Overview of the Day
Seletar Aerospace Park

Development of Seletar Aerospace Park

- Phase 1: 2007-2009
- Phase 2: 2009-2011
- Phase 3: 2012-2014

Customers:
1. Rolls Royce
2. Bombardier
3. Bell Helicopter
4. Eurocopter
5. MAJ Aviation
6. Air Transport Training College
7. Pratt & Whitney
8. ST Aerospace
9. Jet Aviation
10. Hawker Pacific
11. Fokker
12. ST-Airport Svs

Ready-built facilities:
13. Business Aviation Complex
14. Component Mfg and MRO Facility

Sponsors:
- PropNex
- Tampines Expressway

Notes:
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<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Speaker</th>
<th>Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>09:00</td>
<td>Introduction &amp; Overview</td>
<td>Dr Ian Riggs</td>
<td>Rolls-Royce</td>
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<tr>
<td>09:30</td>
<td>Challenges within the Supply Chain</td>
<td>Peter Amsden</td>
<td>Pratt &amp; Whitney</td>
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<tr>
<td>10:00</td>
<td>The Need for Defect Prevention</td>
<td>John Calder</td>
<td>Rolls-Royce</td>
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<tr>
<td>10:30</td>
<td>Coffee Break &amp; Networking</td>
<td>Olivier Castets</td>
<td>Safran</td>
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<tr>
<td></td>
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<td>Dave Goldberg</td>
<td>GE Aviation</td>
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<td>12:00</td>
<td>Lunch &amp; Networking</td>
<td>AESQ Committee</td>
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<td>13:00</td>
<td>Standards Market Place</td>
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<tr>
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<td>Standards Market Place</td>
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<tr>
<td>15:15</td>
<td>Benefits of Standard Deployment</td>
<td>Bhu Kenjale</td>
<td>PCC</td>
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<tr>
<td></td>
<td></td>
<td>Helen Djäknegren</td>
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<td>Martin Schaeffner</td>
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<td>16:00</td>
<td>Market Place Debrief</td>
<td>Peter Amsden</td>
<td>Pratt &amp; Whitney</td>
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<tr>
<td>16:15</td>
<td>Closing Remarks</td>
<td>Dr Ian Riggs</td>
<td>Rolls-Royce</td>
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</table>
Burning Platform

• Increasing supplier / partner engine content
• Wide range of Aerospace engine supplier businesses <$1M to $2B+
• Increasing global footprint
• Overlap of engine suppliers between engine manufacturers
• Demanding Customers
• Improving Quality, Cost and Delivery is a key challenge
Aerospace Engine Supply Chain
Customer vs. Supplier Perceptions of Quality Requirements

- **Customer Perception**
  - Reactive: Focus on inspection to sort ‘good’ from ‘bad’
  - Poor compliance
  - Limited application of Process Control
  - Low maturity of defect prevention and quality planning processes
  - Little Continuous Improvement activity

- **Supplier Perception**
  - Complex requirements set independently by each Customer
  - High levels of external audit with inconsistent interpretations
  - No common language for Quality
  - High levels of customer control and intervention
AESQ 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.
AESQ Guiding Principles

Simplify & Standardize supplier requirements
Build on existing industry standards
Common language for Quality
Standards are simple, prescriptive & auditable

Promote standardized 3rd party training

Easy to adopt within existing process/systems
Deliver results rapidly, through focused activities
G-22 Aerospace Engine Supplier Quality

G-22 Technical Committee

Aero Engine Manufacturers & Suppliers

Supplier Representatives

AESQ – Aero Engine Supplier Quality Strategy Group
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How you can participate

- Attend our AESQ Supplier Forums
- Share your views and experiences of our current standards
- Help to identify new areas of work for the group
- Provide feedback on current and developing standards via the AESQ Website
- Share best practice deployment stories via the website and Forums
- Contact us through the AESQ website

http://aesq.saeitc.org/
Meeting protocols

Welcome to the G22-AESQ Technical Committee
AESQ Code of Conduct

• Audio/video recording of meetings is not permitted

• No Commercialism
  • No discussion of cost, pricing plans, pricing policies, product usage surveys, marketing plans or any related topics

• Presentations must focus on technical issues (not on marketing aspects of products) and relate to or support the development or maintenance of G-22 Committee work

• Be aware of and follow ITAR & EAR rules and regulations governing export control

• Discussions should be open and follow the agenda or other legitimate direction agreed upon by consensus of the committee - avoid unauthorized or ‘private’ meetings
AESQ Code of Conduct

• Strive for high-quality standards to benefit all stakeholders – users, customers, suppliers and the industry as a whole

• Strive for an open atmosphere that promotes a free-flowing interchange of standards technical information

• Respect basic meeting etiquette:
  • Only one person speaking at any given time
  • Attack the issue, not the person
  • Be on time…returning from breaks/lunch
  • Respect all ideas & comments
  • No silent skepticism, be candid
  • Do not dominate discussions
  • Stay focused on the meeting & agenda
The Need for Defect Prevention
How do we achieve Perfect Quality???

- 100% inspection
- Sorting good from bad
- Concessions to accept non-conforming product
- Overrun parts to ensure delivery commitments
- 3rd Party inspection
Focus on defect prevention – How effective is 100% inspection?

• Individually inspect the image to the standard
• Items needed
  • Standard
  • Marking sheet and a pen
• Compare the image to the standard and check “pass or fail”
Focus on defect prevention –

How effective is 100% inspection?

• Discuss on your tables how effective is 100% inspection

• Would 200% be better?

• What can we do as part of defect prevention?

• Prepare for feedback
Focus on defect prevention

Defect Prevention
• No room for customer disruption
• Capacity released
• Predictable planning
• Cost challenges supported
• Focus on growth opportunities
Defect Prevention Tools

Product Life Cycle

Product Design → Process Design → Production & Service

APQP and PPAP

Design FMEA → Process FMEA → Control Plan → MSA → Capability → Error Proofing → Process Control (SPC)

8D Problem Solving

AESO – Aero Engine Supplier Quality Strategy Group
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How we work
Standards overview
SAE ITC / SAE G-22 Structure

**AESQ Strategy Group**
- **Companies**
  - Strategy
  - Training
  - Deployment
  - Promotion & Communication
- Customer, Regulator & IAQG Interface
- Administration

**G-22 Technical Committee**
- **Individuals**
  - Standards Writing

**AESQ Strategy Group**
- Steering Committee
- G22 AESQ Working Team
- Workstream Teams
Existing & Future Workstreams

Quality Planning
- IAQG APQP & PPAP
  - Process Planning
    - Process Flow
    - PFMEA
    - Control Plan
  - MSA

Quality Assurance
- Audit
- Problem Solving
- Sub tier management
- Customer / 3rd party audits
- Counterfeit Parts / Ethics Compliance
- Self Release
- NDT

Process Control
- Process Control (Variation Management)
  - Ppk / Cpk
  - SPC incl. short run
  - Tooling / fixture mgmt
  - KPIs incl. RFT
  - Inspection Frequency
  - Source & method Change

Existing Workstream
- Production Readiness Assessment
- FAI
- FOD

Future Workstream
- AESQ working in IAQG Team
- Current Workstream
- Potential future workstream

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AS13000 Problem Solving

Original State

7-Step | Apollo | DIVE/Red-X® | 8D

Current State

GLOBAL 8D

8D

Supplier

AESQ Principles

- Standardise
- Simplify
- Adopts Existing Industry Standards
- Prescriptive, Auditable
- Common Language
- Supported by 3rd Party Training & Consultancy

Expected Benefits

- Reduced need for Customer training & support
- Improved access to training & consultancy
- Removal of complexity of reporting
- Improved problem solving skills

AESQ – Aero Engine Supplier Quality Strategy Group

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AS13001 Supplier Self Release Training

Original State

- GE Aviation: 5 days
- Pratt & Whitney: 4 days
- Safran: 5 days
- Rolls-Royce: 5 days

Total 19 days

Current State

- SAE: 3 days

- One Common Training Requirement
- Industry wide DQR database through SAE
- Delivered by SAE Globally
- Refresher training every 3 years

AESQ Principles

- Standardise
- Simplify
- Adopts Existing Industry Standards* (Rev A to align with AS9117 - DPRV)
- Prescriptive, Auditable
- Common Language
- Supported by 3rd Party Training & Consultancy

Expected Benefits

- Reduced costs for the supplier
- Reduced training time for DQR
- Training provided in Supplier’s region
- Customer training limited to on-site

* Rev A to align with AS9117 - DPRV
## Expected Benefits

- Standardised Process
- Improved compliance
- Improved Product Quality

### AESQ Principles

<table>
<thead>
<tr>
<th>Principle</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standardise</td>
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<tr>
<td>Simplify</td>
<td>✔</td>
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<tr>
<td>Adopts Existing Industry Standards</td>
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<tr>
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<td>Common Language</td>
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<tr>
<td>Supported by 3rd Party Training &amp; Consultancy</td>
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</tbody>
</table>

### Original State

- **100% Inspection**
  - Error Proof
  - AQL
- **Sample**
- **Reduced**

### Current State

- Common Method for Inspection Planning
- Guidance on commodity specific planning

![Graph showing inspection level vs. capability](chart.png)

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**AS13002 Inspection Frequency**

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AESC - Aero Engine Supplier Quality Strategy Group

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AS13003 Measurement Systems Analysis

**Expected Benefits**

- Improved knowledge of Measurement Capability
- Clarification of minimum acceptance standards
- Mandates replaces guidance
- Adopts Automotive Industry Action Group ‘Blue Book’ on MSA
- Improved Quality Performance

**AESQ Principles**

- [x] Standardise
- [ ] Simplify
- [x] Adopts Existing Industry Standards
- [x] Prescriptive, Auditable
- [x] Common Language
- [x] Supported by 3rd Party Training & Consultancy

<table>
<thead>
<tr>
<th>AESQ Principle</th>
<th>Current State</th>
<th>Practical Case Studies</th>
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<tbody>
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<td><strong>Standardisation</strong></td>
<td>[ ] Critical</td>
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<tr>
<td><strong>Simplify</strong></td>
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<td>[ ] Critical</td>
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<td><strong>Common Language</strong></td>
<td>[ ] Critical</td>
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<tr>
<td><strong>Supported by 3rd Party Training &amp; Consultancy</strong></td>
<td>[ ] Major</td>
<td>-</td>
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</tbody>
</table>
AS13004 Process Risk Mitigation

**Expected Benefits**

- Standardised process
- Increased pace of adoption
- Improved compliance to a better standard
- Reduced quality risks
- Ultimately improved quality & delivery

**AESQ Principles**

- Standardise
- Simplify
- Adopts Existing Industry Standards
- Prescriptive, Auditable
- Common Language
- Supported by 3rd Party Training & Consultancy

**Original State**

- Varying standards and approaches

**Future State**

- **In Scope:** Risk Mitigation requirements with execution guidance & recommended timing, supporting AS9145
- **Out of Scope:** DFMEA requirements, any duplication of related Aerospace Standards (e.g. AS9145)
AS13005 Internal Audits Requirements

Original State

- Internal audit requirements in many documents

- S-1000
- SABRe
- ASQR 01
- SAFE
- ISO19011
- Nadcap
- AS9101
- AS9100
- EASA
- FAA
- TC

Future State

- Aerospace Standard
- AS 13005
- Internal Audit Requirements for Suppliers

Content
- Audit types & checklists (examples)
  - System
  - Production process
  - Product
  - Special process
- Auditor qualification
- Audit KPI’s
- Audit criteria

In scope: Internal audits for suppliers
Out of scope: 2nd/3rd party audits (e.g. Customer audits).

AESQ Principles

- Standardise
- Simplify
- Adopts Existing Industry Standards
- Prescriptive, Auditable
- Common Language
- Supported by 3rd Party Training & Consultancy

Expected Benefits

- Lean & effective internal audit process providing confidence in state of compliance throughout Aero-Engine supply chain
- Reduced and/or eliminated unnecessary and/or duplicate audits

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AS13006 Process Control

Original State

Varying standards & approaches

- PC requirements not clearly defined/understood
- Inconsistent application/flowdown to sub-tiers
- Lack of commitment/belief in benefits
- Belief low volume environments not applicable

Future State

Common standard & approach
Aligned with AS13002, 13003, 13004, AS9103, AS9145 & AIAG “Blue Books”

In scope: Process Control for all characteristics
Out of scope: Foundational requirements

AESQ Principles

- Standardise
- Simplify
- Adopts Existing Industry Standards
- Prescriptive, Auditable
- Common Language
- 3rd Party Training & Consultancy

Expected Benefits

- Improved variation control & reduction techniques, broad-based belief in benefits
- Common prescriptive standard fully aligned with AESQ, AS9103 & AIAG Blue Book Stds
- Focus on accurate data analysis and proactive problem resolution
- Improved Quality Performance, reduced risk
AS13007 Supplier Management

Original State

- Industry Standard for Supplier/Tier Management

Varied Customer-Specific Requirements

- Tier X Flow down ???

Expected Benefits

- Simplify language for organizations to manage suppliers
- Ability to use the standard throughout all tiers of the supply chain
- Standard will simplify and reduce the number of methods the suppliers must use to meet Customer requirements (i.e. simplify/make common the “how to”)
Expected Benefits

- Standard customer audit process aligned to AS13005
- Improved rigor of audit approach
- Suppliers chosen for audit based on risk (performance and risk)
- Reduced supplier audits for good performing suppliers (low risk) that demonstrate compliance to AS13005
- Recognizes existing 3rd party certification
- Cost reduction / resources liberated by customer and supplier.
Product Life Cycle & Document Interaction

AS9145 (APQP/PPAP) & AESQ Standards

1. Planning
   - AS9145 (PDP) - Kick Off
   - AS9145 APQP Phases
   - AS9145 Key PPAP Events
   - AS9145 PPAP Element Timing

2. Product Design & Development
   - Design Release (CDR)
   - Production Readiness Review
   - AS9102 FAIR
   - PPAP Approval
   - Production Process Run

3. Process Design & Development
   - Packaging, Preservation & Labelling
   - MSA
   - ICS
   - FAI

4. Product & Process Validation
   - AS13004 – Process Risk Mitigation
   - AS13003 – Measurement Systems Analysis
   - AS13006 – Process Control Methods
   - AS13002 – Qualifying Alternate Inspection Plans

5. Ongoing Production, use and Post Delivery Service
   - Production Launch

AESQ 2nd Level Documents
- AS13000 - Problem Solving Requirements for Suppliers - 8D
- AS13001 - Delegated Product Release Verification Training Requirements
- AS13005 - Internal Audit Requirements for Suppliers
- AS13007 – Supplier Management
- AS13008 – Customer Audit Frequency

AESQ Systems Documents

AS9145 (APQP/PPAP) & AESQ Standards

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AESQ Standards - Global Deployment Status

**Vision**
- Deploy harmonically
- Challenge each other
- Common language for Quality
- Easy adoption of standards
- Simplify requirements

<table>
<thead>
<tr>
<th>AESQ Member</th>
<th>AS13000 Problem Solving (8D)</th>
<th>AS13001 Supplier Self Release</th>
<th>AS13002 Inspection Frequency</th>
<th>AS13003 MSA</th>
<th>AS13004 Process Risk Mitigation</th>
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<tr>
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AESQ is now well established and is gathering momentum

Supplier feedback is very positive & they want us to move faster

Broader supplier engagement is being sought to apply more resources

Stronger links with IAQG & PRI are being developed

Stakeholder engagement essential for progress & direction