APQP &amp; PPAP</td>
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<td><strong>Process KCs</strong></td>
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### 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.
Customer Specific requirements are designed to include 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
• Define company specific key roles and accountabilities for approvals
• Includes specific IT interface requirements
AS13100 Requirement Highlights

What requirements in AS13100 Chapter A apply to my organization?

Determine what type of organization you are in

Agree the type with your customer

Identify your applicable requirements in Table 1

Deploy

Identify your organization type

Guidance in AS13100 Appendix B

Table 2

Identify your applicable requirements in Table 1

Do you manufacture or assemble at least one part defined by the Customer (e.g., customer-proprietary design, customer-directed 3rd party design), including castings and forgings?

Note: This includes suppliers that purchase parts from third parties manufactured against Customer proprietary drawings and don't add any additional value themselves.

Yes ➔ Type 1: Make to print

No ➔

Do you only manufacture or assemble finished part(s) produced against drawings, etc., proprietary to your company?

Yes ➔ Type 2a: Design/Make

No ➔
AS13100 Requirement Highlights

Identify your organization type – cont.

Ensure that you agree the type with your customer
# AS13100 Requirement Highlights

<table>
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<th>TYPE 2B: DESIGN ONLY</th>
<th>TYPE 3: DISTRIBUTOR</th>
<th>TYPE 4: SPECIAL PROCESS</th>
<th>TYPE 5: RAW MATERIAL</th>
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Table 1 provides a guide to the applicability of AS13100 Sections to Organization scope.

Identify your applicable AS13100 Chapter A paragraphs in Table 1

Deploy the requirements
Which organization type best describes your organization?

Start presenting to display the poll results on this slide.
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

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
- AS91146 FOD
- AS9115 Deliverable Software
- AS9116 Design Change Process
- AS9117 DPRV
- AS5553 Counterfeit Parts (EEE)
- AS6174 Counterfeit Parts

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 Reference Material is available to support the deployment of AS13100. AS13001 DPRV Training will remain unchanged.

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)
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

(Section 9.2.3)

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

(Section 7.2.4)

Auditor Competence Requirements defined for;
• Qualifications
• Education
• Experience
• Ongoing professional development

(Section 7.2.2)

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)

Compliance to **AS9146 FOD Prevention** is required in Design Requirements (8.3.3.3), Production Control (8.5.4.1) and Supplier Control (8.4.2.1)

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

(Section 8.4.1)
AS13100 Requirement Highlights

Specifications of AS5553 Counterfeit Electrical, Electronic, and Electromechanical Parts and AS6174 for Counterfeit Material.
(Section 8.1.4.1 & 8.4.2.1)

The organization shall verify that the correct metallic raw material is used, e.g., through the use of handheld spectrometry.
(Section 8.5.1.4.1)

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 Reference Manual RM13000.
(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

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

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

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 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/supplemental-material

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.
AESQ is Working on AS13100 Revision A

• The AS13100 writing team is currently working on an update of the standard based on user input.

• Target date for publication is year end 2023

• Updates include:
  • Clarifications
  • Grammar & Spelling
  • Suggested Improvements
Deployment Status

UZAM KHAN
SUPPLIER QUALITY EXECUTIVE
ROLLS-ROYCE

JIM WILSON
SR. MANAGER, SUPPLIER QUALITY & DEVELOPMENT
PRATT & WHITNEY CANADA
The Deployment Team

To enable the effective and consistent deployment of the AS13100 Standard

<table>
<thead>
<tr>
<th>Deployment Status and Support</th>
<th>Deployment Strategies</th>
<th>Subject Matter Interest Groups</th>
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<tbody>
<tr>
<td>• Surveys</td>
<td>• Deployment Scenarios</td>
<td>• Each Reference Manual has a SMIG</td>
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<tr>
<td>• Insight, Opportunities</td>
<td>• Consistency/ Variations in deployment requirements</td>
<td>• Webinars</td>
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<td>• Supplier Support</td>
<td>• Consistency in Compliance, incl audit findings</td>
<td>• Linked In CoPs</td>
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<td>• Deployment Webpages</td>
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<td>• Subject Matter Experts</td>
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<tr>
<td></td>
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<td>• Input to Writing Team</td>
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</table>
AESQ Deployment Survey Results
Who Responded?

Respondents had an average of 3.7 AESQ customers

238 respondents
Deployment Status

• We have seen a progressive improvement
• A small number of companies still have not started compliance activities...Why?

Implementation Status Evolution

- The organization believes we are now compliant with AS13100
- The RM13009 gap analysis has been completed and a gap closure action plan is in place
- The compliance gap analysis of RM13009 has been initiated and is in process
- Compliance activities have not yet begun
Deployment Confidence

- 61% compliant by year end...thank you!
- 39% not compliant...when?
- The ones that have not started...why?
Training

- Core Training;
  - Requirements
  - Foundation
- Needed to really understand and deploy standard
- Minimum numbers proposed
- Some companies have large gaps

AS13100 Training Plan Status

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<th>Percentage</th>
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<td>1% to 25%</td>
<td>10%</td>
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<td>26% to 50%</td>
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<td>76% to 99%</td>
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<td>30%</td>
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</tbody>
</table>
Additional AESQ Training Support

- SAE now provides courses for all key topics
- SMIGs provide webinars and coaching via CoPs
- Many others training providers available
Where we would like you to be....

**Suppliers Commitment** – Having the leadership, mindset & engagement across the company and being driven to deliver supply chain goals.

**Suppliers Organizational Capability** – Having the know how, knowledge & resources across the company.
How can the AESQ further support you in effective deployment?
Pause

Return in 25 Minutes
Using FMEA to Reduce Human Error in Assembly & Test

Steve Roebuck
Head of Certification & Quality Assurance
Assembly & Test Operations
Rolls-Royce
Our Large Engine Product Portfolio

Trent XWB-84

Trent XWB-97

Trent 1000-TEN

Trent 7000
30,000 Components

6,000 Manual Operations

Human Factors play a critical part in assuring Product Quality
What is your knowledge of Human Factors?
Rolls-Royce HF Deployment Framework

Aligned to AS13100 and RM13010
Human Factors

1. Lack of Communication
2. Complacency
3. Lack of Knowledge
4. Distraction
5. Lack of Team Work
6. Fatigue
7. Lack of Resources
8. Pressure
9. Lack of Assertiveness
10. Stress
11. Lack of Awareness
12. Norms

The Dirty Dozen
The potential failure modes in the FMEA are the Dirty Dozen.

Work through each one with the cross-functional team to identify potential causes (there will be multiple causes per failure mode – example Distractions).

Next work through the Prevention and Detection controls to allow the scoring to be completed.

Once the scoring is completed the Risk Priority Number will identify the high/medium/low risks from a Human Factors perspective.

Improvement actions can than be prioritised to eliminate or reduce the risk ALARP.

Each area/process will have its own unique signature from a risk profile point of view.
Human Factors FMEA

Let’s have a go!
Scenario – Final Inspection, Friday 3.30 p.m.

- Engine is due for delivery at 5 p.m on Friday. The Dispatch vehicle is waiting outside. The Ferry is scheduled for 11 p.m.
- One of the inspection team who should be working on the engine has phoned in absent this morning.
- The engine has been delayed due to some open operations found not stamped by previous shift and some other paperwork discrepancies.
- The final paperwork usually takes 2 hours to compile once the engine is finished. The delays mean that the team will only have just over 1 hour to get it all done.
- Senior Logistics Manager is in the area to get constant updates on progress to ensure the engine will be ready to deliver on time to the customer.
Which of the Dirty Dozen applies to this Scenario?
Which of these Dirty Dozen applies to this Scenario?
Key Insights

In a Manual Assembly Environment, Human Factors can have a significant impact on business performance

We have learned that;

a) Including Human Factor risks into the Product PFMEA creates too much ‘noise’ – hence a separate Human Factor FMEA approach is used

b) A reference style Human Factor FMEA approach can be used for high level analysis but each area will have a unique ‘signature’

c) It is a simple concept for the teams to use

d) Can be used pro-actively or reactively

e) Creates cross functional / high value discussions that lead to better insights

f) It drives improvements based on risk

g) Improved awareness of HF and issue reporting (MARS) where deployed

h) Human Factors risks will change over time so the FMEA needs to be periodically reviewed.
Any Questions?
Contents

1. Aubert & Duval Overview
2. Foundations: AS1300, APQP and Human Factors
3. Quality Organization and Roadmap
4. Conclusion
1. Aubert & Duval at a glance: locations and key figures

**3 800**

Employees

**14**

sites

**553 M€**

Revenue in 2022

**9 PLANTS IN FRANCE**

**Industrial sites**

1. Les Ancizes / EcoTitanium
2. Imphy
3. Heyrieux
4. Firminy
5. Issoire & Interforge
6. Pamiers

| A&D Spain |
| SQuAD |

**Headquarters:** Issy-les-Moulineaux
(Executive management, Finance & adm°, Strategy & marketing, communication, Sales)

**Tertiary sites:** Clermont-Ferrand
(Operations, Quality, Technique, IS, HR, Export) : ADEI (Belgaum, India: engineering and methods office)

**+ 2 IN THE REST OF THE WORLD**
(A&D Spain, SQuAD in India)
## 1. Main markets

### AERONAUTICS AND SPACE

**Description**
- Structural parts, engine parts, landing gear parts, etc.
- Bulkheads, tank domes, etc.

**Some of the company's products**
- Frames, slice joints, high- and low-pressure discs, turbine shafts etc.

**Some of the company's customers**
- Commercial aviation, military applications and space exploration

**Drivers**
- Construction / extension of the operating life of existing power plants and decommissioning of facilities (incl. transportation, landfill) electricity consumption

**External A&D revenue (2022)**
- 63%
  - Of which 30% for Engines

### ENERGY

**Civil nuclear and land-based turbines**
- Valve bodies, pump shafts, anti-vibration bars, discs, etc.

### DEFENSE

**Nuclear submarines, artillery, missiles, surface ships**
- Large, medium and small caliber tubes, missile bars, nuclear reactor parts, etc.

### SPECIALTIES MARKETS

**Medical, tools, other specialty products and additive manufacturing**
- Injector rods, transmission gears, medical applications, forged blocks, metal powders for additive metal manufacturing

**Underlying niche markets (e.g. motorsports, medical uses, etc.)**

**MARKETS**

- **AERONAUTICS AND SPACE**
- **ENERGY**
- **DEFENSE**
- **SPECIALTIES MARKETS**
1. Aerospace

FOCUS ON ENGINES PARTS

Our quality standards:
AS/EN 9100, AS13100
PRI NADCAP for our special processes and our laboratories

Alloys:
AD730, IN718, M250, U720, TA6V, IN718+, ML340, R65, Ti6246, Waspaloy, ML1014
2. Foundation - Route to AS13100

- **AS13100 Requirement implementation**
- **Compliance action plan**
- **AS13100 concept diffusion**: training as a mindset evolution enabler
- **AS13100 Matrix self assessment and gap Analysis**

### Timeline
- **Feb 22**: Beg 2022:
  - Self Assessment with dedicated task group
- **May 23**:
  - AS13100 Compliance Action plan (Global A&D) → Largely concerned by APQP
- **H2 2022**: Focus on Training → change the mindset
  - Level 1: 35% of management
  - Level 2: 100% of requested population
  - Level 3: 100% of requested population
- **May 2023**: Compliance Action plan (Global A&D)
- **End 2024**: Target 100% Compliant

### Compliance
- **Today**: 99% green + orange
- **2023**: 35% of management
- **ANC**: 40%
- **PAM+IS**: 74%

### Compliance Targets
- **H2 23 & 24**:
  - AS13100 Requirement implementation
- **May 23**:
  - Compliance Action plan
- **End 2024**:
  - Target 100% Compliant
2. Foundation - Route to AS13100

**Benefits:**
- Route for standardization
- Available common trainings
- Methodology support
- Re Use of AS13100 standards for other customers

**Points of attention:**
- Still some customers specific requirements
- Improving skills and mindset takes time
- Availability of resources

**Timeline:**
- **Feb 22**: AS13100 Matrix self assessment and gap Analysis
- **May 23**: Compliance action plan
- **H2 22**: AS13100 concept diffusion: training as a mindset evolution enabler
- **H2 23 & 24**: AS13100 Requirement implementation
2. Foundation - Route to APQP

Benefits:
- **Ease** project management and structure (flowcharts, FMEA, KC lists, control plans)
- **Allow** better anticipation and **mitigate** risks
- **Strengthen** cross functions collaboration

Points of attention:
- Despite AS13100 different customer **templates** remain
- **Measurement System Analysis** is still a challenge
- **Sub-tiers** management: implement APQP but keep pragmatism

Our ambition: Deploy APQP on all major modifications and parts development (NPI) by end of 2024
2. Foundation – Human Factor

Human factor is included in our AS13100 & SMS roadmap:

Examples:

- **SMS WP 4**: Promote product Safety => Train all employees on critical parts, include "dirty dozen" & lessons learnt into our quality management system and software.

- Find alternatives to manual NDT to eliminate risks of errors & increase reliability:
  - FPI & MPI: develop automation for detection & characterization (optical & thermography).
3. A new Organization designed for a new Quality Plan

New organisation in place since 08/2023 with CQO leading Quality & Progress for whole Aubert & Duval.

“An independent and collaborative Quality & Progress department to:
➢ drive the consolidation of AD’s Quality System with regards to certification and customer requirements,
➢ improve synergies & continuity between all sites
➢ develop the progress process according to AD operational excellence standards, in factories and support functions
➢ implement Standards for project management & APQP all along development process.”

1. APQP & AS13100 Ref. Man.

2. New Organisation

3. Compliance Matrix
3. Quality Plan Bricks
## 3. Quality Plan Road Map

<table>
<thead>
<tr>
<th>Quality Bricks</th>
<th>2023</th>
<th>2024</th>
<th>2025</th>
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<tr>
<td>Dev &amp; Indus Control</td>
<td>APQP</td>
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<td>Tools</td>
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<td>Outsourcing Management</td>
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4. Conclusion

AS13100 implementation is a real standardization opportunity even if customers specific requirements still remain.

It’s a demanding job that takes time and resources, but for which we expect a significant ROI in terms of quality improvement.
BREAKOUT SESSION #1
Subject Matter Interest Groups (SMIGs)

MELANIE DEROO
QUALITY SYSTEMS ENGINEER
GE AEROSPACE
## Breakout Session #1: Subject Matter Interest Groups (SMIGs)

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<tr>
<th>Table</th>
<th>Subject Matter Interest Group (SMIG)</th>
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<tr>
<td>1</td>
<td>Problem Solving (RM13000)</td>
<td>Jun Sakai, IHI</td>
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<tr>
<td>2</td>
<td>Alternative Inspection (RM13002) MSA (RM13003) Process Control (RM13006)</td>
<td>Marnie Ham, GE Miriam Kuehn, MTU</td>
</tr>
<tr>
<td>3</td>
<td>Defect Prevention (RM13004)</td>
<td>Ebru Cetin, MTU</td>
</tr>
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<td>4</td>
<td>Compliance Assessment (RM13009) Quality Audit Methods (RM13005)</td>
<td>Jim Wilson, Pratt &amp; Whitney Carol Dunklin, GE</td>
</tr>
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<td>5</td>
<td>Sub-Tier Management (RM13007)</td>
<td>Helen Djäknegren, GKN Markus Braig, MTU</td>
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<td>6</td>
<td>Human Factors (RM13010)</td>
<td>Beata Tarczon, MTU</td>
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<td>7</td>
<td>FAI (RM13102)</td>
<td>Klaus Dietershagen, MTU</td>
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<tr>
<td>8</td>
<td>Training</td>
<td>Earl Capozzi, Pratt &amp; Whitney</td>
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Return in 60 Minutes

Group Photo

TIME FOR LUNCH
Herzlich Willkommen / Welcome / 热烈欢迎 / Bienvenue / Serdecznie witamy
Who we are

Thomas Frank
Senior Vice President Corporate Quality

Alfred Hoepp
Director Supplier Management Forgings and Technology
Flight Safety
Boundary Conditions
Standardization
Proactive
Zero Defects
Digitalization
Partnership
Integrated Quality Management System

Technology & Manufacturing Readiness, Technical Reviews, Gating, Audit, Safety Management System

Quality methods / Tools
- Requirements Based Engineering
- Risk Management
- Design for X
- ESW / PDP / DMBG
- Configuration Control
- DFMEA / FMECA
- Classification
- Approval of drawings & standards
- FRACAS / FMR
- Type Certification
- PFMEA

Technology
- Design
- Verification & Validation
- Project Planning
- Closed Loop
- Production / Assembly / Maintenance, Repair, Overhaul
- Product Support
- Voice of Customer
- PER-Process
- Field Support Council
- Non-Conformance Monitor
- Customer Complaints process
- Inspection Systems
- SPC
- Production Approval
- Repair Source Approval
- CMT

Employees
- Passion for Quality, Corporate & Error Culture, Training & Learning
Vielen Dank für Ihre Aufmerksamkeit. / Thank you for your attention.
Aerospace Engine Supplier Quality Consortium (AESQ) Training

Shorten Your Path to Zero Defects

EARL CAPOZZI
DISCIPLINE CHIEF; QUALITY & PROCESS ENGINEERING / SUPPLIER QUALITY
PRATT WHITNEY NORTH AMERICA
What Does Training Mean To You?
• Reduces the time to adoption of AS13100
  • Simplifies the requirements
  • Delivers most recent insights from experts
  • Saves you money

• Increases your ability to:
  • Maintain the right business processes
  • Comply with the standard
  • Understand customer requirements
  • Grow your business

• Shortens Your Path to **Zero Defects**!
What Courses Are Available to Suppliers?


**SAE AS13100 Quality Requirements Course**

- 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
- A good overview of each of the AS13100 requirements
- eLearning: take at your own pace, approximately 15 hours with a final exam
SAE AS13100 Quality Foundations Course

• Required for Quality Leaders with responsibility for supporting the design, manufacturing, and assembly operations via AS13100.

• Recommended for anyone with accountability for the quality of the design, production, assembly and test areas of the organization.

• Instructor led: 3-day course with an exam, offered virtually, in-person or at your company site.
**AS13100 Executive Overview**

**Five-Part Video Series, 35 minutes**
- Executive perspectives from across the industry detailing why compliance to AS13100 is critical to your company's success.

**AS13100 Requirements**

**eLearning course, 15 hours**
- Guides the user through each section of the AS13100 standard, providing knowledge that supports the requirements and business processes to meet the intent of the standard.

**AS13100 Quality Foundations**

**Virtual or In Person 3 Days**
- Live instructors provide an overview of the AS13100 Standard, and a detailed exploration of the guidance provided in the Reference Manuals.

---

**Common Training for DPRV Personnel Revised!**

**Virtual or In Person, 3-Days**
- Live instructor
- AESQ Approved
- Aligned to AS13001 and AS9117
- Certification credentialed by Probitas™
- Completing DPRV training can be beneficial in positioning suppliers to obtain business with top tier suppliers or OEMs
AS13100 Requirements Course Completions YTD 2023

1,972 Completed
914 Suppliers
42 Countries

Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct
---|---|---|---|---|---|---|---|---|---
150 | 94 | 124 | 84 | 104 | 60 | 72 | 55 | 59 | 27
Quality Foundations Course Completions YTD 2023

- Jan: 142
- Feb: 85
- Mar: 145
- Apr: 41
- May: 38
- Jun: 93
- Jul: 18
- Aug: 51
- Sep: 12
- Oct: 22

1522 Completed
632 Suppliers
42 Countries
Does Your QMS Meet AS13100 Requirements?

SAE offers supplemental trainings:

- RM13000 Problem Solving
- RM13002 Alternative Inspection
- RM13003 MSA
- RM13004 Defect Prevention
- RM13010 Human Factors
- RM13145 APQP/PPAP

https://discover.sae.org/AS13100
BREAKOUT SESSION #2

Zero Defects

UZAM KHAN
SUPPLIER QUALITY EXECUTIVE
ROLLS-ROYCE
Zero Defects Principles

a) Quality is defined as conformance to customer requirements
b) The quality standard (target) is Zero Defects
c) Defect prevention not Inspection to ensure Quality
d) Quality is measured through the Cost of non-quality
Getting to Zero Defects...

Arrange these characters into a natural value stream and identify what they need to provide to each other to achieve zero defects.
Quality Improvement vs Zero Defects

**Zero Defects Thinking**
- What do we want to happen
- What could go wrong
- Eliminate / reduce the likelihood of it going wrong
- Manage the process and use feedback to ensure it continues to give us the right outcome

**Traditional Improvement**
- Wait for something to happen
- See why it happened
- Try and remove the cause so it can’t happen again
Getting to Zero Defects...

Overlay the Zero Defects tools and practices over the value stream
The Quality Value Stream

**DFMEA**
Identifies the aspects of the product that are important to meeting customer requirements, to prioritise improvements.

**PFMEA**
Identifies the aspects of the product process that are important to meeting product requirements, to prioritise improvements.

**CONTROL PLAN**
Specifies variables in the manufacturing process that need to be controlled to guarantee that the design features produced are conforming.

**SPC**
Real-time graphical means of monitoring and controlling a process so as to prevent non-conformance.

**MSA**
Ensures that the inspection systems are fit for purpose and capable of measuring the design features.

**PACKAGING STANDARDS**
Ensures that the product is fully protected during transportation and storage.

**CUSTOMER SPECIFICATION**
Clearly defines what the customer wants, embedded in the purchase order.

Sets the expectation of what the product or service must do to satisfy their requirements.

Ensures that our suppliers deliver conforming product, to schedule.

Ensures the business understands the costs of non-quality so we invest wisely to get to zero defects.

Ensures we comply to the required processes so that we do any job right first time.

Ensures the purchase order is scheduled.

Audit
Regular checks to ensure that all relevant procedures in the FMEAs are being complied to.

**SABRe**
“Supplier Management System Requirements” is the supplier-facing mirror of the RRM and is applicable to all suppliers or partners.

**CAQ**
The total cost of not achieving zero defects; scrap, concession, inventory, productivity, customer dissatisfaction.

**CONQ**
The total cost of not achieving zero defects; scrap, concessions, inventory, productivity, customer dissatisfaction.

**Hillary HR**
Ensure we are able to recruit and/or develop capable people.

**Training Plans**
Ensure that everyone is capable of doing the jobs they are required to do.

Christopher Customer
Sets the expectation of what the product or service must do to satisfy their requirements.

**CUSTOMER SPECIFICATION**
Clearly defines what the customer wants, embedded in the purchase order.

**Mel ME.**
Takes what’s important about the product and makes sure the production process is designed to deliver it, every time.

**Izzy Inspector**
Verifies the product meets the design intent and can therefore be passed down the value stream.

**Olly Operator**
Ensures we comply to the required processes so that we do any job right first time.

**Planned**
Ensures the business understands the costs of non-quality so we invest wisely to get to zero defects.

Ensures we are able to recruit and/or develop capable people.

**Hillary HR**
Ensure we can comply to the required processes so that we do any job right first time.

**Leslie Logistics**
Move the right parts, to the right place in the right amounts just as they are required, without damage/FOD.

**Quincy Quality**
Ensures the purchase order is scheduled.

**Petra Purchase**
Ensures that our suppliers deliver conforming product, to schedule.

**Fran Finance**
Ensures the business understands the costs of non-quality so we invest wisely to get to zero defects.

Ensures we comply to the required processes so that we do any job right first time.

**Quincy Quality**
Ensures the business understands the costs of non-quality so we invest wisely to get to zero defects.

Ensures we comply to the required processes so that we do any job right first time.
AS13100 FAQ Panel

BARRIE HICKLIN
SR. DIRECTOR, QUALITY SYSTEMS & REGULATORY COMPLIANCE
HONEYWELL

BARBARA NEGROE
EXECUTIVE SOURCING QUALITY LEADER
GE AEROSPACE

EARL CAPOZZI
DISCIPLINE CHIEF, SUPPLIER QUALITY
PRATT & WHITNEY AMERICA

FLORENCE AUGEARD
SUPPLIER QUALITY ASSURANCE MANAGER
SAFRAN AIRCRAFT ENGINES

DR. MARNIE HAM
CONSULTING ENGINEER
GE AEROSPACE
AESQ

How to Get Involved?

JUN SAKAI
CHIEF ENGINEER
IHI CORPORATION
“Get Involved” with AESQ

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

1. Become an AESQ Member

2. Join the SAE G-22 Standards Committee

3. Subscribe to AESQ’s Newsletter

4. Join a Community of Practice on LinkedIn

Click on each link for further information
“Get Involved” – AESQ welcomes new members

AESQ membership is open to organizations that are engaged in the Aero Engine supply chain.

AESQ Contributing Member –

- Have a voice in AESQ activities
- Participate in AESQ Committees
- Lead and/or participate on Subject Matter Interest Groups (SMIGs)
- Participate in AESQ meetings
- Networking opportunities with aero engine organizations
- Gain visibility and recognition on AESQ’s website
- Access to AESQ Materials (posters, stickers, etc.)

Click and submit member application form
"Get Involved" – Join the SAE G-22 Committee

G-22 AESQ Standards Committee is established to develop, specify, maintain and promote quality standards specific to the Aero Engine supply chain. (i.e. AS13xxx series)

G-22 committee is open for individuals from the Aero Engine supply chain;

- Have technical knowledge and expertise.
- Participate in writing of quality standards by providing comment on all document ballots.

Click on “Join the SAE G-22 Committee” link and submit Committee Participation Request.
"Get Involved" – Subscribe to Receive AESQ’s Newsletter

• Issued monthly

• Learn about AESQ’s current activities

• Submit AESQ Email Request Form to begin receiving
“Get Involved” – Join a Community of Practice

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

- Problem Solving Methods
- First Article Inspection (FAI)
- Defect Prevention Tools
- Design Work & Production Repair
- Quality Audit Methods
- Sub-Tier Management
- Measurement Systems Analysis
- Human Factors
- DPRV
- APQP & PPAP
- Process Control Methods
- Compliance Assessment
- Alternate Inspection Frequency

Communities of Practice Members

- Problem Solving Methods 394
- First Article Inspection (FAI) 328
- Defect Prevention Tools 591
- Design Work & Production Repair 189
- Quality Audit Methods 339
- Sub-Tier Management 233
- Measurement Systems Analysis 300
- Human Factors 260
- DPRV 269
- APQP & PPAP 527
- Process Control Methods 292
- Compliance Assessment 49
- Alternate Inspection Frequency 64
“Get Involved” – Additional Options

- Attend AESQ Events (Supplier Forums, Webinars) or Watch Videos Online

- Take a AS13100 Training Course

- Download AESQ Reference Manuals (RM)s & Templates

- Send your comment by e-mail; info@aesq.sae-itc.org
Summary & Close

LISA CLAVELOUX
SR. DIRECTOR, QUALITY
PRATT & WHITNEY
WHAT DOES SUCCESS LOOK LIKE?

• Leaders advocating for process control - speaking the language

• Common tool usage, processes control is the way we work

• Developing proficiency through common Industry training

• Culture of product safety and quality felt into the tiers of the supply base

• Continuous Improvement of the AS13100 standard - feedback from supply base, OEM's, customers

Mindset Shift – Belief that Zero Defects is Achievable
AESQ Thanks You for Attending!