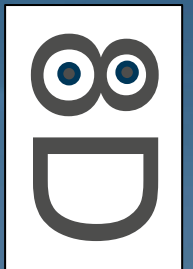




WHAT MAKES A GOOD 8D INVESTIGATION?

*Tools & Tips Webinar sponsored by the
RM13000 Problem Solving Community of Practice*

May 25, 2022



AESQ – Aerospace Engine Supplier Quality Strategy Group

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WHAT MAKES A GOOD 8D?



ADAM ROGERS

LEAD QUALITY CONTROL ANALYST
HONEYWELL

WEBINAR OVERVIEW

We are **recording** today's webinar and will distribute the video link following the close of the webinar. It will also be posted on the AESQ website for free viewing.

We will take **questions** during today's webinar using the **Chat** feature.


Please remain on Mute during the presentation to prevent background noise. We will also be muting all lines at the start of the session.




Record



Q&A



CHAT NOW



Mute

WHAT MAKES A GOOD 8D INVESTIGATION?

Agenda – 90 minutes

Who is the 8D Subject Matter Interest Group

Adam Rogers- Honeywell

Why this webinar? Where can we find help?

Adam Rogers- Honeywell

What makes a good 8D?

Pete Teti – Pratt & Whitney

Do you need all 8D steps for every problem type?

Pete Teti - Pratt & Whitney

8D on a page

Pete Teti - Pratt & Whitney

The Magnificent Seven

Pete Teti – Pratt & Whitney

Examples

Pete Teti – Pratt & Whitney

Interaction with Human Factors

Catherine Catarina-Graca – Safran

Addressing Human Error as part of 8D

Catherine Catarina-Graca – Safran

Interaction with the other AESQ Reference Manuals

Catherine Catarina-Graca - Safran

Q&A

Team

Summary and Close

Pete Teti – Pratt & Whitney

EIGHT DISCIPLINES (8D) METHODOLOGY

Purpose of this training

Introduce quality and manufacturing associates to the 8D RCCA investigation methodology defined in AS13100 and RM13000, “Problem Solving Methods including 8D”

Communicate why 8D has become the standard for root cause investigations that suppliers to aerospace engine OEMs will work to

Understanding that AS13100 is being flowed down by PW, RR, GE, HW, Safran, Arconic, PCC, IHI and GKN (all members of the AESQ)

Reference Manual RM13000 provides the step-by-step help for properly documenting a root cause investigation using the Eight Discipline (8D) process



8D OVERVIEW

Background



Eight Disciplines (8D) Problem Solving

Method developed at Ford Motor Company in 1987 used to approach and to resolve problems, typically employed by engineers or other professionals

Focused to identify, correct, and eliminate recurring problems

Establishes a permanent corrective action based on cause & effect analysis of the problem

Originally comprised of eight stages, or 'disciplines', it was later augmented by an initial planning stage called D0 (Preparation and Initial Containment Actions)

8D follows the logic of the PDCA cycle developed by Walter Shewhart and W. Edwards Deming over 80 years ago



8D has since become very prevalent in industry and has now been adopted by the AESQ as the standard for RCCA investigations

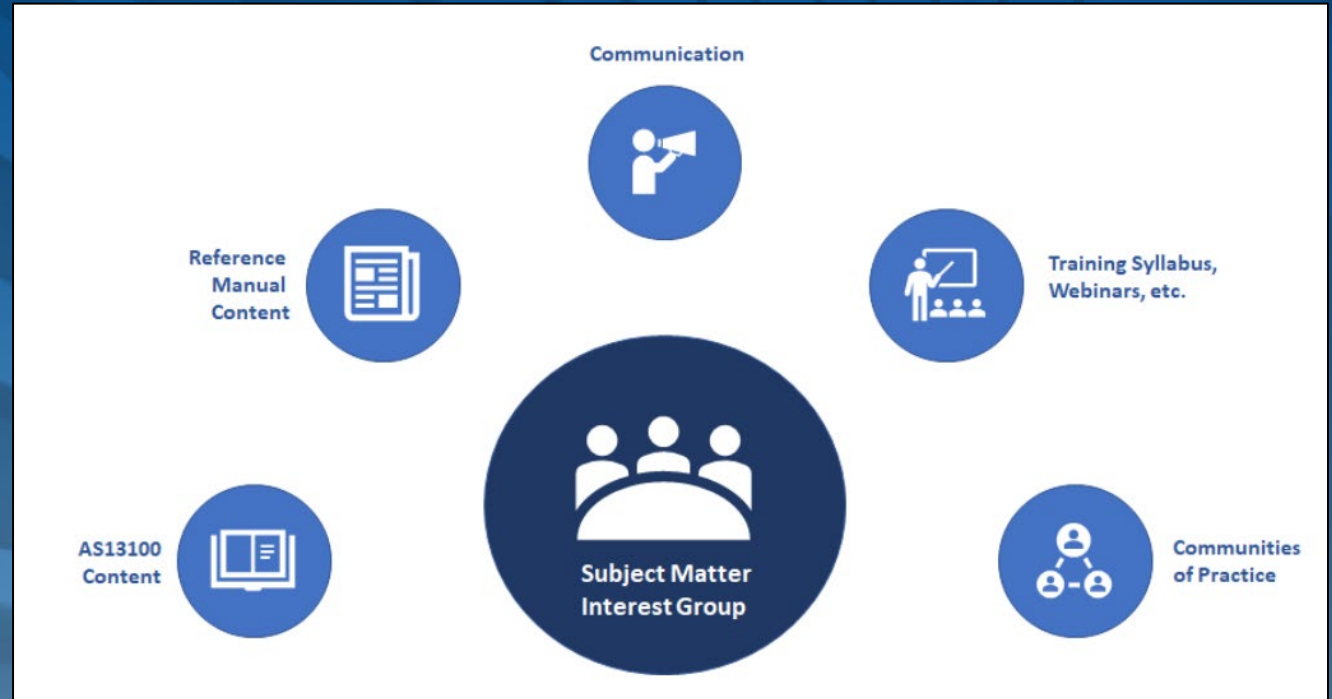
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8D PROBLEM SOLVING SUPPORT

What is the Problem Solving Methods SMIG Group?

- The purpose of the 8D Subject Matter Interest Group is to promote the effective deployment of the 8D problem Solving methodology across the AESQ Supply Chain.
- The Group is made up of Subject Matter Experts from the AESQ Member Companies.
- The Group is accountable for the AS13100 related Requirements and associated Reference Manual content, ensuring that it is up to date and reflects current knowledge and best practice.
- It shall promote the effective deployment of the Reference Manual using Communities of Practice (CoP). The CoP is open to any subject matter expert from the AESQ Member Companies and the wider AESQ supply chain.
- Activities may include webinars, best practice sharing, development of shared training materials, conferences and published papers.



<https://aesq.sae-itc.com/interest-groups>

SUBJECT MATTER INTEREST GROUPS

Who is the Problem Solving Methods SMIG Team?



Meets every two or three weeks

AESQ – Aerospace Engine Supplier Quality Strategy Group

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8D PROBLEM SOLVING SUPPORT

Why this webinar?



Communicate what is expected to be part of an 8D investigation

Provide guidance when preparing an 8D investigation package

Promote the available free documents and tools that can be used by any AESQ supplier

Answer questions suppliers may have about the 8D process

8D PROBLEM SOLVING SUPPORT

Where to get help

AESQ Supplementary Materials webpage for a copy of RM13000 and supporting templates

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

Subject Matter Interest Group – meets 2nd Monday of each month – supports continuous improvement of RM13000 and supporting templates & tools

AESQ Problem Solving Methods (RM13000)
Community of Practice on Linked In

Current membership is 168 – let's get some more!!



WHAT MAKES A GOOD 8D?



PETER E. TETI
FELLOW, QUALITY ENGINEERING
PRATT AND WHITNEY

WHAT MAKES A GOOD 8D?

Some things to look out for

Problem Statement

Identifying the Generation and Escape Points in the process

Addressing Direct, Detection and Systemic causes

Identifying Emergency, Interim, Permanent and Preventive actions

Addressing sources of human error

Developing error-proof solutions as corrective actions

Corrective actions that align with root causes

PFMEA documents are all updated

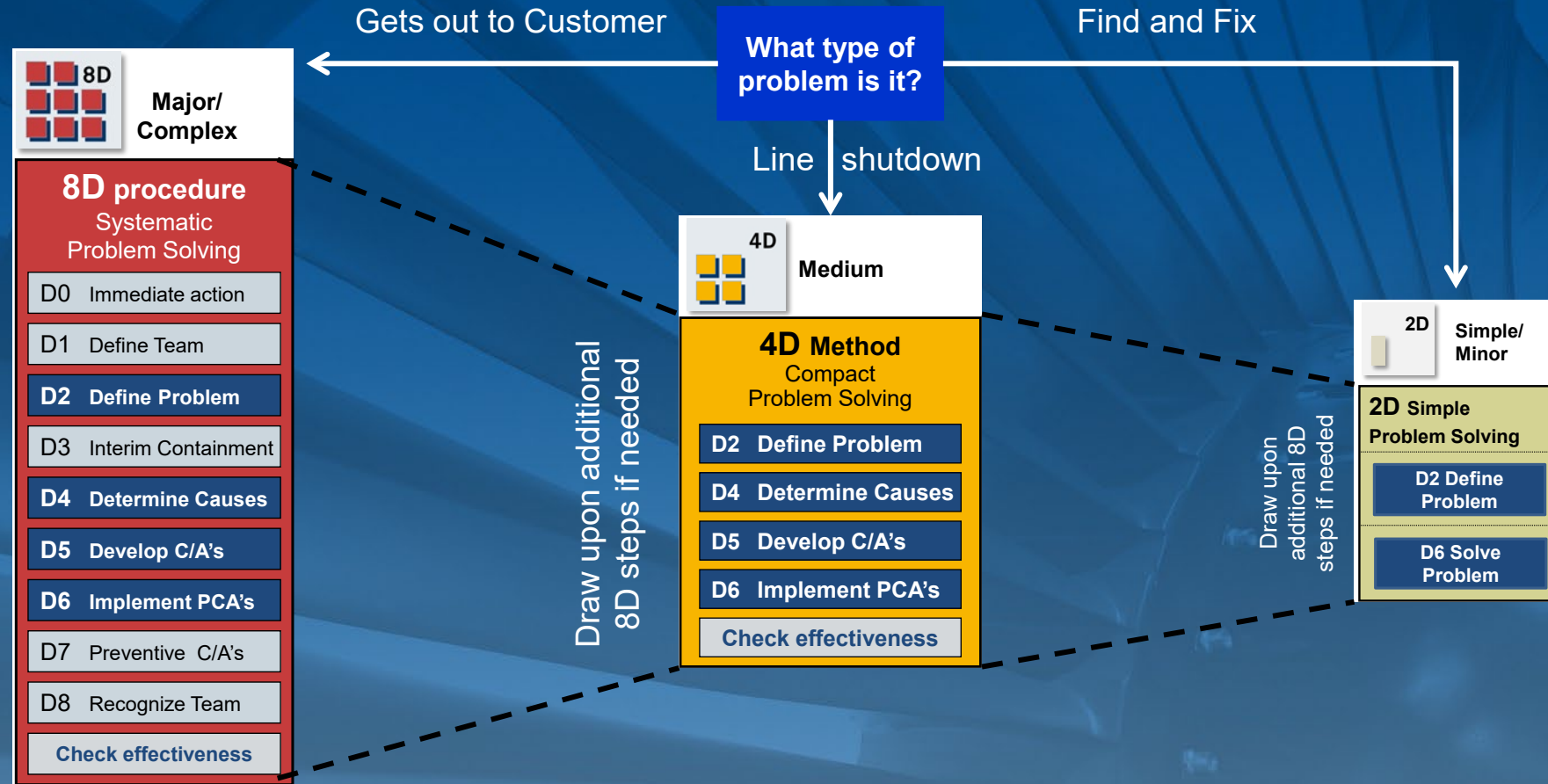
Measures of effectiveness are established

Preventive measures taken such as read-across on similar part numbers, QMS procedures, design manual updates, and and PFMEA documentation update

ASK THE KEY QUESTIONS

1. Was the suspect population identified and contained?
2. Were the appropriate stakeholders, disciplines and experts engaged to complete the analysis?
3. Is the problem defined and supported with data?
4. Were interim (temporary) actions verified not to cause other problems?
5. Were the direct cause/generation point and detection cause/escape point identified?
6. Was the cause of the system breakdown determined?
7. Is RCCA tool usage appropriate and evident?
8. Have permanent corrective actions been identified, verified to work, validated to be in place, and effective?
9. Have proper controls been put in place and documented to prevent recurrence?
10. Have the lessons learned from this 8D investigation been applied to other parts, processes, and/or sites, i.e., read across/PFMEA update?

PROBLEM SOLVING TYPES



When to use 8D

- Need for Emergency Containment
- Need for Population Bounding
- Need for Interim Containment
- Root cause(s) and solution(s) not obvious
- Ex. 1: Escape found at Customer
- Ex. 2: Escape found at supplier (e.g., NOE)

If no go here next

When to use 4D

- No need for Emergency Containment Action
- No need for Population Bounding
- Problem contained to a specific area inside company
- Interim containment not always needed
- Root cause(s) and solution(s) not known but ideas abound
- Document using basic root cause tools
- Ex. 1: Part feature found to be nonconforming
- Ex. 2: Measurement system bias discovered
- NOTE: Add additional 8D steps when needed (e.g., D3, D7)





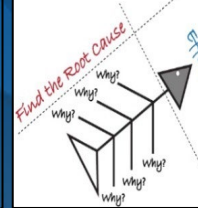




If no go here next

When to use 2D

- Resolved immediately without a lengthy investigation
- Fix and move on; typical of many shop floor problems/turnbacks
- Cause and solution are generally known
- Not likely to need containment actions
- Confined locally to a specific work station
- Ex. 1: Replace battery in flashlight
- Ex. 2: Replace light bulb when burnt out
- NOTE: Add additional 8D steps if needed (e.g., D3, D4)

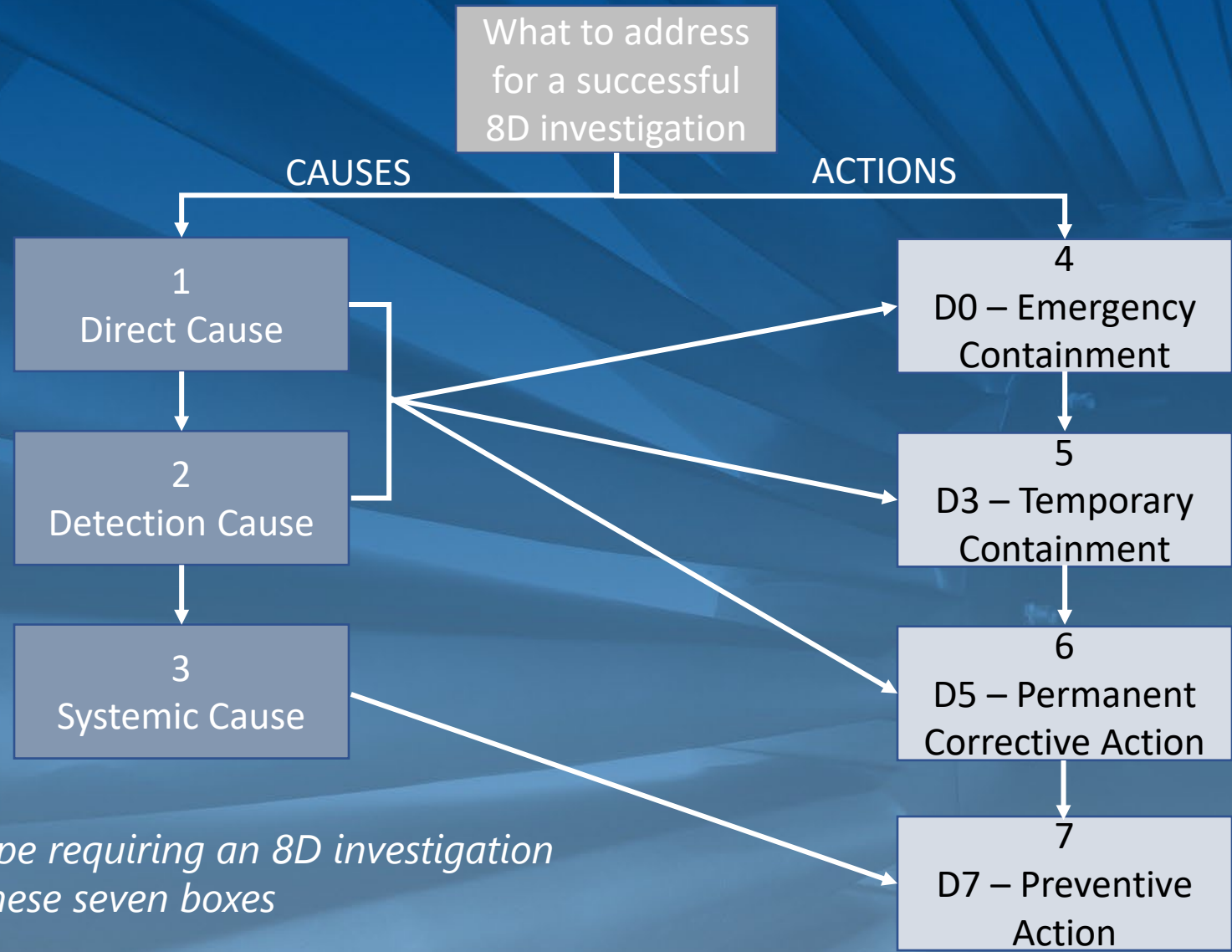
EIGHT DISCIPLINES (8D) ON ONE PAGE

Structured Problem Solving Process

0. Immediate Containment	1. Define the Team(s)	2. Problem Description	3. Interim Containment	4. Root Causes Analysis	5. Short & Long Term Actions	6. Action Validation	7. Prevent Recurrence	8. Congratulate Team
								
D0 Stop	D1 Skills	D2 Impact	D3 Production	D4 Causes	D5 Solve	D6 Validate	D7 Recurrence	D8 Recognize
<p><u>Emergency Response Actions</u></p> <p>Immediate Containment Actions</p> <p>Bound & Quantify the population</p>	<p><u>Charter Teams to Correct</u></p> <p>Resource the Team (Product & Process Knowledge)</p> <p>Prioritize the Effort</p>	<p><u>Define & Describe Problem</u></p> <p>Baseline & Supporting Data</p> <p>5W + 2H</p> <p>Problem Definition Tree</p>	<p><u>Temporary Containment Actions</u></p> <p>Help Customer get product again</p> <p>Risk Mitigation</p>	<p><u>Verify Root Cause(s)</u></p> <p>C & E Analysis</p> <p>Tree Diagram, 5-Why</p> <p>Direct, Detection and Systemic</p> <p>Human Error</p>	<p><u>Permanent Corrective Actions</u></p> <p>Mistake-Proofing</p> <p>Evaluate actions with Solution Selection Matrix</p>	<p><u>Implement & Validate Actions</u></p> <p>Apply Best Measures</p> <p>Ensure Effectivity</p>	<p><u>Preventive Actions</u></p> <p>Read Across</p> <p>Update PFMEA</p> <p>Update Standard Work/QMS/ PFMEA</p>	<p><u>Congratulate</u></p> <p>Acknowledge</p> <p>Communicate Successes</p>
			(and verify)			(and verify)		

THE MAGNIFICENT 7 – BOTTOM LINE

For any 8D investigation it comes down to these



Any customer escape requiring an 8D investigation needs to address these seven boxes

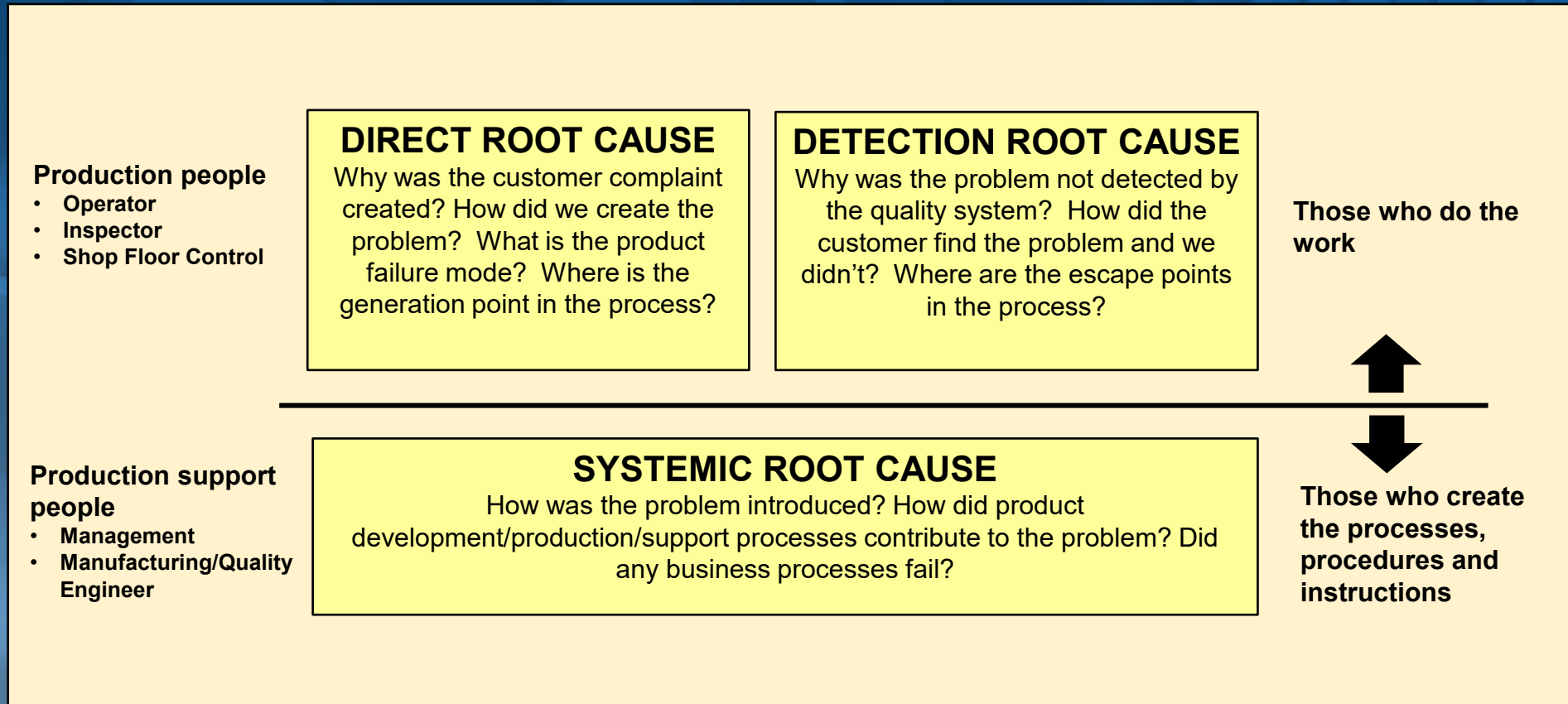
THE THREE ROOT CAUSE CATEGORIES

Identify the controllable root cause for each of the categorized causes

DIRECT – Why was the nonconformance created? Focus on the “generation point”.

DETECTION – How did we fail to catch it before it got to the customer? Focus is on the “escape point”.

SYSTEMIC – Why was the overall system weak in the first place?



THE THREE ROOT CAUSE CATEGORIES

DIRECT CAUSE

Associates with the “**generation point**” in the process; where the chain of events started; what triggered the investigation; some may also refer to this as the “**manufacturing cause**”

Direct causes are typically closest to those who execute a specific task or operation (i.e., Operator)

Associated with the immediate problem

DETECTION CAUSE

Associates with the “**escape point**” in the process; where the process released the nonconformance to the Customer; Asks the question “how did we fail to find the issue before it got away?”; some may also refer to this as the “**quality cause**”

Detection causes are typically closest to those who inspect a specific task or operation (i.e., Inspector, Final Inspector, DQR, etc.)

Associated with the immediate problem

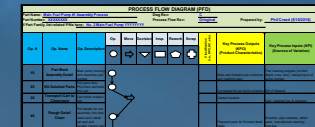
SYSTEMIC CAUSE

Associates with the term “**read across**” as part of D7 in the 8D investigation process; Asks questions such as “where else could this problem pop up?”, “what other parts are made on this errant machine” and “could other suppliers produce the same nonconformance?”, etc.

Systemic causes are addressed by changes in QMS procedures, drawing specifications, company policies and PPAP documents such as the Process Flow Diagram, PFMEA and Control Plan. These changes affect a broader range of product & processes than just the one that started the whole chain of events

Description of Process
Mixed model screw compressor parts have to be selected from an array of bins.

Before Improvement
Incorrect selection of parts led to delays and incorrect assembly.



Don't forget to update your PFMEA documents!

THE FOUR KEY 8D ACTIONS

D0 – IMMEDIATE PROTECTIVE ACTION

- Also referred to as “Emergency Containment Action” taken to STOP suspect parts from continued shipment to the Customer
- *Example include:*
- Performing a population bounding to clearly identify all suspect material. This may include ascertaining from the supplier within 24 hours they checked their production WIP, Finished Stores, and product in transit that may be part of the suspect population.
- Notifying internal and external Customers via a “Notification of Potential Quality Escape” so they can segregate suspect material from their production/assembly process

D3 – INTERIM CONTAINMENT ACTION

- Also referred to as “Temporary Containment Action” taken to get good product to the Customer so they can get PRODUCTION going again.
- *Example include:*
- The over-inspection of suspect material from a bounded population and separating the good from the bad in order to ship the good product to the Customer in order to keep their production line moving.
- Setting up a rework or repair line to address the nonconforming product

(More on next page)

THE FOUR KEY 8D ACTIONS - CONTINUED

- **D5 – PERMANENT CORRECTIVE ACTION**

- The action(s) taken to permanently SOLVE the problem that initiated the investigation at both the Generation and Escape points of the process.

- *Example include:*

- Adding clearer work instructions and inspection instructions at both the Generation and Escape points of the process.
- Modifying the process in terms of its tooling, fixturing, source of raw materials, measurement methodology, etc.

- **D7 – PREVENTIVE ACTION**

- The action(s) taken to prevent problem RECURRENCE not only on the initiating problem but related product and processes resulting from a thorough read-across conducted by the supplier. This action focuses on the systemic causes of the problem.

- *Example include:*

- Revising QMS procedures
- Revising the Design Manual or Lessons Learned Database to help avoiding this failure mode on future products.
- Implementation of more robust preventive (error-proofing) and detection-based controls at the Generation & Escape points of the process for the initiating part/process as well as those identified in the read-across.
- Updating your PFMEA documents

WHAT MAKES A GOOD 8D?

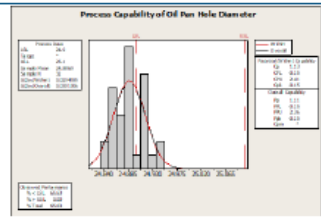
Start with one of the AESQ templates available at <https://aesq.sae-itc.com/supplemental-material>

See Oil Pan Bracket Case Study #1, Page 23 in RM13000 for real-life 8D illustration using this form

Provides the following

- 8D milestone plan
- Problem Statement
- All 8D Steps
- Generation and Escape Points
- 5-Why drill down for direct, detection and systemic causes
- Corrective action plan
- Format in Microsoft Excel

A quality issue was found at ACME Engine Assembly involving the XYZ Oil Pan Bracket. It was discovered that the holes were undersized resulting in the inability to assemble the bracket to the pan. An investigation was launched to determine the root causes of the issue. Follow the case study in Figure 12 using the Excel A3 8D Form.

8D A3 Worksheet (Example)					
Problem Name	Problem Statement	Date created	Created by	Reviewed by	Review date
Part XYZ Oil Pump bracket Holes	Part XYZ Oil Pump bracket holes too small				
D0: Immediate Containment Action(s) Hold product at inspection, stop producing new brackets		D5: Determine Corrective Action(s)		D6: C/A Validation	
D1: Form the Team Problem investigation owner: Sarah Seaward Team members: Brian Jones, Gwyn Bailey, Judith Button		Direct Cause (addresses generation point)	Validation of the program code must be run, and production checked before the machine is released to production. Use the pre-flight checklist from RM13006.	Implemented? <input checked="" type="radio"/> Y <input type="radio"/> N * Effective? <input checked="" type="radio"/> Y <input type="radio"/> N	
D2: Define the Problem The oil pump bracket could not be installed during assembly because the bolts would not fit through the bolt holes on the bracket. Inspection of the part found that the holes were 0.05 mm under lower specification, resulting in holes being too small. Specification 25 mm +/- 0.1 mm		Detection Cause (addresses escape points)	Control Plan amended to require a first off and last off check and appropriate sampling in the lot (RM13002). Additional use Pre-control to qualify lot set-up (RM13005).	Implemented? <input checked="" type="radio"/> Y <input type="radio"/> N * Effective? <input checked="" type="radio"/> Y <input type="radio"/> N * Describe method of effectiveness check	
D3: Interim Containment Action(s) All other assemblies checked in production and all parts in inventory, in transit and at supplier have been checked. A further 19 parts, spread from production to supplier, were found non-conforming, dimensions between 0.01 and 0.05 mm below specification. Additional interim inspection added to check bracket hole diameter prior to assembly until further notice.		D7: Prevent Recurrence (fix the system) PFMEA updated? <input checked="" type="radio"/> Y <input type="radio"/> N Process FMEA updated to reflect need for first off and last off inspection. Read across on similar process/product conducted? <input checked="" type="radio"/> Y <input type="radio"/> N Fix applied to all brackets Describe updates to QMS/lessons learned/communications to suppliers, etc. Control Plan also updated for the validation, pre-flight checklist and sampling			
D4: Find the Root Cause(s) W1. Why were the holes undersize? Because the drill used was undersize W2. Why was the drill used undersize? Because it had worn during production W3. Why was it worn to be out of specification? Because it had not been changed after 500 drilling operations W4. Why had it not been changed after 500 drilling operations? Because the machine program did not count how many operations the drill had produced W5. Why did the machine not count this as programmed? The program had been amended and the number of operations had been inadvertently reset.		D8: Team Recognition Team recognized at the Plant Quality All-Hands Meeting			
Direct Root Cause: Problem: The CNC program was updated, and a validation of the code was not performed. Escape: Parts only required to be checked at set up. Detection Root Cause Problem: Parts missed inspection due to poor inventory management Escape: Poor management of inventory		Pictures/Drawings/Evidence Specification 25 mm +/- 0.1 mm Readings: 1 2 3 4 24.85, 24.92, 24.87, 24.95 24.88, 24.85, 24.89, 24.92 24.89, 24.87, 24.84, 24.91 24.91, 24.90, 24.87, 24.91 24.84, 24.89, 24.86, 24.88 24.87, 24.89, 24.92, 24.95 24.88, 24.85, 24.85, 24.88 24.93, 24.89, 24.91, 24.86			

WHAT MAKES A GOOD 8D?

Start with one of the AESQ templates available at <https://aesq.sae-itc.com/supplemental-material>

D2 Summary				2018-005			
Engine Program:	Turbine1	Value Stream:	Compressor	D1 Team Leader: Wile E. Coyote Team Members: B. Bunny, R. Runner,			
P/N	1234567			Insert Picture/Drawing (in sharable format)			
Nomenclature	Disk						
Source	ACME Supplier						
Qty. Affected	~500						
Requirement	Incoming Material to meet Blueprint Dimensions						
Condition	Webs Thickness Contained O/Max & U/Min Conditions						
When Found / QEM	Dec 2018						
Est. resolve date	Jan 2019						
Impact to customer (int. & ext.) / Who?	All Customers Internal and External						
D0 / D3 Containment					8D Step		
Immediate (D0) / Interim (D3)	Containment Action Descriptions	Owner	Target Date	Status			
D0	Issued a stop build order from using all ACME disks P/N1234567	D. Doright	Dec 1, 2018	Complete			
D0	100% inspection of all ACME disks and rework.	D. Doright	Dec 2, 2018	Complete			
D3	Incoming Inspection at Assembly of all components	D. Doright	Dec 4, 2018	Complete			
D3	Create an incoming quality inspection process for all similar products that ACME	D. Doright	Dec 21, 2018	Complete			

Failure Mode: Thickness Contained O/Max & U/Min Conditions						
	D4 How was the N/C generated?		D4 Why was the NC not detected?		D7 What is the Systemic Root Cause?	
D r i l D o w n	1st Why	Inconsistent material removal along the length of the part resulted in out of tolerance parts	1st Why	Sonic gauge misread thickness of the materials	1st Why	Sonic tool not capable of measuring the web thickness
	2nd Why	Manufacturing did not account for natural variation in process or stack-up of variation in flipping part	2nd Why	Sonic gauge placement was not consistent from part to part	2nd Why	Verification of measurement system was not completed
	3rd Why	Manufacturing process designed to make part was not followed	3rd Why	Sonic gauge template was not designed to fix onto the part, leading to variation	3rd Why	FAI did not have 2 independent measurement methods – only pin point micrometer (sonic gauge)
	4th Why	Over or under machining the part due to lack of accounting for manufacturing variation.	4th Why	Application and physics of sonic gauge was not understood	4th Why	
	5th Why		5th Why	No GRR completed at FAI (team feels GRR would have picked this up)	5th Why	
D5 Permanent Corrective Actions & D6 Implementations & Validations						
Action	RC Type (G/D/S)	Owner	Target Date	Status		
New machining practice to better account for distortion prior to final cut	G	J. Machine	2019 W6	Complete		
New template being created that will fix into center of hub to ensure consistent measurement location	D	A. Quality	TBD	Ordering		
100% CMM inspection	D	B. Inspect	2019 W15	Complete		
Vertical CMM Program (faster and more accurate)	D	B. Inspect	2019 W30	Complete		
CMM Computer Warning when any characteristic measured as non-conforming	D	B. Inspect	2019 W30	Complete		
Standardize how PQEs are evaluating FAIs	S	T. Turbine	2019 W5	Complete		
D8 Recognize the Team:						
ACME and Turbines Inc were acknowledged by Quality Leader at Turbines Inc.						

Provides the following

- 8D milestone plan
- Generation and Escape Point identification
- 5-Why drill down for direct, detection and systemic causes
- Corrective action plan
- Format in PowerPoint

See Machined Disk Case Study #2, page 24 in RM13000 for real-life 8D illustration using this form

WHAT MAKES A GOOD 8D?

Start with one of the AESQ templates available at <https://aesq.sae-itc.com/supplemental-material>

EIGHT DISCIPLINE (8D) ROOT CAUSE INVESTIGATION REPORT 8D Report # _____

Warning: Once completed, the jurisdiction & Classification of the form must be obtained to comply with export regulations.

Continue to High Data: No Yes

Classification Date: _____

U.S. Export Classification (EAR or ITAR): _____

Other restrictions or comments (if): _____

General Information

Supplier Name: _____ Supplier Code: _____

Supplier Representative: _____

Supplier Representative Email: _____

Supplier Representative Phone: _____

Customer Contact: _____

Issued Date: _____

Description of Nonconformity: _____

Specification Requirement: _____

Description of the actual condition (Failure mode): _____

Repeat issue? Yes No If Yes, reference previous report if known: _____ Is this a PPAP part? Yes No

Category: Check All that Apply: Audit Product Process Procedure Other: _____

Was there product impact? Yes No If Yes, please complete D0 section. Otherwise, skip D0.

D0: Implement Immediate Protective Action(s) – Response required within 24 hours

PO / SA	PO Item
Part Number / Rev.	Part Description
Drawing Number / Rev.	Part DW
Manufactured Date	Quantity
Customer NC #	Date Due / Commitment
8D Tracking number	Provided by

Please address these key questions and sign off following items

Have you shipped, or is there any suspect material in stock, to this or any other site?	<input type="checkbox"/> No <input type="checkbox"/> Yes
Do you have any similar parts in finished stock with the same problem?	<input type="checkbox"/> No <input type="checkbox"/> Yes
Do you have any suspect material currently in production that may exhibit this problem?	<input type="checkbox"/> No <input type="checkbox"/> Yes
Does this problem exist in similar part numbers?	<input type="checkbox"/> No <input type="checkbox"/> Yes
Has a sub-tier supplier contributed to this problem?	<input type="checkbox"/> No <input type="checkbox"/> Yes
Has any suspect material been drop shipped to a direct source?	<input type="checkbox"/> No <input type="checkbox"/> Yes

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D1: Form the Team (Identify specific Subject Matter Experts (SME) and supporting team members)

TEAM LEADER	TEAM LEADER'S PHONE #	TEAM LEADER'S EMAIL ADDRESS
TEAM MEMBER		
RESOURCES		

D2: Define the Problem/Issue (Issue a problem statement using quantifiable terms; Address problem Generation and Escape Points; Describe problem Impact)

D3: Complete Interim Containment Action(s) (Identify the temporary action taken to help the Customer get back into production. Describe verification action taken to assure interim actions do not result in other problems)

List action(s) on a separate sheet if necessary	Action Owner	Planned completed date	Completed date
1			
2			
3			

Describe Verification Actions here: _____

D4: Identify, Analyze, and Verify Root Causes: (Use appropriate problem analysis tools contained in the 8D Tool Section to address both the Direct Cause(s) at Generation Point and Root Cause(s) at Escape Point of the process)

Process/Manufacture Cause – Generate Cause

Supplier/Quality Cause – Escape Cause (Address why the Customer found the problem and the Supplier did not)

D5: Identify Permanent Corrective Action(s): (Address why the Customer found the problem and the Supplier did not; Verify CA(s) will prevent future problems) **30 Days (reference)**

List action(s) on a separate sheet and attach if necessary	Action Owner	Planned implementation /Completed date	Implementation /Completed date
1			
2			
3			
4			

Describe PCA Verification completed: _____

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D6: Implement Permanent Corrective Action(s): (Validate PCA(s) are in place; Check root causes at Generation and Escape Points do not occur again; Remove known Containment measures)

Have all PCA(s) been implemented? Yes No

Has the problem reoccurred? If "Yes", Supplier to go back and readdress D2 and D4. Yes No

D7: Define Systemic Preventive Action(s): (Identify systemic actions such as changes to the QMS, applying C/A to other PNs, implementing a plan for reducing effect rates, etc.) **60 Days (reference)**

Are similar parts and/or processes affected? Yes No Have Lessons Learned been documented? Yes No

Have all PFMEA documents been updated (e.g., Process Flow Diagram, PFMEA and Process Control Plan)? Yes No Corrective Action Accepted Date: _____

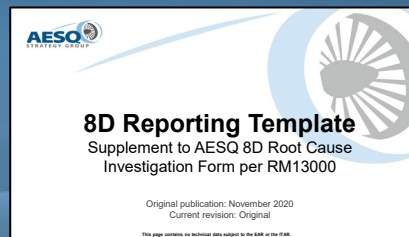
Describe plan to measure effectiveness of all corrective and preventive actions implemented (i.e., inspection lots verified): _____

D8: Team and Individual Recognition: (Validate the 8D Team was recognized for completing this investigation)

Originator Name (PRINT): _____ Date: _____

Provides the following

- All 8D Steps
- Four key actions broken out
- Key D0 emergency containment questions
- Problem Statement
- Generation and Escape Points
- 5-Why drill down for direct, detection and systemic causes
- Corrective action plan
- Format in Microsoft Word
- Supported by 8D Reporting Template



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WHAT MAKES A GOOD 8D?

Part Marking Example using Microsoft Word Template

EIGHT DISCIPLINE (8D) ROOT CAUSE INVESTIGATION REPORT		8D Report #108	
Warning: Once completed, the Jurisdiction & Classification of the form must be obtained to comply with export regulations.			
Contains Technical Data:		<input checked="" type="radio"/> No <input type="radio"/> Yes	
Classification Date			
U.S. Export Classification (EAR or ITAR)			
Other restrictions or comments (IP)			
General Information			
Supplier Name	Belcan Part Marking Cell	Supplier Code	12345
Supplier Representative	Brenda Olson		
Supplier Representative Email	brenda.olson@belcan.com		
Supplier Representative Phone	860-234-5678		
Customer Contact	John Doe		
Issued Date	9/4/2019		
Description of Nonconformity: Ink marking was used instead of Integral marking on various P/N's – Wrong method			
Specification Requirement: Mark per Customer specification ABC-123, Class 30. Note field of drawing requires Integral Marking method to apply.			
Description of the actual condition (failure mode): The applicable drawing showed the marking symbol and stated: "Mark identification per spec ABC-123, Class 30", allowing for temporary Ink 3.2.6 or Integral 3.1. However, the drawing field specifically showed the marking symbol with an additional compound symbol indicating Integral Marking required.			

Repeat Issue? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> If Yes , reference previous report# if known		Is this a PPAP part? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	
Category: Check All that Apply: Audit <input type="checkbox"/> Product <input checked="" type="checkbox"/> Process <input type="checkbox"/> Procedure <input type="checkbox"/> Other <input type="checkbox"/>			
Was there product impact? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> If Yes , please complete D0 section. Otherwise, skip D0.			
D0: Implement Immediate Protective Action(s) – Response required within 24 hours			
PO / SA	See Supplier ABC's 8D	PO Item	See Supplier ABC's 8D
Part Number / Rev.	98765-01	Part Description	Grommet
Drawing Number / Rev.	98765	Part S/N	N/A
Manufactured Date	See Supplier ABC's 8D	Quantity	23
Customer NC #	See Supplier ABC's 8D	Date Due / Containment	4/17/2022
8D Tracking number	See Supplier ABC's 8D	Provided by	Jim Lang, Belcan
Please address these key questions and sign off following items			
Have you shipped, or is there any suspect material in transit to this or any other site?			<input checked="" type="radio"/> No <input type="radio"/> Yes
Do you have any similar parts in finished stores with the same problem?			<input checked="" type="radio"/> No <input type="radio"/> Yes
Do you have any suspect material currently in production that may exhibit this problem?			<input checked="" type="radio"/> No <input type="radio"/> Yes
Does this problem exist in similar part numbers?			<input checked="" type="radio"/> No <input type="radio"/> Yes

What if it was a PPAP part? Then a pFMEA would be required. This means a process flow diagram is available that could be used to document the Generation and Escape Points. Also, a Control Plan could be reviewed for the current detection controls called out.

WHAT MAKES A GOOD 8D?

Part Marking Example using Microsoft Word Template

Has a sub-tier supplier contributed to this problem? <i>Belcan is the sub-tier that contributed to the AGC part marking escape</i>	<input type="radio"/> No <input checked="" type="radio"/> Yes
Has any suspect material been drop shipped to a directed source?	<input checked="" type="radio"/> No <input type="radio"/> Yes

D1: Form the Team (Identify specific Subject Matter Expert(s) (SME) and supporting team members)

Team Leader	Team Leader's Phone #	Team Leader's Email Address		
Jim Lang	860-123-4567	jim.lang@belcan.com		
Team Members	Brenda Olson	860-234-5678	<input type="text"/>	brenda.olson@belcan.com
	Gil Macsata	860-345-6789	<input type="text"/>	gil.macsata@belcan.com
Resources	John Doe	860-456-7890	<input type="text"/>	john.doe@pw.rtx.com

D2: Define the Problem/Issue (Enter a problem statement using quantifiable terms; Address problem Generation and Escape Points; Describe problem impact)

Background Statement:

On September 4, 2019, Supplier ABC submitted a Part Marking Request for 98765-01. On September 5, 2019 an Approval was sent to Supplier ABC by the Belcan Part Marking Cell. On September 17, 2019, the Belcan Part Marking Cell was notified that a QN (40238765 SDO 22018) had been issued against the marking due to the mark using the incorrect method. The required method as indicated in the field of the drawing should have been integral marking, not the ink marking Supplier ABC used.

Note 4 was read and a review of the field of the dwg was reviewed and a flag was noted. The content of the markings was correct and therefore an Approval was issued. The Cell failed to observe, as did the supplier, the additional compound symbol in the field of the drawing that required integral marking.

Problem: The Supplier, the SQAR and the Part Marking Cell all read Note 4 on the dwg and looked for either Temp Ink or Integral to be used as a method. During rework, the emphasis was placed on using a more permanent ink due to the temp ink rubbing off with handling or alcohol. Through all of these processes, the field of the dwg was not examined showing Compound Symbol standing alone.

PROBLEM STATEMENT:
Supplier ABC had their part marking approved by the Belcan Cell when it should have been rejected (Type II Error)

D3: Complete Interim Containment Action(s): (Identify the temporary actions taken to help the Customer get back into production; Describe verification actions taken to assure interim actions do not result in other problems)

List action(s) on a separate sheet if necessary		Action Owner	Planned completed date	Completed date
1	Pulled all Part Marking Inspectors together and re-instructed how to handle compound symbols per Customer spec ABC-123, Section 4.3.1	B. Olson	11/07/2019	11/07/2019
2	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
3	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Describe Verification Actions here:

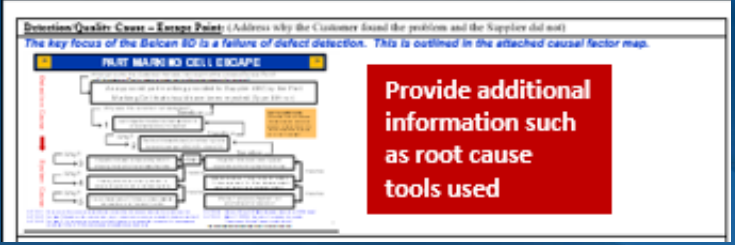
D4: Identify, Analyze, and Verify Root Causes: (Use appropriate problem analysis tools contained in the 8D Tool Section to address both the Direct Cause(s) at Generation Point and Detection Cause(s) at Escape Point of the process)

Process/Manufacturing Cause – Generation Point:

Per 5-Why analysis, Supplier ABC's operator marked part with ink method as that was the method called out on his operation sheet. Additionally, the M.E. who prepared the operation sheet only read the note on sheet 1 of the drawing and missed the compound note in the drawing field that require integral marking.

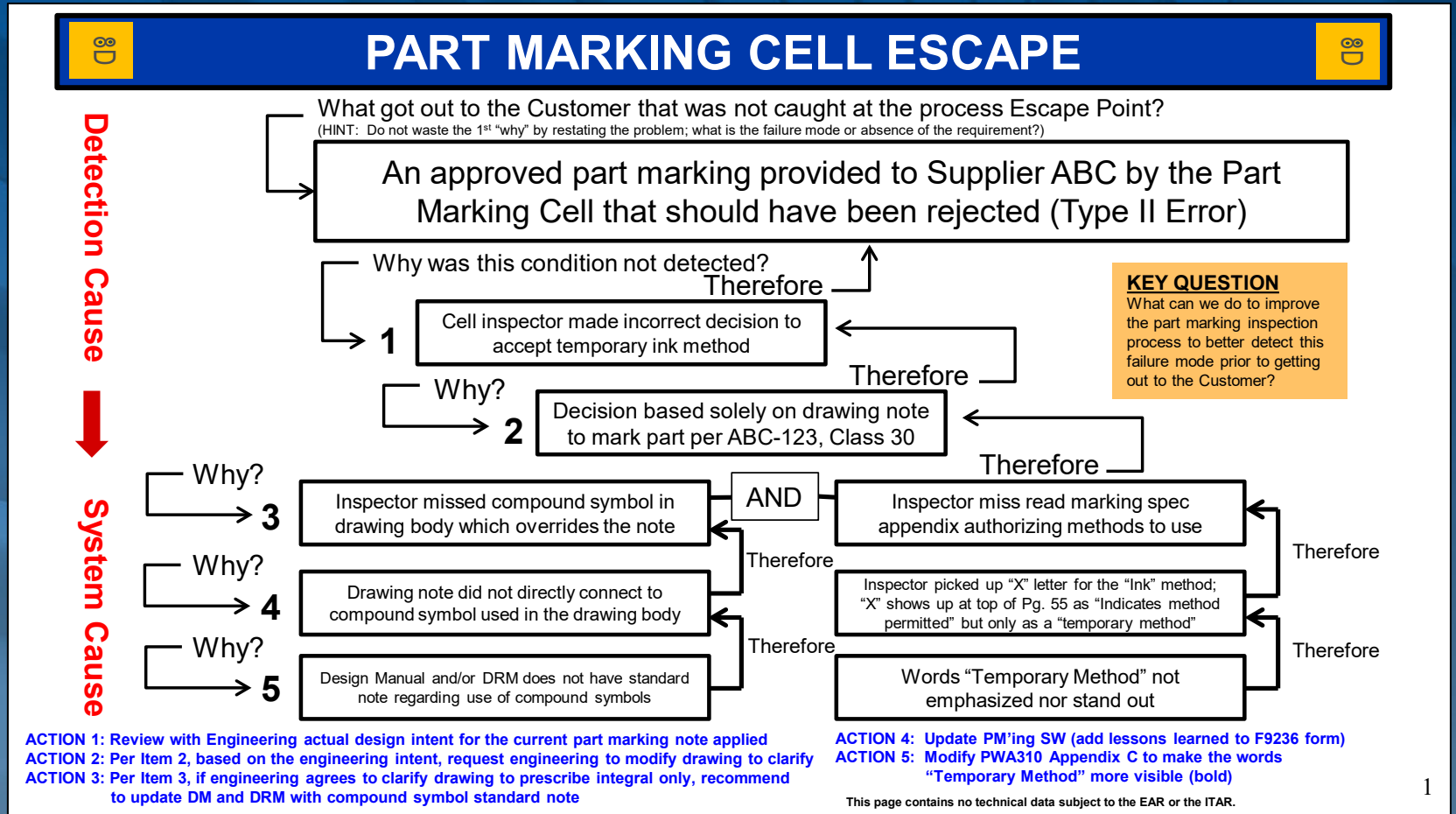
WHAT MAKES A GOOD 8D?

Part Marking Example using Microsoft Word Template



Notes on using the 5-Why Diagram

- Do not limit yourself to one singular path if other paths are obvious
- Use the “therefore” test to assure the 5-Why layers make sense
- Identify potential C/A at the various layers



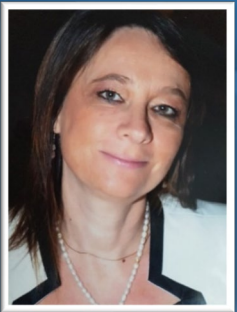
WHAT MAKES A GOOD 8D?

Part Marking Example using Microsoft Word Template

D5: Identify Permanent Corrective Action(s): (Address why the Customer found the problem and the Supplier did not; Verify C/As will not cause further <u>problems</u>). 30 Days (reference)				
List action(s) on a separate sheet and attach if necessary		Action Owner	Planned implementation /completed date	Implementation /Completed date
1	Review with Engineering actual design intent for the current part marking note applied.	M. Mouse	1/31/2020	11/13/2019
2	Per Item 2, based on the engineering intent, request engineering to modify drawing to clarify.	M. Mouse	1/31/2020	11/13/2019
3	Per Item 3, if engineering agrees to clarify drawing to prescribe integral only, recommend to update DM and DRM with compound symbol standard note	M. Mouse	01/31/2020	
4	Update Part Marking Standard Work (add lessons learned to F9236 form).	B. Olson	12/12/2019	
5	Modify ABC-123, Appendix D to make the words "Temporary Method" more visible (bold).	M. Mouse	03/31/2020	
Describe PCA Verification completed: <i>Part Marking System Team will monitor at it's weekly Thursday meeting until all items are closed out.</i>				

D6: Implement Permanent Corrective Action(s): (Validate PCA(s) are in place; Check root causes at Generation and Escape Points do not come back; Remove Interim Containment measures)			
Have all PCA(s) been implemented?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Has the problem reoccurred? If "Yes", Supplier to go back and readdress D3 and D4.	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	
D7: Define Systemic Preventive Action(s): (Read across actions such as changes to the QMS, applying C/A to other P/Ns, implementing a plan for measuring effectiveness, etc.) 60 Days (reference)			
Are similar parts and/or processes affected?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	Have Lessons Learned been documented? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Have all PFMEA documents been updated (e.g., Process Flow Diagram, PFMEA and Process Control Plan)?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Corrective Action Accepted Date <input type="text"/>
<i>NOTE: This is N/A.</i>			
Describe plan to measure effectiveness of all corrective and preventive actions implemented (i.e., Inspection lots verified)	<i>Items 3-5 under Permanent C/A are actually Preventive Actions that impact multiple P/N's either currently active or yet to be designed.</i>		
D8: Team and Individual Recognition: (Validate the 8D Team was recognized for completing this investigation)			
Originator Name (PRINT):	B. Olson to acknowledge completion and team effort at monthly escapes review.		Date: 12/15/2019

8D INTERACTION WITH HUMAN FACTORS



CATHERINE CATARINA-GRACA
SUPPLIER MANAGEMENT SYSTEM COORDINATOR
SAFRAN AIRCRAFT ENGINES

TAKE THE HUMAN AND ORGANIZATIONAL ASPECTS INTO ACCOUNT IN THE 8D CAUSAL ANALYSES

The new revision of AS9100D - Chapter 10.2

“Nonconformity and corrective action” will require us to “evaluate the need for action based on human factors to ensure non conformities do not recur.”



AS13100 is requiring HF investigation and RM13010 gives some tools that can be used.

8D STEPS

HF contributions

D0

Make a preliminary analysis of the problem

Ensure that the emphasis is placed on the situation, time, location and impacts and not on the person(s) at the origin of the event.

D1

Form the team

Work directly in the 8D by bringing the specific features of HF into the context of the 8D team formed.
Ensure that the FH skills are present.

D2

Define the problem to be processed

Challenge the characterization of the event and of the error from a human and organizational viewpoint.
Ensure that the description of the event does not contain value judgments, interpretations or opinions.

D3

Contain the risks

–

D4

Find the root cause(s)

Ensure that the root causes linked with the persons and the organization have been studied. Characterize the facts from a human and organizational viewpoint. (dirty dozen, Swiss cheese Model ...)

D5

Define and select the corrective actions

**Challenge the chosen solutions.
Propose solutions already applied in other similar activities.**

D6

Implement the chosen actions and check their effectiveness

Take part in the on-site observation in order to check the effectiveness of the corrective actions and collect the feedback

D7

Capitalize, perpetuate, generalize

Ensure that the feedback is shared within the HF network.
Update the catalog of HF solutions / best practices.

D8

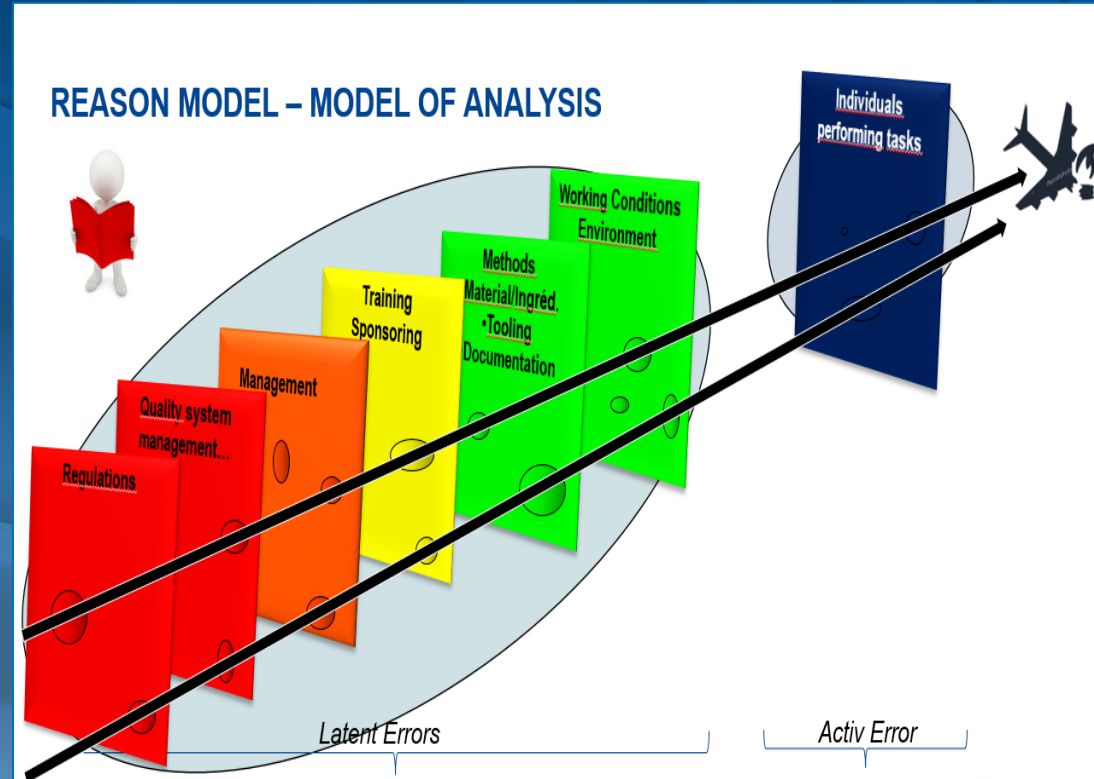
Conclude the group and congratulate the team

–

AESQ – Aerospace Engine Supplier Quality Strategy Group

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TAKE THE HUMAN AND ORGANIZATIONAL ASPECTS INTO ACCOUNT IN THE 8D CAUSAL ANALYSES



- Take into account contributive factors to prevent recurrence
- Organizational failures must be identified because of their influence on human performances.
- They produce situations conducive to error: communication, distance from the field, lack of experience...

The Reference Manual Interactions

8D investigations (RM13000) will interact with failure mode and cause identification (RM13004), which includes sources of human error (RM13010), and identified process control methods (RM13006) as corrective actions



AESQ 8D INTERACTIVE TOOL

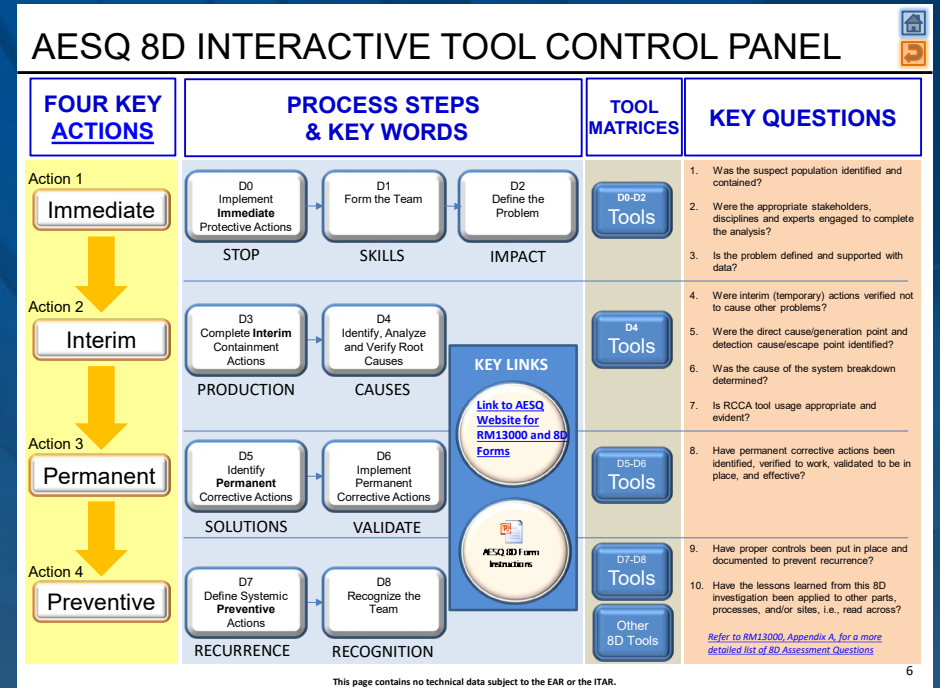
Instructions

From the control panel on the next slide, in presentation mode, all the boxes are live links that will redirect you to different places in the presentation.

Tool	Description	Use when....	Template
Fault Tree Diagram	A structured process for analyzing potential causes of failure. The fault tree structure is associated with the combined probability of underlying events causing the top level event to occur	To determine the logical interaction and probabilities of potential contributors to the top level event under study.	Apollo Fault Tree Template
Causal Factor Map	Excellent training webinars for creating effective Causal Factor Map. For more information/training availability, go to www.thinkreliability.com .	Excellent tool built on the 5-Why principle that does not constrain the user into just one linear path. Use to diagnose the causes of a problem at a variety of levels.	Causal Factor Map Template
Defect Concentration Chart	For reviewing physical location of defects on a particular part/ process overtime to determine if there are any patterns	To determine if the non conformance is random or concentrated to a specific location/area	Concentration Diagram
Cause and Effect Diagram (Fishbone)	A brainstorming tool that can be used to identify and prioritize potential factors contributing to the clearly defined problem.	To capture and organize the team's ideas of potential contributing factors to a problem; to prioritize potential factors that will require further investigation	Fishbone
3 Legged 5 Why	A problem solving technique of continuously asking "why" to get to the root of a problem. The 3 categories or "legs" represent: direct failure detection, and system root causes	To identify the controllable root cause for each of the categorized causes and to drive improvement in detection and systems in addition to specific failure mistake-proofing NOTE: Prior to opening 3-legged 5-Why template, get out of presentation mode, and then double click on the template icon and make sure to "enable macros".	3 Legged 5 Why 5-Why Template
Gauge Capability (R&R) Study	A tool to quantify and evaluate sources of variation in the measurement system	To understand the impact of the variation associated with the measurement system.	Gage RR Worksheet

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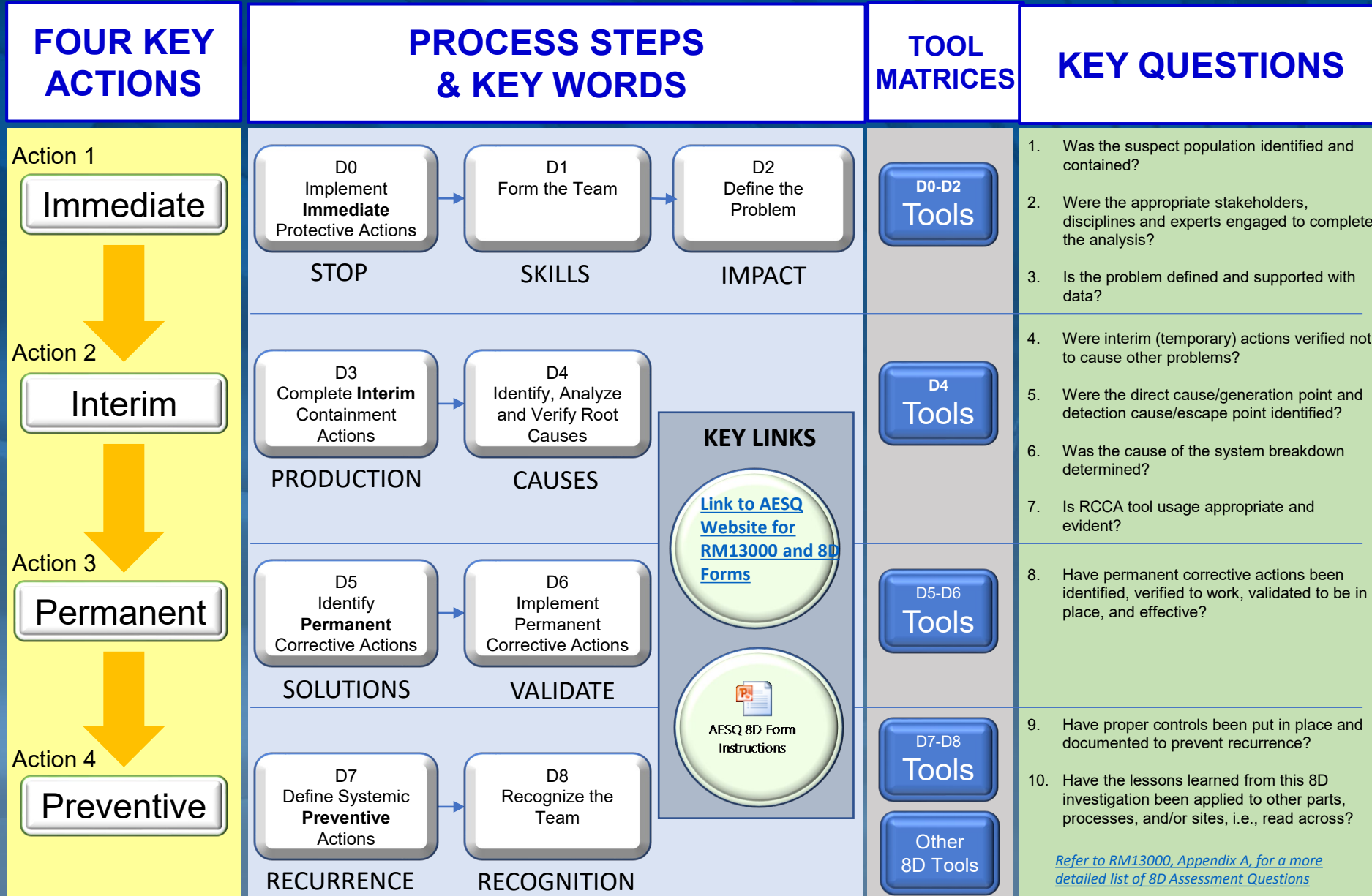


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Each slide also has a "Return" button in the top right corner that when clicked will automatically bring you back to the last page you were viewing.

AESQ 8D INTERACTIVE TOOL CONTROL PANEL



KEY LINKS

[Link to AESQ Website for RM13000 and 8D Forms](#)

AESQ 8D Form Instructions

Q & A SESSION

USE THE “CHAT” FUNCTION
TO ASK A QUESTION...



SUMMARY AND CLOSE

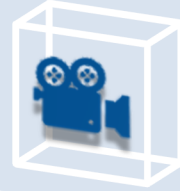


PETER E. TETI
FELLOW, QUALITY ENGINEERING
PRATT AND WHITNEY

SUMMARY

All resources will be available on the AESQ website within a few days.

An email will be sent to all registrants with a link.



Video



Q&A



Presentation



THANK YOU FOR PARTICIPATING



THANK YOU FOR PARTICIPATING

BACK-UP SLIDES

8D Step-by-Step

D0 – IMPLEMENT IMMEDIATE PROTECTIVE ACTIONS

D0: Overview

In the case where nonconforming (NCM) product has escaped to a Customer, *immediate action is taken to STOP all possibility of continued NCM shipments and contain what nonconformities have already been made.* These are actions designed to protect the Customer.

The suspect population must be identified and effectively contained. Ensure nonconforming material is segregated from production.

Consideration should be given to the following:

- Work in process
- Finished goods storage
- Goods in transit
- Customer location
- Raw material inventory

Per AS13000, D0 must be completed within 2 days (48 hours) unless otherwise agreed by the Customer.



D1 - FORM TEAM

The 8D team must include appropriate cross-functional disciplines and subject matter experts with pertinent product and process knowledge needed to conduct the investigation and establish the required corrective actions.

Consideration should also be given to inviting the affected customer to be on the team as the customer can offer a unique perspective.

Team members should be trained in the basics of 8D Problem Solving per AS13000. The event or project leader should have deeper training in the use of the process and tools.

Team leader/co-leader

- Organize the event
- Train participants
- Convey methods
- Coordinate activities

Team members

- Provide specialist knowledge (Subject Matter Expert – SME)
- Generate ideas
- Generate solutions
- Implement solutions

Process Owner

- Ensure implementation is completed
- Align to business need

Sponsor

- Enable resources
- Ensure organizational commitment

D2 - DEFINE PROBLEM



Gather the facts using a 5W-2H to define the problem. The problem definition must include:

- **Problem “Generation” (discovery) point:** Where in the process was the non-conformance detected?
- **Problem manifestation:** What are the indications that a problem exists? The problem should be described in terms of customer experience.
 - Customer/engineering requirement versus actual results
 - When it failed (date/time)
 - Where it failed (location, assembly, at customer, in service, etc.)
 - Failed quantity (WIP, finished goods, in transit, at customer location, etc.)
 - Nonconformity photos as necessary
- **Problem impact:** What is the impact in terms of quality, reliability and productivity? These are best expressed in financial terms.

5W2H PROBLEM DEFINITION FORM		
	5W and 2H	Response
5 W	What is the problem? Describe it in a single sentence, so that others will be able to understand what you mean. Describe what the requirement is and what the actual condition is.	The Customer requirement is... The actual condition is... The problem failure mode is...
	Why is it a problem? What is the pain?	This is a problem because... <i>Note: This is where we can describe why the product is not currently usable (i.e., does not fit into next higher assembly, etc.)</i>
	Where do we encounter the problem?	From the process flowchart, we encounter the problem at (Location) (Time) when (Specific circumstance)... <i>Note: This is where we can define the process Generation Point and Escape Point</i>
	Who is impacted?	This impacts: (Customer) by..., (Management) by..., (Operator) by ... (others) by... <i>Note: Customer impact may need to come from Engineering analyzing the impact of the failure mode</i>
	When did we first encounter the problem?	We first encountered this problem... <i>Note: Time and date stamp goes here</i>
2H	How did we know there was a problem?	The symptoms of this problem are... <i>Example: An assembler noticed oil leaking on the floor; a smell of oil was noticed by the end-user, etc.</i>
	How often do we encounter this problem?	We encounter this problem (x) times and each encounter is (this big). The problem is getting (better/worse).

D3 – COMPLETE INTERIM CONTAINMENT ACTION(S)

Also referred to as “Temporary Containment Action” taken to get good product to the Customer so they can get PRODUCTION going again.

Example include:

- 1) The over-inspection of suspect material from a bounded population and separating the good from the bad in order to ship the good product to the Customer in order to keep their production line moving.
- 2) Setting up a rework or repair line to address the nonconforming product

Key D3 Actions include:

- 1) Select and implement the most effective containment action.
- 2) Work with the customer to determine the locations of affected product and the responsibilities, methods and timescale to contain that product.
- 3) Check that the containment action is effective. Read across to other affected product as appropriate.
- 4) Maintain records of containment as required by the customer.
- 5) Notify customer of resumption of shipping as agreed to by customer.

D4 - IDENTIFY, ANALYZE AND VERIFY ROOT CAUSES

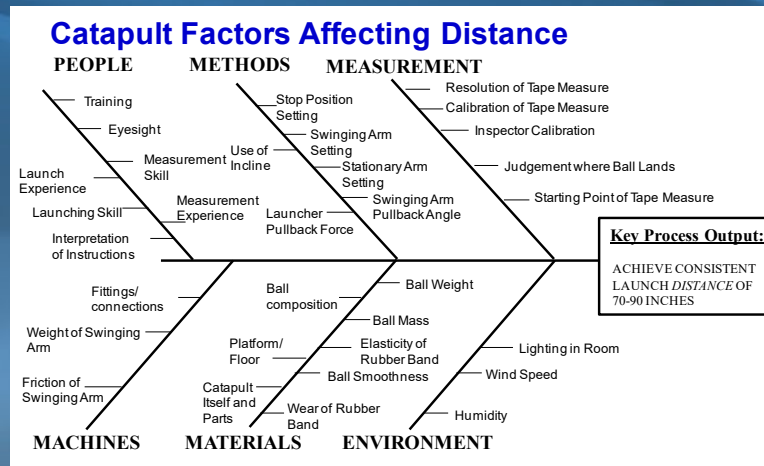
Investigate Potential Causes

Collect and analyze data to determine potential causes or factors contributing to the non-conformance. Validate the measurement system used in conjunction with the problem (gauge, inspection and/or control plan, etc.) and ensure that it provides valid, accurate information.

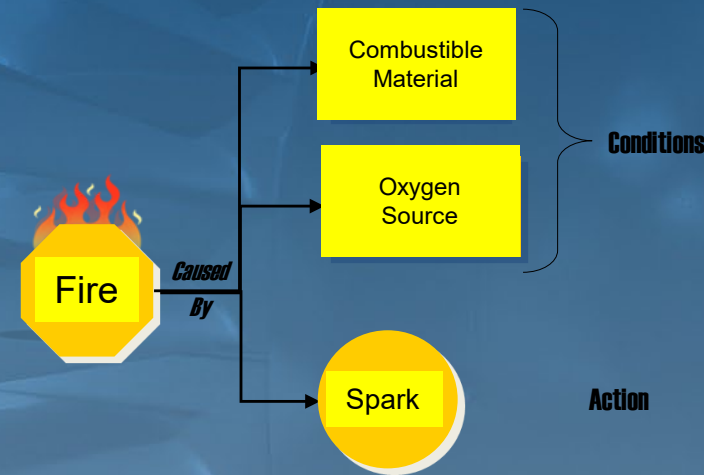
Brainstorm potential investigation paths if data and facts are not readily available for analysis.

Use the appropriate investigation tool to organize and prioritize potential causal factors.

FISHBONE DIAGRAM



CAUSE / EFFECT TREE DIAGRAM



(More on next page)

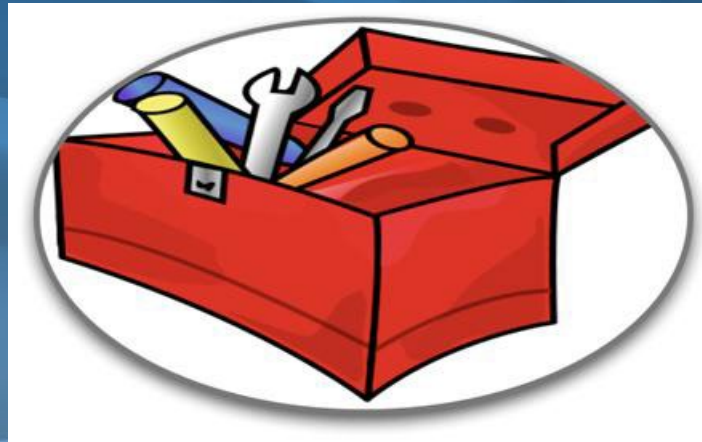
D4 - IDENTIFY, ANALYZE AND VERIFY ROOT CAUSES

Verify Root Cause(s)

Verify the root cause(s) identified by conducting a test attempting to replicate the event. Tools that can be used to confirm root cause(s) are:

- Scatter diagram showing input/output relationships
- Design of experiments (DOE) used to test the impact of two or more variables on an output

(Additional tools can be found on the D4 tools matrix page)



D5 - DETERMINE PERMANENT C/A(s)

The team shall identify and evaluate potential permanent corrective actions to prevent reoccurrences. Consideration should be given to:

- Short term (may be a D3 action) and long term solutions
- Feasibility
- Timing
- Budget
- Employee involvement

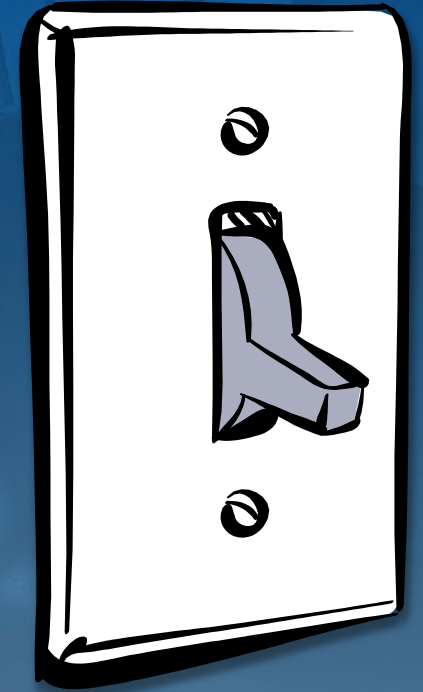


Suggest using a Solution Selection Matrix – see the D5 Tools Matrix page

D6 – IMPLEMENT PERMANENT C/A(s)

Key D6 Actions

- Plan the implementation of the permanent corrective actions (PCA).
- Implement the permanent corrective actions that fix the root causes.
- Verify that the root causes are fixed and that the problem will not happen again.
- Implement the corrective actions that fix the quality control system at the generation and escape point(s) ensuring that it will detect and not release the problem again.
- As required, remove containment measures when it's no longer detecting non-conformant products.
- Update the appropriate quality documentation as required by the customer (such as PFMEA and the control plan).
- Check that the corrective actions continue to be effective by monitoring through inclusion into the internal auditing program.



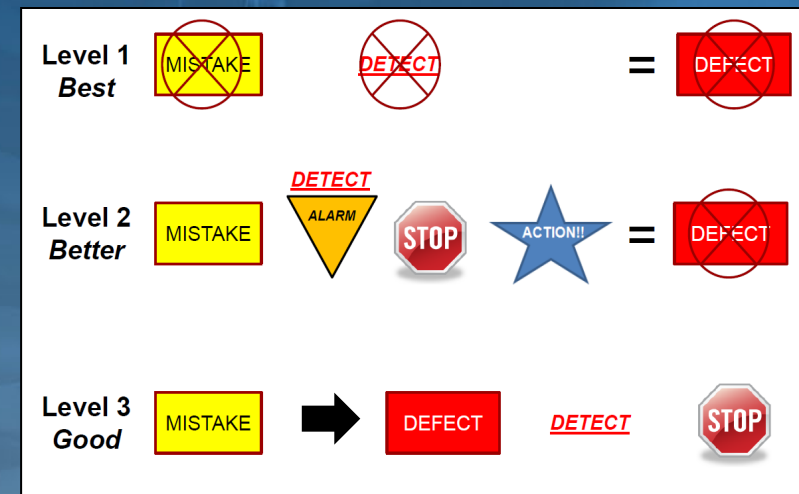
D6 – IMPLEMENT PERMANENT C/A(S)

Apply Mistake-Proofing Controls

The RRCA team shall apply the use of mistake-proofing strategies to control the cause(s) of the failure.

Level one mistake proofing that prevents the error at its source is the goal.

Level two or three mistake proofing that prevents errors from escaping to the customer would be the next best option.

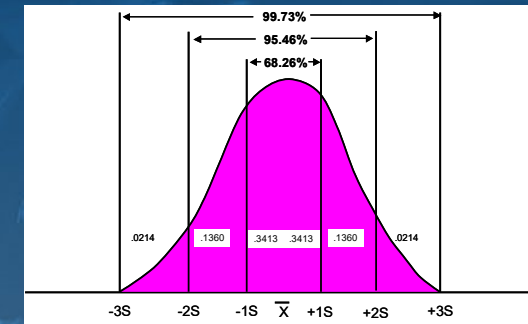


D7 – DEFINE SYSTEMIC PREVENTIVE ACTION(S)

Monitor and Control Using Data

Process monitoring and control can be accomplished by:

- Using simple tools such as run charts or control charts to monitor the process for consistency
- Using a histogram to evaluate if the process is capable of meeting customer requirements
- Using an elephant chart to monitor if the process controls implemented are still effective
- Modifying PFMEA to account for failure modes, their causes and updated preventative and detection based controls
- Updating control plan with process and mistake-proof controls used to mitigate occurrence and/or drive detection reliability



Environmental Control Systems Mechanical Operations										
Critical Boeing 777 Turnbacks										
Date	Shift	Flow Sensing Venturi	Engine Anti-Ice Valve	Temperature Sensor Supplier: Eaton (Bethel)	Dust Heat Exchanger	Trim Air PRECOV - Aired	111997	Air Cycle Machine	Reliability Issues	
		Kullite Data P Sensor Shifts	Valve Fail	Shifts	Cracking	Bolemod Sticking	111997-1	111997-4	111997-1	111997-4
Apr-08	CEM	1	8	3	0	0	0	0	0	0
Apr-08	ATP	0	11	N/A	0	0	0	0	0	0
Mar-08	CEM	0	0	0	0	0	0	0	0	0
Mar-08	ATP	1	3	N/A	0	0	0	0	0	0
Feb-08	CEM	0	0	0	0	0	0	0	0	0
Feb-08	ATP	0	0	0	0	0	0	0	0	0
Jan-08	CEM	1	11	12	0	0	0	0	0	0
Jan-08	ATP	0	16	N/A	0	0	0	0	0	0
Dec-07	CEM	0	0	0	0	0	0	0	0	0
Dec-07	ATP	0	12	N/A	0	0	0	0	0	0
Nov-07	CEM	0	0	0	0	0	0	0	0	0
Nov-07	ATP	1	17	N/A	0	0	0	0	0	0
Oct-07	CEM	0	0	0	0	0	0	0	0	0

D7 – DEFINE SYSTEMIC PREVENTIVE ACTION(S)

Apply Read-Across to Similar Parts/Processes

GOAL: Prevent recurrences

The 8D investigation is expected to resolve any other related process and/or product issues that could benefit from the work done on the targeted failure.

Consider the following questions:

- 1) Could the process condition that led to the non-conformance for one part number be present on other similar part numbers?
- 2) Could this event also be happening in another cell, building, or plant site that produces similar product or service?
- 3) Who else could benefit from the lessons learned from this investigation?
- 4) Have PFMEA documents been updated?

D8 – RECOGNIZE THE TEAM

Once a team has completed implementing the solution, applied the read-across and ensured that the solution is effective, all team members deserve to be congratulated.

Team members need to know that their efforts are appreciated and that the organization knows about their accomplishments.

Examples of team recognition include issuing a certificate to each member, throwing a pizza party, a congratulatory email or recognition at a staff meeting.



See D7-D8 Tools Matrix for template