Lesson Objectives

Terminal Learning Objective - Given an event-based, problem situation scenario, sample data, and a cause and effect charting tool, identify the root cause of the problem.

This lesson has seven objectives. Upon completion, you should be able to:

- Recognize the difference between presumptive, contributing, and root cause.
- Recognize event-based problem situation descriptions by causal factor.
- Identify presumptive causes that facilitate the determination of the root cause of a problem.
- Define the process to validate presumptive causes.
- Recognize the difference between root and contributing cause criteria.
- Identify methods to verify root cause.
- Identify root and contributing causes.

First, you will learn the difference between presumptive causes, contributing causes, and root causes.

Types of Causes Introduction

When we have meetings to solve problems at DCMA, we often end up with a long list of things that could have gone wrong.

Wouldn't it be nice if we could just sift through that long list of things that could have caused the problem and focus on the one thing that is the most basic reason for it?

Of course it would be nice.

But still, there is value in those long lists of causes to a problem. While only one of them can be the root cause, the others may be contributing to the nonconforming condition and must also be addressed.

Let's take a look at all the causes, how they are labeled, and their differences.

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Long Description

The mentor, Linda, is now having a conversation with a different DCMA Specialist. The DCMA Specialist states that, "When we have meetings to solve problems at DCMA, we often end up with a long list of things that could have gone wrong." The mentor replies, "Wouldn't it be nice if we could just sift through that long list of things that could have caused the problem and focus on the one thing that is the most basic reason for it? Of course it would be nice. But still, there is value in those long lists of causes to a problem. While only one of them can be the root cause, the others may be contributing to the nonconforming condition and must also be addressed. Let's take a look at all the causes, how they are labeled, and their differences."

Types of Causes

In the quality industry, there are many ways to refer to the causes of problems. The three most common cause types are listed below.

Click on each tab to learn more about the cause type.

Presumptive Cause | Contributing Cause | Root Cause

Presumptive cause(s) may be apparent at the beginning of the investigation or they may emerge during the data collection process. These are hypotheses that would explain the effects of the problem, but they need validation.

At the end of Root Cause Analysis, there will be no Presumptive Causes remaining. All Presumptive Causes, once verified, will be categorized as either contributing causes or root causes, or will be determined to not have been a cause.

Popup Content

Presumptive Cause

Presumptive cause(s) may be apparent at the beginning of the investigation or they may emerge during the data collection process. These are hypotheses that would explain the effects of the problem, but they need validation.

At the end of Root Cause Analysis, there will be no Presumptive Causes remaining. All Presumptive Causes, once verified, will be categorized as either contributing causes or root causes, or will be determined to not have been a cause.

Contributing Cause

Contributing cause(s), when viewed alone, would not have caused the problem, but they are important enough to be recognized as needing corrective action to improve the quality of the process or product. (Contributing causes include secondary causes and possible causes.)

Root Cause

Root cause is the most basic reason for a problem, which, if corrected, will prevent recurrence of that problem.

Sometimes, in highly complex technical problems, it may be impossible, from a financial perspective, to find the root cause.

Although, theoretically, there is only one root cause, any "cause" of the nonconformance must be investigated and corrective action must be taken to prevent recurrence of the nonconformance.A green door labeled "ROOT CAUSES" with an exclamation mark problem.

Types of Causes, Cont.

It is important to recognize the differences between these labels because they typically drive your supplier to take a specific corrective action.

If a supplier is not able to recognize the difference, they may initiate a corrective action that does not eliminate or alleviate the problem, but that instead causes a waste of valuable resources.

Next, you will apply the definitions of problem causes to a problem discovered at Acme Company.

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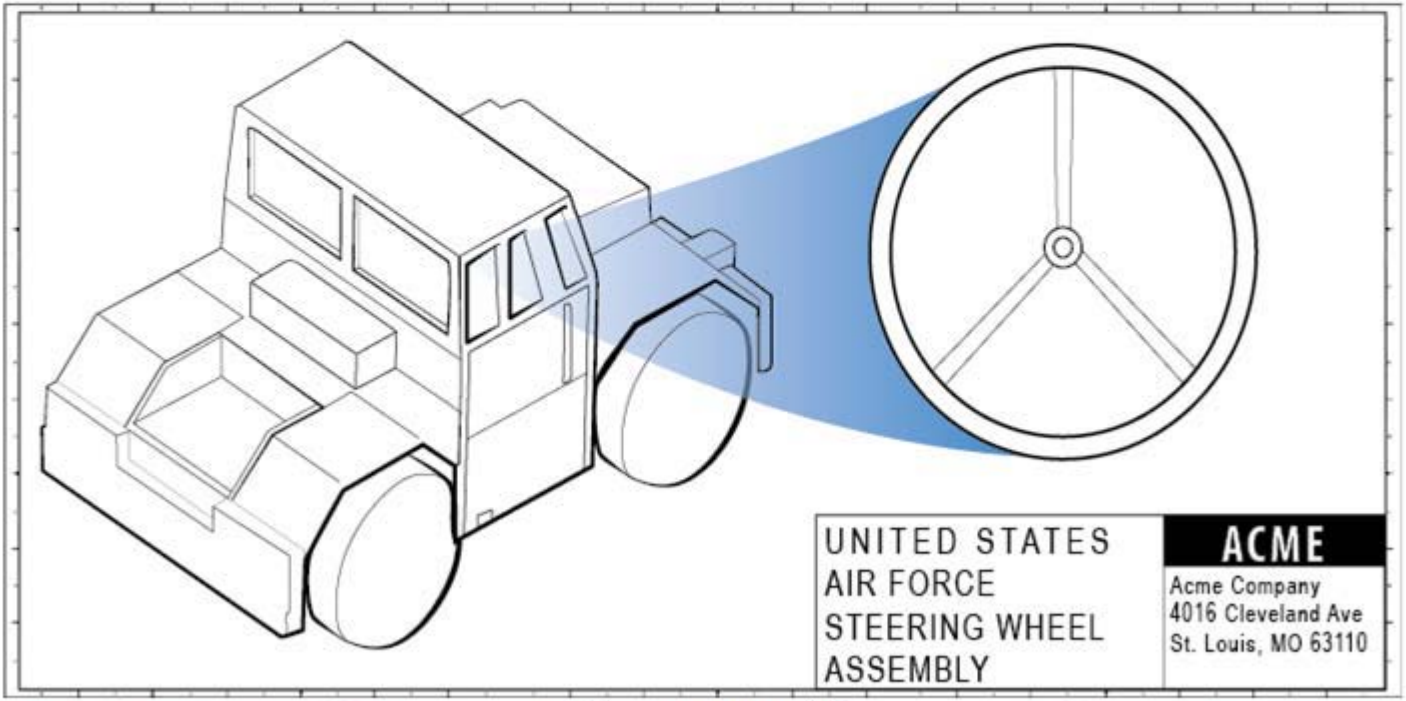
Long Description

Three doors are side-by-side. The first door is blue and is labeled "Presumptive Causes" with an exclamation mark. The second door is green and is labeled "Root Causes" with an exclamation mark. The third door is red and is labeled "Contributing Causes" with an exclamation mark.

Case Study Introduction

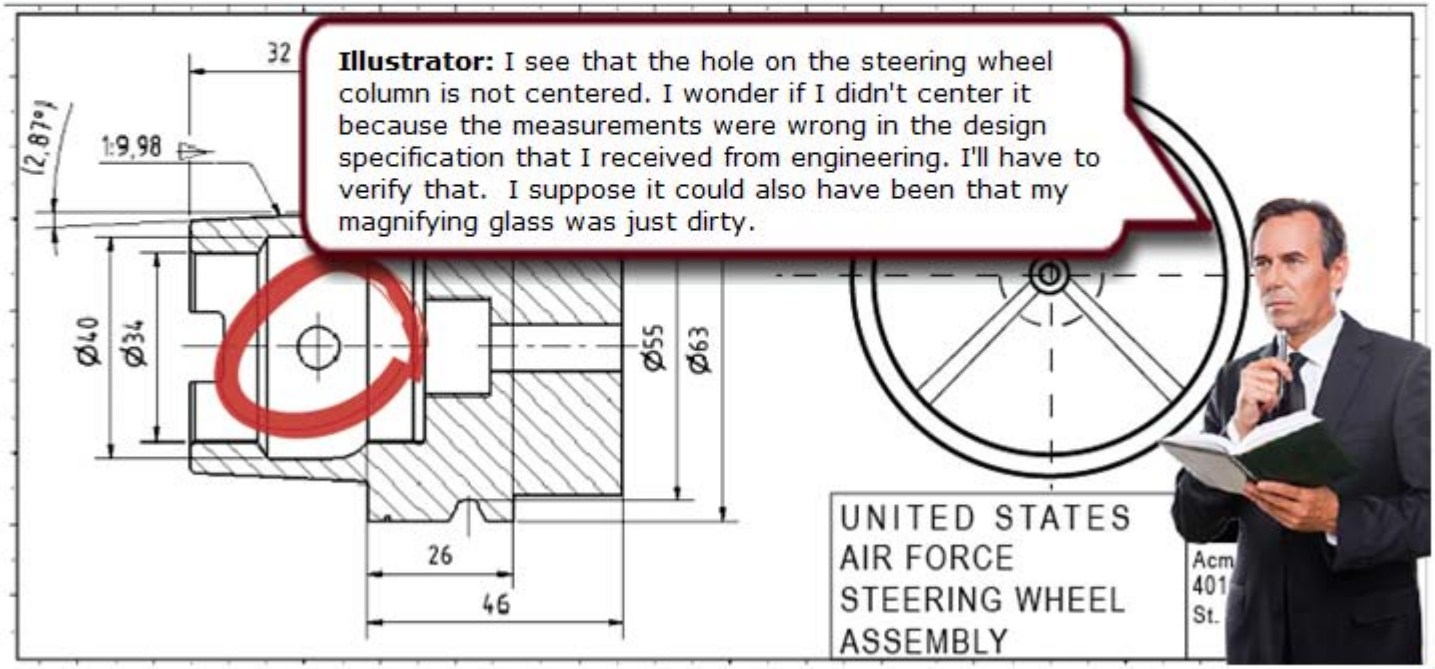
Acme Company delivers steering wheels to a prime supplier. They are ultimately installed on U.S. Air Force tow tractors. The prime supplier has rejected the last delivery of steering wheels, claiming the steering wheels would not fit onto the tractors and were out of spec. Click on the Next button to tab through the Acme Company analysis of possible causes.



Case Study Causes

Click on each tab to see Acme Company's analysis of the possible causes to their steering wheel problem.

Presumptive Cause | Contributing Cause 1 | Contributing Cause 2 | Root Cause



Illustrator: I see that the hole on the steering wheel column is not centered. I wonder if I didn't center it because the measurements were wrong in the design specification that I received from engineering. I'll have to verify that. I suppose it could also have been that my magnifying glass was just dirty.

D

Popup Content

Presumptive Cause

Image only

Long Description

An Acme Company illustrator stands looking at the engineering drawing of the Steering Wheel Assembly. The illustrator circles a mistake on the engineering drawing. He says, "I see that the hole on the steering wheel column is not centered. I wonder if I didn't center it because the measurements were wrong in the design specification that I received from engineering. I'll have to verify that. I suppose it could also have been that my magnifying glass was just dirty."

Contributing Cause 1

Image only

Long Description

A reviewer from Acme Company comments on the engineering drawing of the Steering Wheel Assembly. He says, "I am the person responsible for checking the work of Acme Company illustrators. I did not check this drawing because it got the fast track treatment. Sometimes, our delivery schedules are so compressed."

Contributing Cause 2

Image only

Long Description

The Acme Company illustrator continues to inspect the engineering drawing of the Steering Wheel Assembly. He says, "I'm also surprised that the installer just blindly installed the steering wheel without

questioning why it was off-center. I admit that this mistake alone would not have caused the problem, but someone still needs to talk to the installer."

Root Cause

Image only

Long Description

Failure Review Board team members are looking at the engineering drawing of the Steering Wheel Assembly with defects circled in red. The word "Rejected" is stamped on the drawing. A pair of dirty eyeglasses are superimposed in front of the drawing. The failure review board lead says, "Upon investigation, the presumptive cause that perhaps there was a mistake in the measurements in the Engineering source data turned out to be invalid. The engineering design document measurements were correct. Therefore, our root cause is that the illustrator made a mistake and did not center the hole on the steering column when creating the drawing."

Types of Causes Knowledge Review

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Which problem cause is the most basic reason for a problem, which, if corrected, will prevent recurrence of that problem?

- [ ] Contributing Cause
- [ ] Calculated Cause
- [ ] Prohibitive Cause
- [ ] Presumptive Cause
- [x] Root Cause

Check Answer

The best answer is that the **Root Cause** is the most basic reason for a problem, which, if corrected, will prevent a recurrence of that problem.

Types of Causes Summary

Wait a minute. Are you actually telling me that a dirty magnifying glass can lead to a rejected delivery?

When dealing with suppliers, it is not likely that they would publish such a cause in their corrective action plan. They would most likely list the cause as a "lack of attention to detail" or "failure to comply with specification." Dirty tools were used here to help you recognize that all possibilities should be considered during a Root Cause Analysis.

At that point, the focus of DCMA will be on the supplier's implementation of the various corrective actions associated with the root and contributing causes, effectiveness of the corrective actions implemented and ensuring the DoD customer is satisfied with the delivery.

Now, let's take a look at a new topic about event-based problems and their causal factors.

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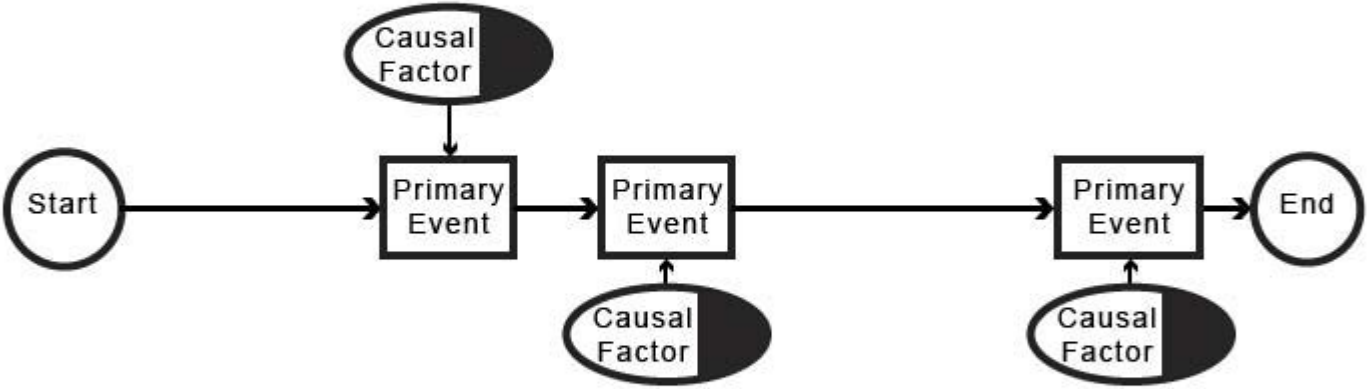
Long Description

The mentor and the DCMA Specialist continue their conversation. The DCMA specialist looks skeptical and says to the mentor, "Wait a minute. Are you actually telling me that a dirty magnifying glass can lead to a rejected delivery?" The mentor explains, "When dealing with suppliers, it is not likely that they would publish such a cause in their corrective action plan. They would most likely list the cause as a 'lack of attention to detail' or 'failure to comply with specification'. Dirty tools were used here to help you recognize that all possibilities should be considered during a Root Cause Analysis. At that point, the focus of DCMA will be on the supplier’s implementation of the various corrective actions associated with the root and contributing causes, effectiveness of the corrective actions implemented and ensuring the DoD customer is satisfied with the delivery. Now, let's take a look at a new topic about event-based problems and their causal factors."

Causal Factors Introduction

Causal factors are important to problem solvers when analyzing a problem for its root cause. They can be listed on a sheet of paper or illustrated on an event sequence or timeline. Notice the symbol and shape used to illustrate a causal factor on the timeline below. Notice the direction of the arrow and how it points to the primary event along the horizontal timeline. These causal factors point to the primary events because they shaped the outcome of their connected events.



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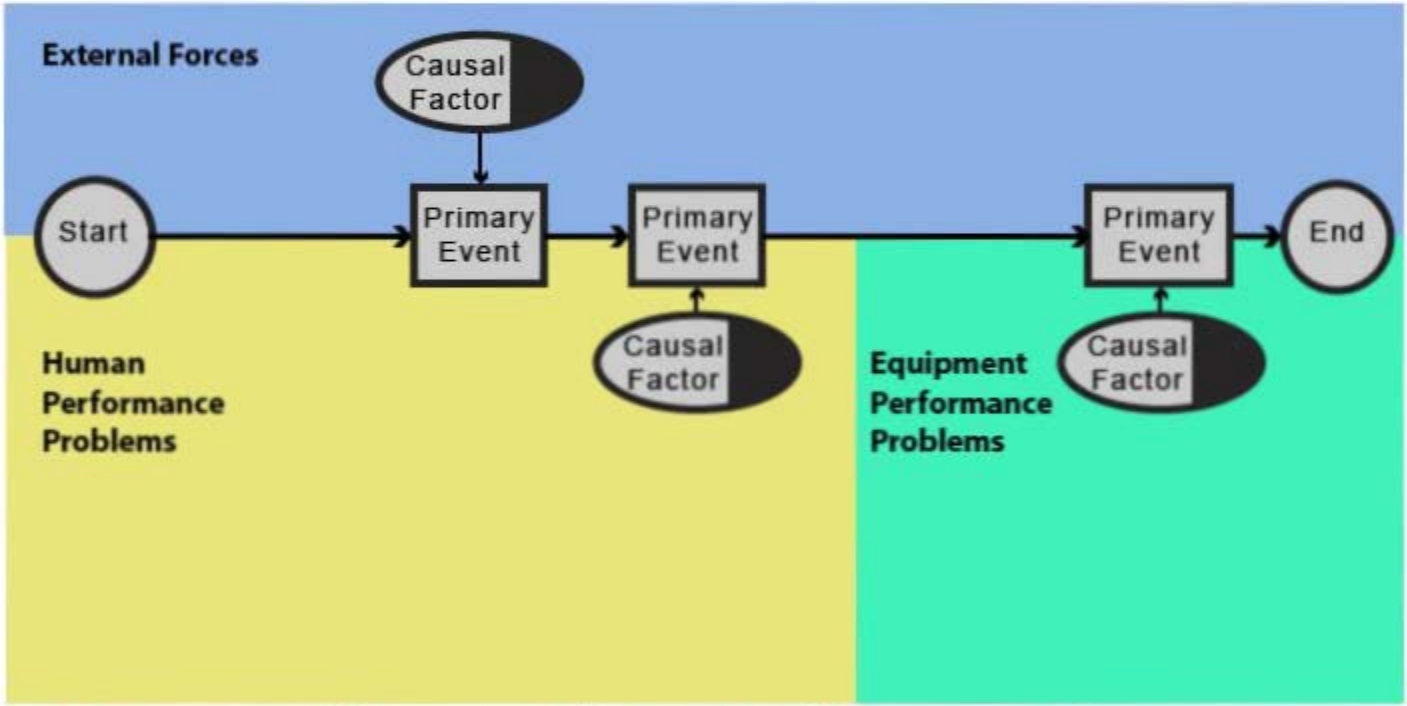
Long Description

An Event Sequence / Timeline graphic comprised of the following elements: A circle on the left is labeled "Start". A long, thick horizontal arrow comes out of the Start event circle and points to a long, horizontal rectangle labeled "Primary Event". Above this rectangle is a half-shaded oval labeled "Causal Factor". A thin, vertical arrow points from the Causal Factor half-shaded oval down to the Primary Event rectangle. To the right of the first Primary Event rectangle are two more Primary Event rectangles, each connected by short, thick horizontal arrows. Below these two rectangles are two more Causal Factor half-shaded ovals, with short, thin, vertical lines point up to the Primary Event circles. From the last Primary Event rectangle is a final long, horizontal arrow pointing to a circle on the right, which is labeled "End."

Causal Factor Categories

Causal factors are sorted into three categories (color-coded below):

- Human Performance Problems
- Equipment Performance Problems
- External Forces



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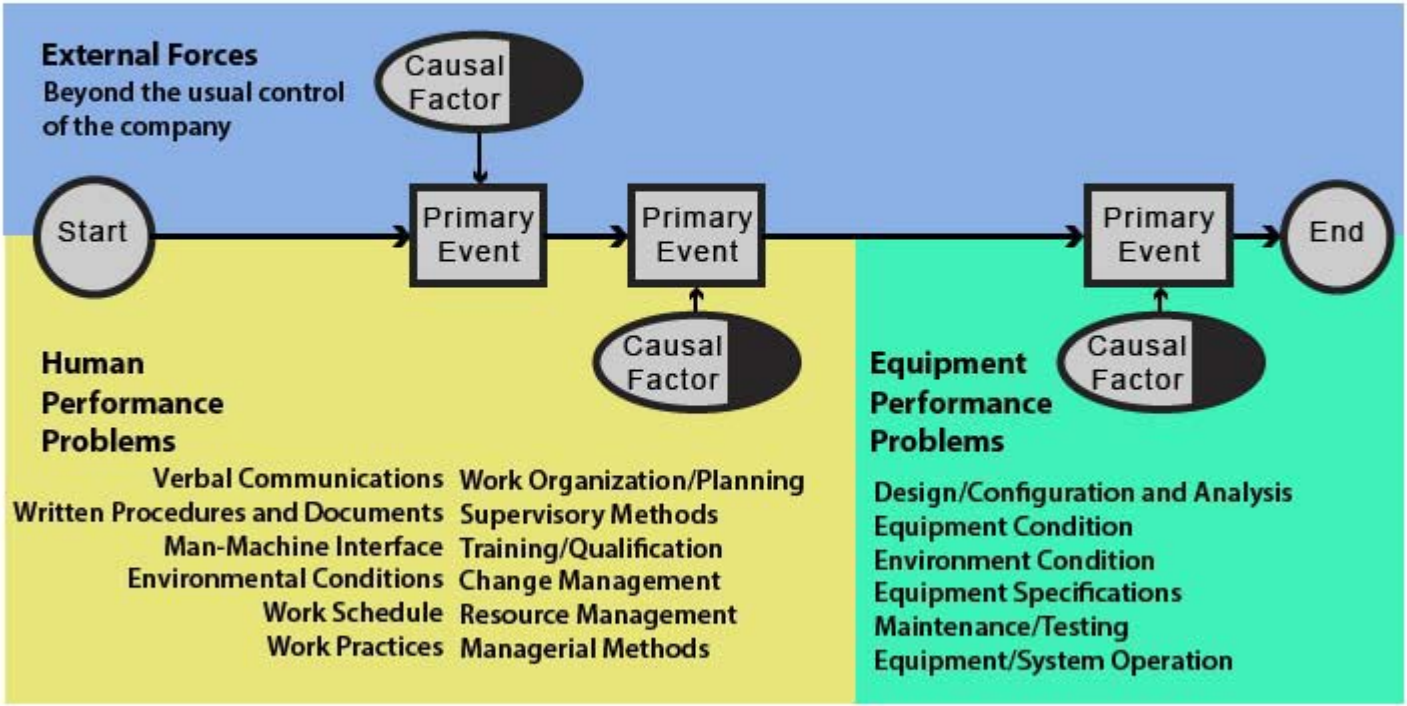
Long Description

The same Event Sequence Timeline graphic as before. There are now three new colored sections that break up this diagram. The first box is blue, it stretches across the top of the timeline, encompassing the Causal Factor above the first Primary Event, and it is labeled "External Forces." The second box is yellow, it stretches across the left two thirds of the bottom of the timeline, encompassing the Causal Factor below the second Primary Event, and it is labeled "Human Performance Problems." The last box is green, it takes up the last right third of the bottom of the timeline, encompassing the Causal Factor below the last Primary Event, and it is labeled "Equipment Performance Problems".

Causal Factor Categories, Cont.

Each Causal Factor category is further broken down into potential causal factors that are associated with Root Cause Analysis.



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Long Description

The same Event Sequence Timeline graphic as before. Each colored section now has an accompanying description. The blue External Forces section is described in a caption as "Beyond the usual control of the company." The yellow Human Performance Problems has a caption with the following list: "Verbal Communications, Written Procedures and Documents, Man-Machine Interface, Environmental Conditions, Work Schedule, Work Practices, Work Organization / Planning, Supervisory Methods, Training / Qualification, Change Management, Resource Management, and Managerial Methods." The green Equipment Performance Problems section has a caption with the following list: "Design / Configuration and Analysis, Equipment Condition, Environmental Conditions, Equipment Specifications, Maintenance / Testing, and Equipment / System Operation."

Case Study

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When Causal Factors are listed vertically, their problem types still fall into the same three categories:

- Human Performance Problems
- Equipment Performance Problems
- External Problems

There are 19 problems sorted into these three categories.

Next, you will be given an event-based problem and shown which category it falls into and what type of problem it is within that category.

D

Long Description

There are three, vertically aligned rectangles. The first rectangle is yellow and has a half-shaded oval with the title "Human" in the center. Under this section is the following list: "Verbal Communications, Written Procedures and Documents, Man-Machine Interface, Environmental Conditions, Work Schedule, Work Practices, Work Organization / Planning, Supervisory Methods, Training / Qualification, Change Management, Resource Management, and Managerial Methods". The second rectangle is blue and has a half-shaded oval with the title "External" in the center. Under this section is the following caption: "Outside the Company". The last rectangle is green and has a half-shaded oval with the title "Equipment" in the center. Under this section is the following list: "Equipment Condition, Environmental Conditions, Equipment Specifications, Maintenance / Testing, Equipment / System Operation, and Design / Configuration and Analysis".

Case Study, Cont.

Acme Company delivers steering wheels to a prime supplier. They are installed on U.S. Air Force tow tractors for use on the flight line.

The company's last delivery of steering wheels was rejected by the prime because the steering wheels would not fit onto the tractors and were out of spec.

Acme Company determined that the cause of the problem was that the illustrator failed to pay the proper attention to detail and misplaced the location of a drilled hole on the steering column.

The Primary Event on the Sequence Timeline would likely be labeled "Technical Drawing".

The Causal Factor connected to the primary event is Human.

The problem can be isolated to Work Practices.

Next, you will be asked to recognize the proper causal factor category and problem for a different example.

D

Long Description

There are three, vertically aligned rectangles. The first rectangle is yellow and has a half-shaded oval with the title "Human" in the center. Under this section is the following list: "Verbal Communications, Written Procedures and Documents, Man-Machine Interface, Environmental Conditions, Work Schedule, Work Practices, Work Organization / Planning, Supervisory Methods, Training / Qualification, Change Management, Resource Management, and Managerial Methods". The second rectangle is blue and has a half-shaded oval with the title "External" in the center. Under this section is the following caption: "Outside the Company". The last rectangle is green and has a half-shaded oval with the title "Equipment" in the center. Under this section is the following list: "Equipment Condition, Environmental Conditions, Equipment Specifications, Maintenance / Testing, Equipment / System Operation, and Design / Configuration and Analysis".

Causal Factors Knowledge Review 1

Acme Company delivers shipboard mounted chairs to the U.S. Navy. Each chair is equipped with a restraint to prevent the operator from falling out of the chair in heavy seas. The company's last delivery of restraints failed to meet the specified length of 28 inches.

Acme Company determined the cause of the problem was the machine that cuts the fabric for the belt was out of calibration and cut a lot of restraints at 27.5 inches. Which letter-number combination best describes the causal factor of the problem?

- [ ] A1
- [ ] B4
- [ ] C5
- [x] C6

Check Answer

A.

1 Verbal Communications
Written Procedures and Documents
Man-Machine Interface
Environmental Conditions
Work Schedule
2 Work Practices
Work Organization / Planning
Supervisory Methods
Training / Qualification
Change Management
Resource Management
3 Managerial Methods

B.

4 Outside the Company

C.

5 Equipment Condition
Environment Condition
Equipment Specifications
6 Maintenance / Testing
Equipment / System Operation
Design / Configuration and Analysis

The best answer is **C6** – the Maintenance/Testing of the belt cutting equipment (not set properly) was the causal factor of the belts being cut too short.

D

Long Description

There are three, vertically aligned rectangles. The first rectangle has a black box labeled "A". Under this section are three potential answers. Answer 1 is "Verbal Communications". Answer 2 is "Work Practices". Answer 3 is "Managerial Methods". The second rectangle has a black box labeled "B". Under this section is one potential answer, Answer 4 "Outside the Company". The last rectangle has a black box labeled "C". Under this section are two potential answers. Answer 5 is "Equipment Condition". Answer 6 is "Maintenance/Testing".

Causal Factors Knowledge Review 2

Acme Company ships restraints (seat belts) to a Virginia plant for installation to shipboard mounted chairs. The ABC Delivery Company picked up the pallet of Acme Company belts on Friday and left them in a back lot over the weekend.

Rain water seeped into the pallet of belts and soaked the webbed fabric. The belts shrunk ½ inch in transit to Virginia. Which letter-number combination best describes the causal factor of the problem on the Acme Company point of event timeline?

- [ ] A1
- [x] B4
- [ ] C5
- [ ] C6

Check Answer

A.

1 Verbal Communications
Written Procedures and Documents
Man-Machine Interface
Environmental Conditions
Work Schedule
2 Work Practices
Work Organization / Planning
Supervisory Methods
Training / Qualification
Change Management
Resource Management
3 Managerial Methods

B.

4 Outside the Company

C.

5 Equipment Condition
Environment Condition
Equipment Specifications
6 Maintenance / Testing
Equipment / System Operation
Design / Configuration and Analysis

The best answer is **B4** – the shrinkage of the belts was beyond the control of Acme Company assuming that Acme Company's delivery instructions warned the shipping company / customer of environmental precautions.

D

Long Description

There are three, vertically aligned rectangles. The first rectangle has a black box labeled "A". Under this section are three potential answers. Answer 1 is "Verbal Communications". Answer 2 is "Work Practices". Answer 3 is "Managerial Methods". The second rectangle has a black box labeled "B". Under this section is one potential answer, Answer 4 "Outside the Company". The last rectangle has a black box labeled "C". Under this section are two potential answers. Answer 5 is "Equipment Condition". Answer 6 is "Maintenance/Testing".

Human Category Causal Factors Example

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The graphic focuses on the Human Category and its 12 causal factors. Notice the Verbal Communication factor now points to 10 possible events that could occur to contribute to poor verbal communications. The list of 10 events are possible root causes to a problem. The next frame helps you connect these lists to the events illustrated on a factor chart.

- Verbal Communications
  - Shift turnover not performed or completed
  - Supervisor not notified of suspect problem
  - Pertinent information not transmitted
  - Information sent but not understood
  - Inaccurate message transmitted
  - Too much unfamiliar information presented at once
  - Information communicated too late
  - No means of communication available
  - Inadequate or malfunctioning communication equipment
  - Improper use of communication equipment
- Written Procedures and Documents
- Man-Machine Interface
- Environmental Conditions
- Work Schedule
- Work Practices
- Work Organization/Planning
- Supervisory Methods
- Training/Qualification
- Change Management
- Resource Management
- Managerial Methods

D

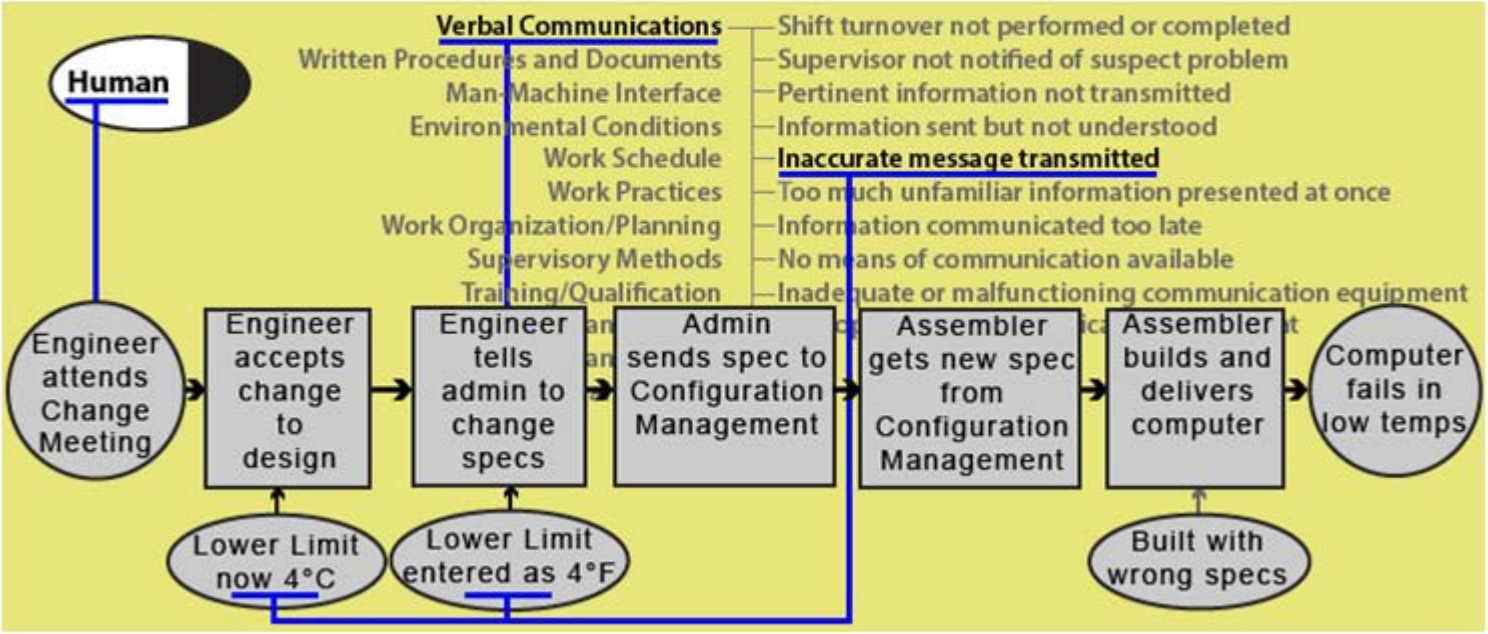
Long Description

A rectangle has a half-shaded oval labeled "Human". A two-column list is to the right. The first column reads: "Verbal Communications, Written Procedures and Documents, Man-Machine Interface, Environmental Conditions, Work Schedule, Work Practices, Work Organization/Planning, Supervisory Methods, Training/Qualification, Change Management, Resource Management, and Managerial Methods". To the right of "Verbal Communications" is a line connecting to the second column of the list, indicating ten possible events that can occur within Verbal Communications, including: "Shift turnover not performed or completed; Supervisor not notified of suspect problem; Pertinent information not transmitted; Information sent but not understood; Inaccurate message transmitted; Too much unfamiliar information presented at once; Information communicated too late; No means of communication available; Inadequate or malfunctioning communication equipment; Or improper use of communication equipment."

Human Category Causal Factors Example, Cont.

View CR *Submit CR*

The graphic uses blue lines to connect the Engineer to the Human Category. Another blue line connects the word "tells" in the diagram to the causal factor labeled Verbal Communications. And another blue line connects the mismatch in Celsius and Fahrenheit to the Root Cause – Inaccurate message transmitted. You have just recognized the root cause from a list of 10 potential events and mapped it to verbal communications as a causal factor.



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Long Description

The same rectangle and two-column list from before, but now with an Event Sequence Timeline overlaid on the bottom. On the left side of the Timeline is a circle labeled "Engineer attends Change Meeting". A thin blue line connects this circle to a half-shaded oval labeled "Human". A thick arrow branches from the right of this circle and connects to a square labeled "Engineer accepts change to design". Beneath this square is an oval labeled "Lower Limit now four degrees Celsius". A thin vertical arrow connects this oval to the square. To the right of both these graphics is another thick arrow pointing to a rectangle labeled "Engineer tells admin to change specs". A thin blue line connects this square to the words "Verbal Communications", indicating what category this Causal Factor falls under. Beneath this square is another oval labeled "Lower Limit entered as four degrees Fahrenheit". A thick arrowed line branches to the next rectangle, labeled "Admin sends specs to Configuration Management". A thick arrow branches to the next rectangle, labeled "Assembler gets new specs from Configuration Management". A thick arrowed line branches to the next rectangle, labeled "Assembler builds and delivers computer". Beneath this box is an oval labeled "Built with wrong specs". A thing vertical line connects this oval with the box. A thick arrowed line connects this last box to a circle labeled "Computer fails in low temps".

Equipment Causal Factors Example

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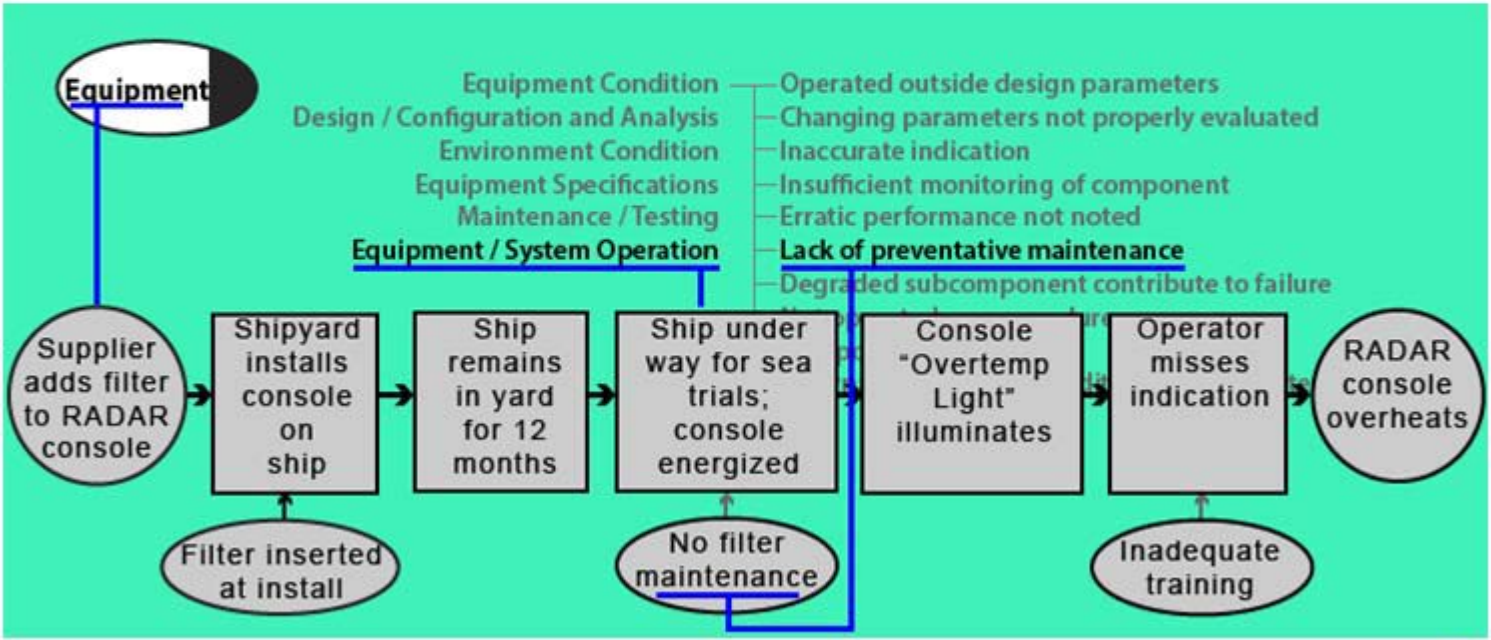
The graphic uses blue lines to connect the RADAR console to the Equipment Category. Another blue line connects the word "energized" in the diagram to the causal factor labeled Equipment/System Operation. Another blue line connects the U.S. Navy and the shipyard to the Root Cause – Lack of preventive maintenance. You have just recognized the root cause from a list of 10 potential events and mapped it to Equipment/System Operation as a causal factor.



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Long Description

A rectangle has a half-shaded oval labeled "Equipment". A two-column list is to the right. Most of the list is grayed out, except for the listing, "Equipment / System Operation". To the right of this list is second column, also grayed out, except for the listing "Lack of preventative maintenance". An Event Sequence / Timeline is overlaid on the bottom of the list. On the left side of the Timeline is a circle labeled "Supplier adds filter to RADAR console." A thin blue line connects this circle to the half-shaded oval labeled "Equipment." A thick arrowed line branches from the right of the first circle and connects to a square labeled "Shipyard installs console on ship." Beneath this square is an oval labeled "Filter inserted at install." A thin vertical arrow connects this oval to the rectangle. To the right of both these graphics is another thick arrow pointing to a rectangle labeled "Ship remains in yard for 12 months." A thick arrowed line branches to the next box, labeled "Ship under way for sea trials; console energized." A thin blue line branches from this rectangle to the words "Equipment /System Operation", indicating what category this Causal Factor falls under. Beneath this rectangle is an oval labeled "No filter maintenance". A thin blue line connects this oval to the words "Lack of preventative maintenance," indicating the root cause of this issue. A thick arrow branches to the next box, labeled "Console 'Overtemp Light' illuminates." A thick arrowed line branches into the next box, labeled "Operator misses indication." Beneath this box is an oval labeled "Inadequate training." A thin vertical line connects this oval with the rectangle. A thick arrowed line connects this last rectangle to a circle labeled "RADAR console overheats".

Causal Factors Job Aid

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The Root Cause Analysis Handbook, by Max Ammerman, printed by Productivity Press in 1998, lists over 700 possible root causes to explore when performing Root Cause Analysis.

The reference carefully guides you through the sorting process by first selecting a problem's category, then a problem's factor, and then the potential root cause(s).

A Job Aid has been made available that guides you step-by-step through this sorting process for a single problem with six potential root causes.

This job aid is best used as a training reference. You are encouraged to go to the Root Cause Analysis Handbook cited above.

Click here to access the Casual Factor Road Map to Potential Root Cause Job Aid for this training.

CMQ220 Root Cause Analysis

Job Aid – **Sorting Problems by Category, Factor, and Cause**

INTRODUCTION: This job aid is a list of potential root causes by problem category and causal factor. It is adapted from ideas suggested in the Root Cause Analysis Handbook, by Max Ammerman, 1998, and printed by Productivity Press. This job aid is not meant to provide you with a comprehensive list of potential root causes. It is only meant for you to learn to sort problems into categories, then into factors and finally into root causes. A complete and comprehensive list of root causes is available in the reference above.

1. **Sort Problems by Category**

   As you investigate problems, try to determine if the [illegible] one of these three categories:

   1. Human Performance Problems
   2. Equipment Performance Problems
   3. External Forces

   For example, if a supplier has identified a prob[illegible] with indicator on a mechanical device, you should fo[illegible] Performance Problem category. It is likely the root [illegible] related.

   By selecting a category in the early stage of Root Cause Anal[illegible] you are eliminating problems in the other categories and narrowing [illegible] list of potential root causes.

2. **Sort Problems Further by Causal Factors**

   Once you have identified the category of the problem, you [illegible] sort it even further by causal factor. The list below sorts 19 possible[illegible] factors into the three categories in the previous step:

D

Causal Factors Summary

There sure are a lot of causal factors in Root Cause Analysis.

It is like going to an automotive shop. You will find car problems there because that is where people take their vehicles with their problems. You do not look for cars with problems when parking at a restaurant.

So, the process of Root Cause Analysis is a study of all causal factors to determine which one is the basic reason for the problem.

Now, let's take a look at presumptive causal factors.

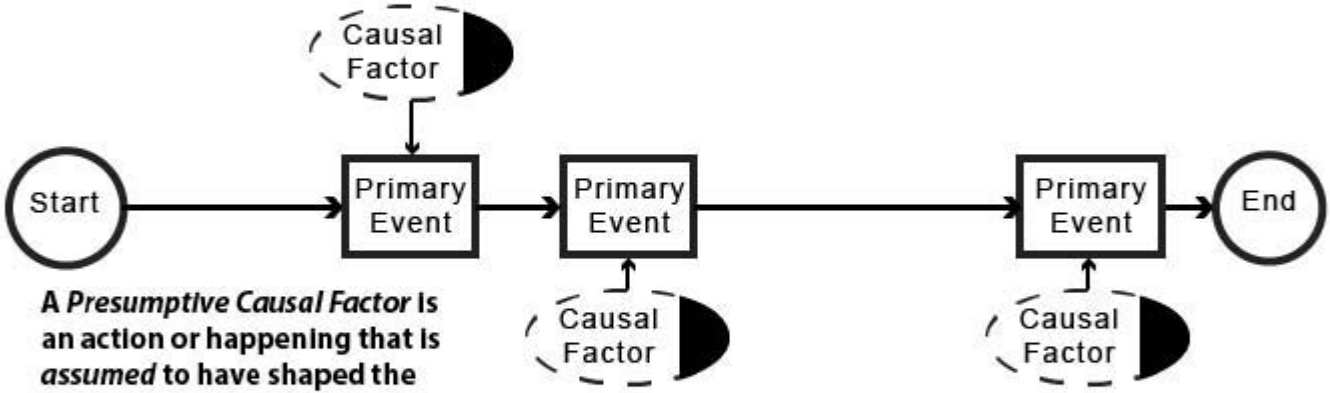
D

Long Description

The mentor and the DCMA specialist continue their conversation. The DCMA specialist remarks that, "There sure are a lot of causal factors in Root Cause Analysis." The mentor replies, "It is like going to an automotive shop. You will find car problems there because that is where people take their vehicles with their problems. You do not look for cars with problems when parking at a restaurant. So, the process of Root Cause Analysis is a study of all causal factors to determine which one is the basic reason for the problem. Now, let's take a look at presumptive causal factors."

Presumptive Causal Factor Introduction

Presumptive Causal factors are illustrated with dashed ovals with the right third shaded when they appear on an event sequence or timeline. Like causal factors, they are logical actions or happenings in a sequence, but they are also presumptive, because they have not yet been proven. They are assumed to be causal factors to the primary event to which they are connected. Presumptive causal factors need validation.



A *Presumptive Causal Factor* is an action or happening that is *assumed* to have shaped the outcome of a primary event, and may logically appear in the sequence.

D

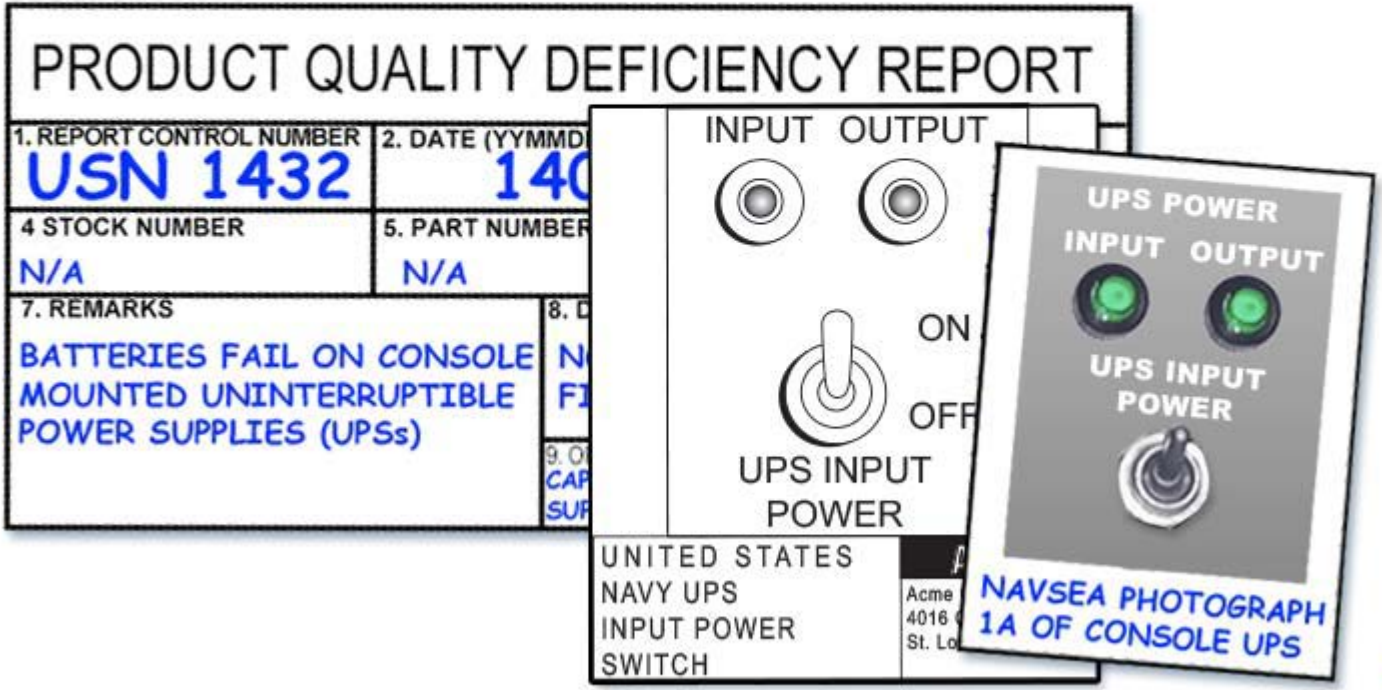
Long Description

An Event Sequence Timeline is shown. A Start circle is followed by three Primary Event rectangles and then an End circle. Each of the Primary Event rectangles has a dashed oval with right third shaded pointing to it. These dashed right third-shaded ovals are labeled "Causal Factor". There is a caption that reads, "A Presumptive Causal Factor is an action or happening that is assumed to have shaped the outcome of a primary event, and may logically appear in the sequence."

Case Study

View CR *Submit CR*

Compare the artifacts below to each other. Acme Company builds Uninterruptible Power Supplies (UPSs) for the U.S. Navy. In order for the backup batteries installed in the UPS to remain charged, the Technical Manual requires the UPS INPUT POWER Switch to be set to the ON position. This allows shipboard power to pass through to charge the batteries. Based on the Deficiency Report, power is not getting to the backup batteries in the UPSs when ship's power is lost.



D

Long Description

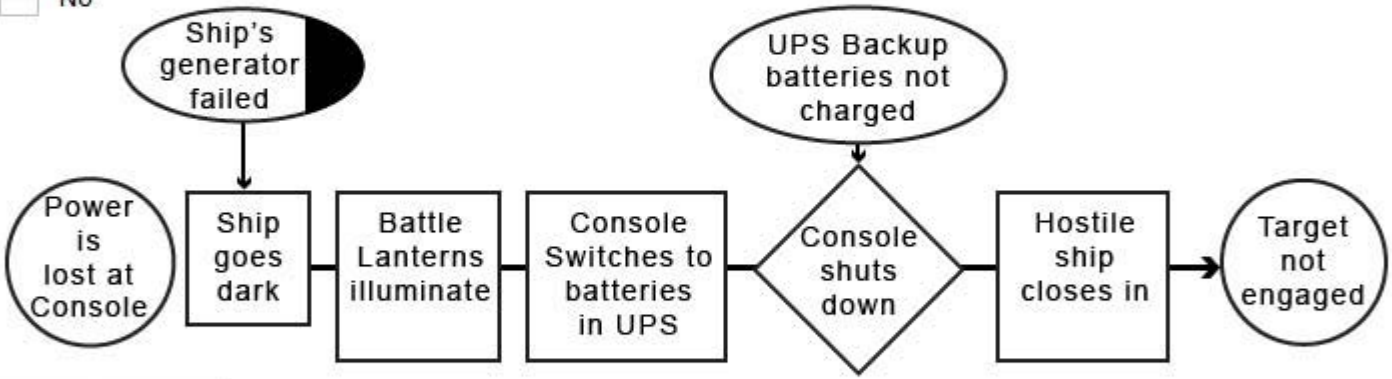
Three documents are pictured together. The first is a Product Quality Deficiency Report that says "Batteries fail on console mounted Uninterruptible Power Supplies (UPSs)". The next document is an engineering drawing of the Input Power Switch. The drawing depicts a switch labeled "UPS INPUT POWER" with the up position labeled as "ON" and the down position labeled as "OFF". Two other lights are depicted. One is labeled "INPUT" and the other is labeled "OUTPUT". The last document is a photograph of the UPS Input Power Switch. The switch is labeled "UPS INPUT POWER", but there are no "ON" and "OFF" labels. There are two other lights. One is labeled "INPUT", and the other is labeled "OUTPUT". There is another label above the "INPUT" and "OUTPUT" labels that says "UPS POWER".

Case Study Knowledge Review 1

View CR *Submit CR*

In its corrective action process, Acme Company has reported that the UPS Input Power Switch was in the wrong position (OFF) and failed to charge the backup batteries. Based on the artifacts on the previous frame, is there a presumptive causal factor that should be added to their chart?

- [x] Yes
- [ ] No



Check Answer

The answer is **Yes** – Compare the labels on the drawing to the labels on the equipment. The reason the UPS Batteries did not charge is presumed to be that the UPS Input Switch was in the wrong position.

D

Long Description

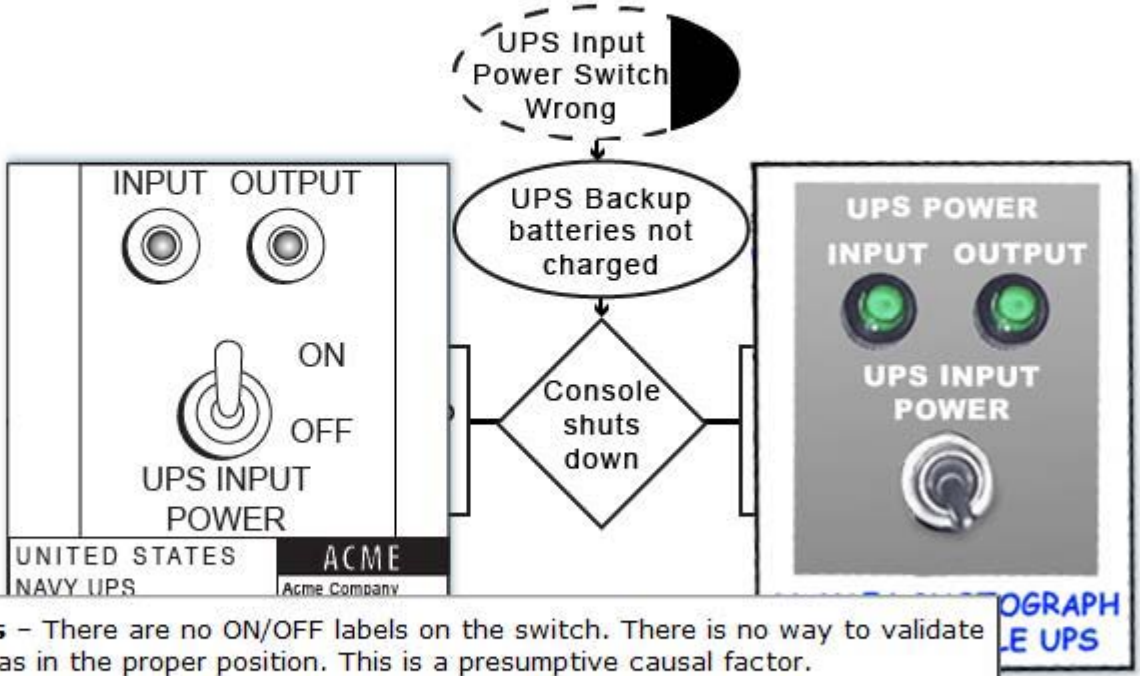
An Event Sequence Timeline is shown. The start event circle is labeled "Power is lost at Console". This points to a Primary Event rectangle that is labeled "Ship goes dark". An oval with right third shaded points to the "Ship goes dark" rectangle. This oval is labeled "Ship's generator failed." The "Ship goes dark" rectangle then points to another primary event rectangle labeled "Battle Lanterns illuminate", which points to another primary event rectangle labeled "Console Switches to batteries in UPS", which then points to a diamond labeled "Console shuts down". An oval with no shading points down to the "Console shuts down" diamond. This oval is labeled "UPS Backup batteries not charged". The "Console shuts down" diamond then points to a primary event rectangle labeled "Hostile ship closes in", which then points to the end event circle, which is labeled "Target not engaged".

Case Study Knowledge Review 2

View CR *Submit CR*

Acme Company has responded to DCMA in their Corrective Action Request that the UPS Input Power Switch was in the wrong position (OFF) and failed to charge the backup batteries. Based on the artifacts on the previous frame, is there a presumptive causal factor that should be added to their chart?

- [x] Yes
- [ ] No



Check Answer

The answer is **Yes** – There are no ON/OFF labels on the switch. There is no way to validate that the switch was in the proper position. This is a presumptive causal factor.

D

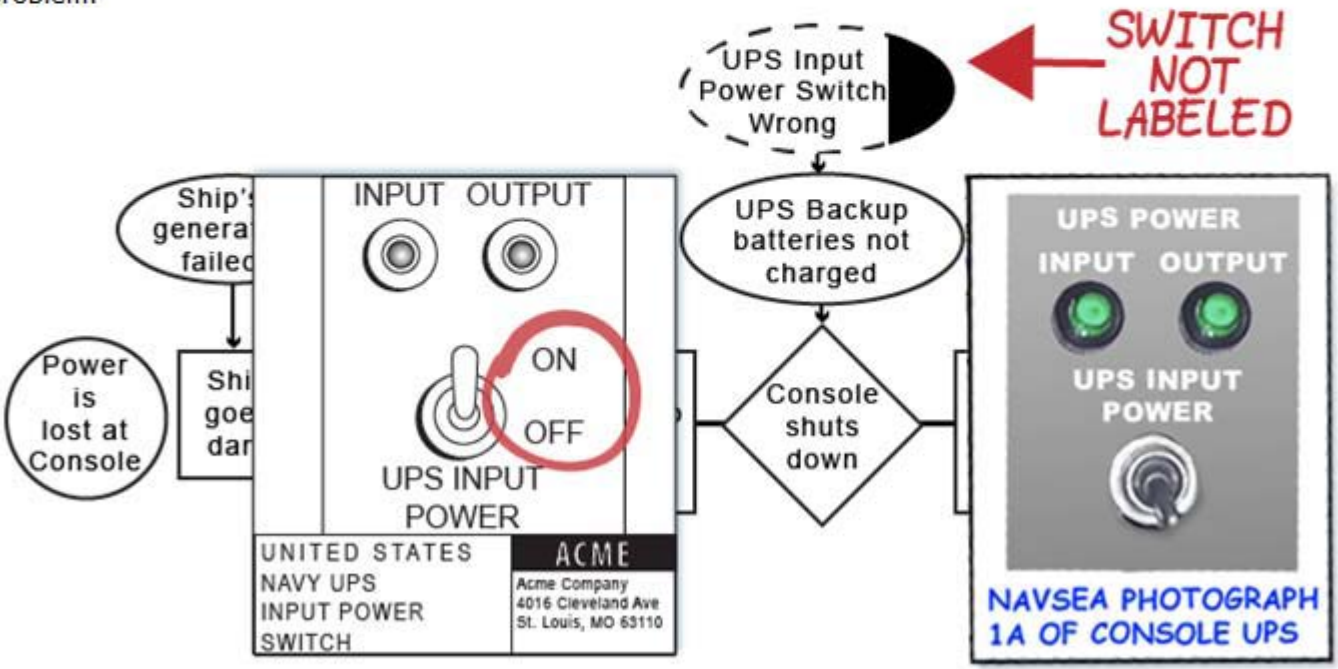
Long Description

The engineering drawing of the UPS INPUT POWER switch is displayed along with the photograph of the UPS INPUT POWER switch. Again, the drawing depicts the switch labeled "UPS INPUT POWER" with the up position labeled as "ON" and the down position labeled as "OFF". The photograph depicts the switch labeled "UPS INPUT POWER", but there are no "ON" and "OFF" labels. Also depicted is a portion of the Event Sequence Timeline from the previous page. The portion shown is the diamond labeled "Console shuts down", which is pointed to by the plain oval labeled "UPS Backup batteries not charged". There is a new addition to this Event Sequence Timeline, and that is a dashed oval with right third shaded labeled "UPS Input Power Switch Wrong", which points to the "UPS Backup batteries not charged" oval.

Case Study Conclusion

Acme Company has declared the Root Cause of the UPS battery failure as SWITCH NOT LABELED. The photograph of the switch shows that there are no labels for the ON or OFF position. This led Acme Company to deduce that the operator could not determine ON from OFF which is therefore, the root cause.

This is an example of how a presumptive cause facilitates the determination of the root cause of a problem.



D

Long Description

A collage is depicted here of the engineering drawing and photograph of the UPS INPUT POWER switch, superimposed over the Event Sequence Timeline from the previous frames. The labels "ON" and "OFF" are circled in red on the engineering drawing. A note is handwritten in red that says "Switch Not Labeled", and the note contains a red arrow pointing to the dashed oval with right third shaded that is labeled "UPS Input Power Switch Wrong".

Presumptive Causal Factor Knowledge Review

When you are looking for presumptive causes that may point to the root cause of a problem, what is the shape you are looking for?

- [ ] A dashed oval with no shading
- [ ] An oval with right third shaded
- [ ] A dashed oval with left third shaded
- [x] A dashed oval with right third shaded

Check Answer

The best answer is that presumptive causes are illustrated with a **dashed oval whose right third is shaded**.

Presumptive Causal Factor Summary

Finding presumptive causes looks to be a difficult task for our supplier.

In this example, the artifacts were generated to be obvious.

Imagine the wall of a room filled with a factor diagram and hundreds of causes. Yes, presumptive causes are difficult tasks to prove. Many are dismissed and few are determined to be root causes, but they still may point your suppliers in the right direction.

Now, it is time to look at a process to define our presumptive causes.

D

Long Description

The mentor and the DCMA specialist continue their conversation. The DCMA specialist comments that, "Finding presumptive causes looks to be a difficult task for our supplier." The mentor replies, "In this example, the artifacts were generated to be obvious. Imagine the wall of a room filled with a factor diagram and hundreds of causes. Yes, presumptive causes are difficult tasks to prove. Many are dismissed and few are determined to be root causes, but they still may point your suppliers in the right direction. Now, it is time to look at a process to define our presumptive causes."

View CR Submit CR

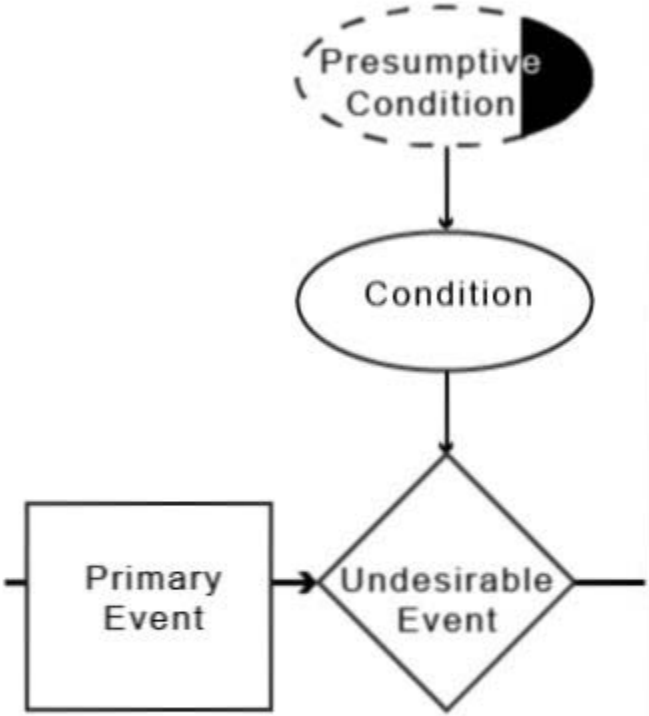
Presumptive Cause Validation

A presumptive cause requires validation before it can be considered as a root cause.

The Quality industry suggests the heart of analysis centers around the use of information and reasoning to support or eliminate presumptive causes.

At DCMA, you have minimum interaction with your suppliers when they are performing their root cause analysis and developing their Corrective Action Plan (CAP). However, you may learn of their analysis results when viewing their CAP.

This may require you to scan their reports to determine if their presumptive causes were factored into their analysis and whether or not they were validated.



D

Long Description

A portion of an Event Sequence Timeline is shown. It starts with a rectangle labeled "Primary Event" which points to a diamond labeled "Undesirable Event". The diamond is pointed to by a plain oval labeled "Condition", which is pointed to by a dashed oval with right third shaded that is labeled "Presumptive Condition".

View CR Submit CR

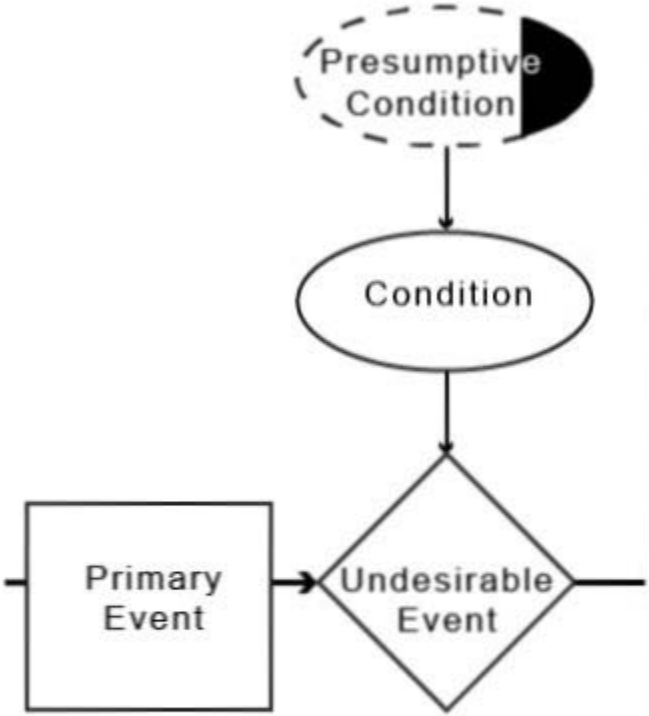
Presumptive Cause Validation, Cont.

There are two steps to validate presumptive causes. The purpose of the steps is to help you reason through information. The steps are characterized by these phrases:

1. For each cause, ask, "If I fix this, will I prevent the problem from happening again?"
2. For each cause, ask, "If [blank] is the root cause, how does it explain the problem situation as well as the comparable situations?"

If fixing that cause will not prevent the problem from recurring, or if that cause does not explain both the problem and comparable situations, then you cannot consider it to be a root cause of the problem. You may show it as a contributing cause on factor chart if when viewed alone, that cause would not have caused the problem, but it is important enough to be recognized as needing corrective action to improve the quality of the process or product.

Let us revisit Acme Company and the Presumptive Cause of its UPS backup battery problem.



D

Long Description

The same Event Sequence Timeline portion from the previous page is shown. Again, it starts with a rectangle labeled "Primary Event" which points to a diamond labeled "Undesirable Event". The diamond is pointed to by a plain oval labeled "Condition", which is pointed to by a dashed oval with right third shaded that is labeled "Presumptive Condition".

Presumptive Cause Validation Knowledge Review 1

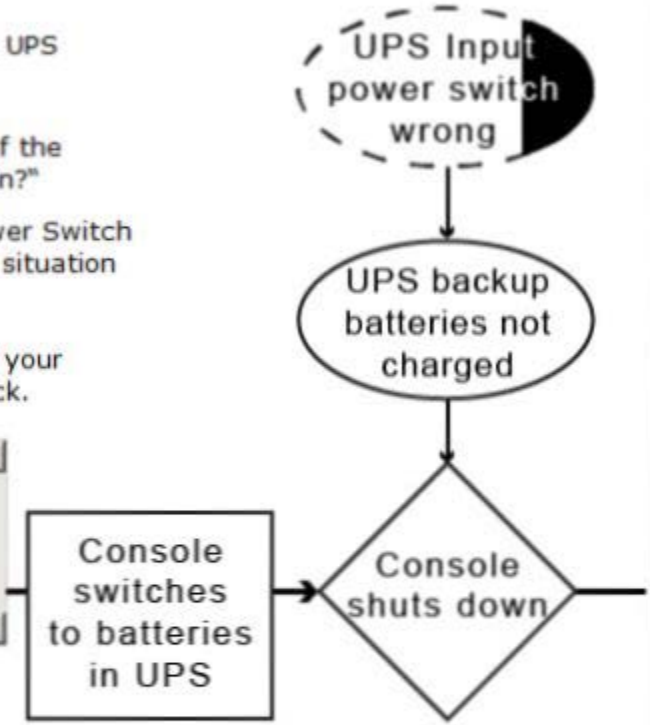
View CR Submit CR

Consider these steps for the case of Acme Company and its UPS backup battery failure:

1. For the presumptive cause, ask, "If I fix the position of the switch, will I prevent the problem from happening again?"
2. For the presumptive cause, ask, "If the UPS Input Power Switch position is the root cause, does it explain the problem situation as well as the comparable situations?"

   Answer both of these questions in the box below with your reasoning and select Check answer to receive feedback.

Check Answer



D

Long Description

A portion of an Event Sequence Timeline is shown. It starts with a rectangle labeled "Console switches to batteries in UPS" which points to a diamond labeled "Console shuts down". The diamond is pointed to by a plain oval labeled "UPS backup batteries not charged", which is pointed to by a dashed oval with right third shaded that is labeled "UPS Input power switch wrong".

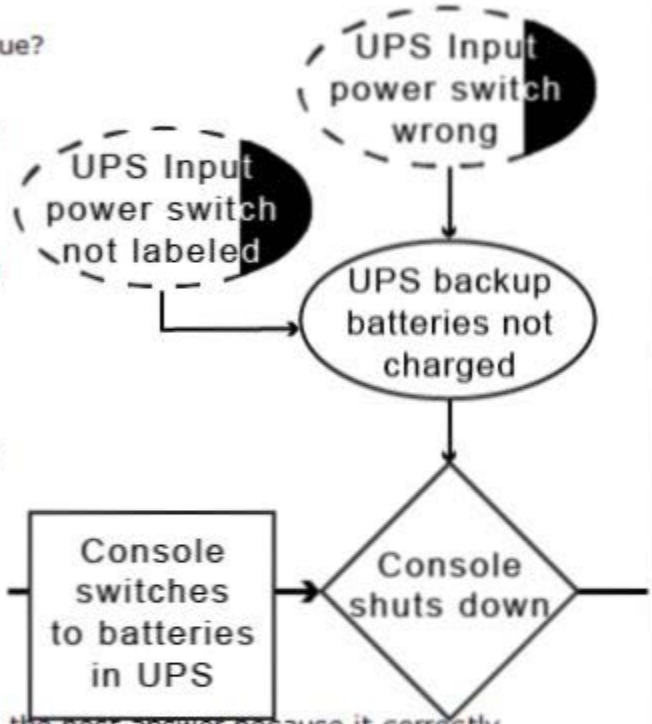
Presumptive Cause Validation Knowledge Review 2

View CR Submit CR

Based on the Factor Chart, which of the below phrases is true?

- [ ] For the presumptive cause "UPS Input Power Switch Not Labeled", if I label the switch, I will prevent the problem from happening again.
- [x] For the presumptive cause "UPS Input Power Switch Not Labeled", if the UPS Input Power Switch Not Labeled is the root cause, it explains the problem situation as well as the comparable situations.
- [ ] For the presumptive cause "UPS Input Power Switch Wrong", if the position of the switch is set to ON, it will prevent the problem from happening again.

Check Answer



This is a very difficult question. The second answer is the best answer because it correctly **identifies the Root Cause (Switch not labeled) and when compared to other factors, explains the problem**. It is assumed that when the switch is labeled per the specification, then the operator will position the switch per the technical manual.

D

Long Description

The same Event Sequence Timeline from the previous page is shown, except now there is an additional dashed oval with right third shaded that points to the plain oval "UPS backup batteries not charged". This new dashed oval with right third-shaded is labeled "UPS Input power switch not labeled". As a reminder, the Event Sequence Timeline starts with a rectangle labeled "Console switches to batteries in UPS" which points to a diamond labeled "Console shuts down". The diamond is pointed to by a plain oval labeled "UPS backup batteries not charged", which is pointed to by a dashed oval with right third shaded that is labeled "UPS Input power switch wrong".

Presumptive Cause Validation Summary

View CR Submit CR

Yikes. For two simple validation steps, it seems like we must dig really deep into presumptive causes.

Well, your suppliers might, and their problems are not usually missing labels on their equipment.

But, there may be occasions where you are tasked to perform Root Cause Analysis on an internal DCMA process and find presumptive causes.

It is rare, but supervisors might challenge you with internal analysis to check your comprehension of the fundamentals. Remember, validating a presumptive cause is two steps.

Now, let's take a look at the differences between root and contributing causes.

D

Long Description

The mentor and the DCMA specialist continue their conversation. The DCMA specialist exclaims, "Yikes. For two simple validation steps, it seems like we must dig really deep into presumptive causes." The mentor replies, "Well, your suppliers might, and their problems are not usually missing labels on their equipment. But, there may be occasions where you are tasked to perform Root Cause Analysis on an internal DCMA process and find presumptive causes. It is rare, but supervisors might challenge you with internal analysis to check your comprehension of the fundamentals. Remember, validating a presumptive cause is two steps. Now, let's take a look at the differences between root and contributing causes."

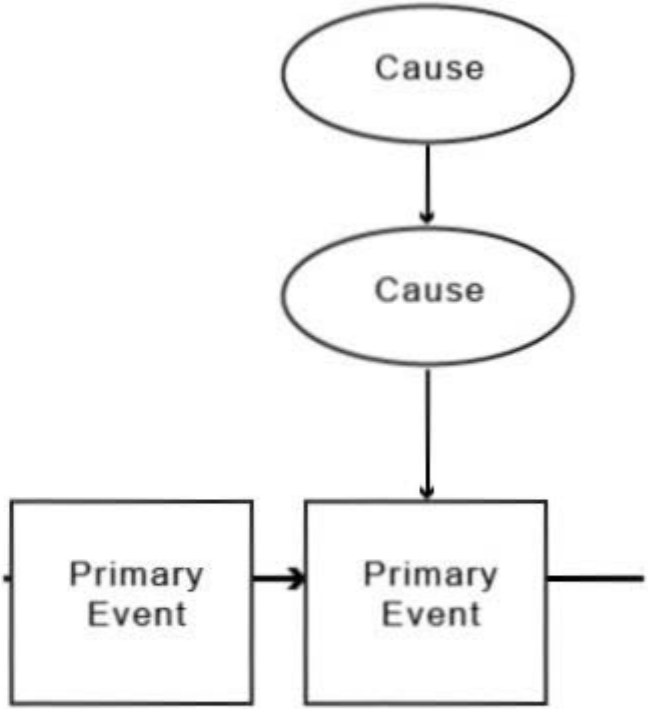
View CR Submit CR

Separating Root and Contributing Causes

When problem solving, it will be necessary to separate contributing causes from root causes. By recognizing the difference, you are better prepared to focus on the root cause.

There are three questions used in the Quality industry to determine if each validated cause is a root cause or a secondary or possible cause:

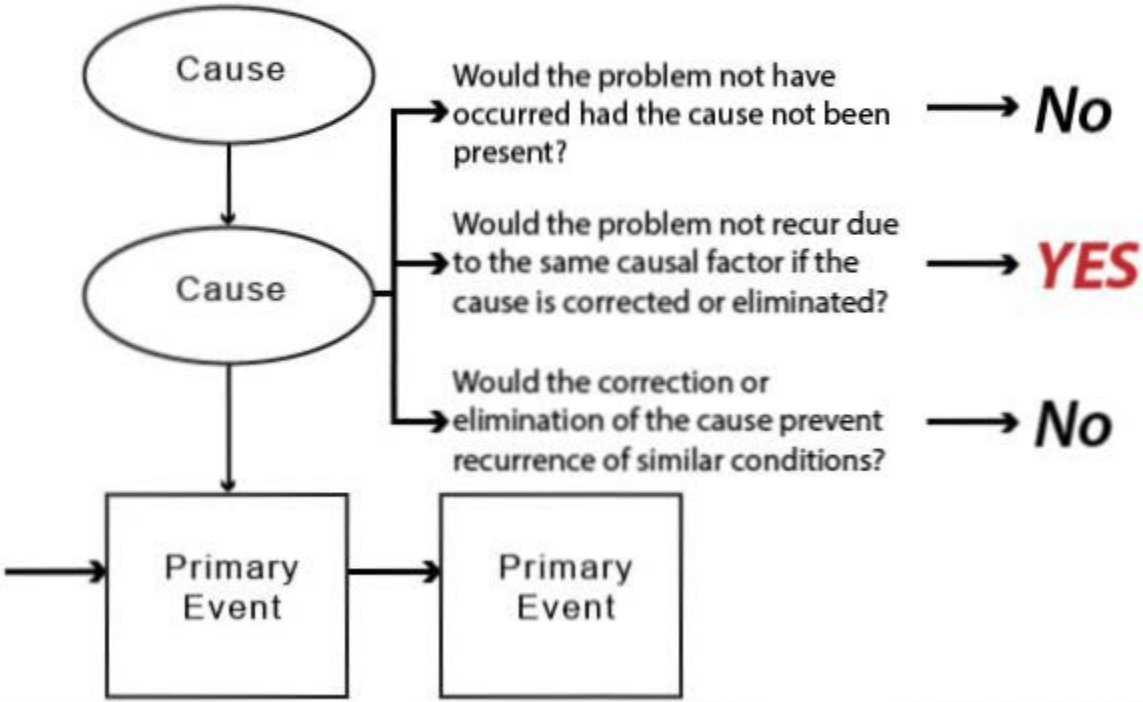
1. Would this problem have occurred had this causal factor not been present?
2. Will this problem still recur even if this causal factor is corrected or eliminated?
3. Will the correction or elimination of this causal factor prevent recurrance of similar conditions?



Separating Root and Contributing Causes, Cont.

Use these statements as a guideline for separating root causes from contributing causes:

- If you get a "yes" to a question, you have a root cause.
- If you get a "no" to a question, you have a contributing cause.



D

Long Description

An event sequence timeline showing contributing causes and primary events. Three questions branch from one of the causes. Each question is followed by a "Yes" or "No" answer. The first question is: "Would this problem have occurred had this causal factor not been present?" The answer is "No". The second question is: "Will this problem still recur even if this causal factor is corrected or eliminated?" The answer is "Yes". The last question is "Will the correction or elimination of this causal factor prevent recurrance of similar conditions?" The answer is "No".

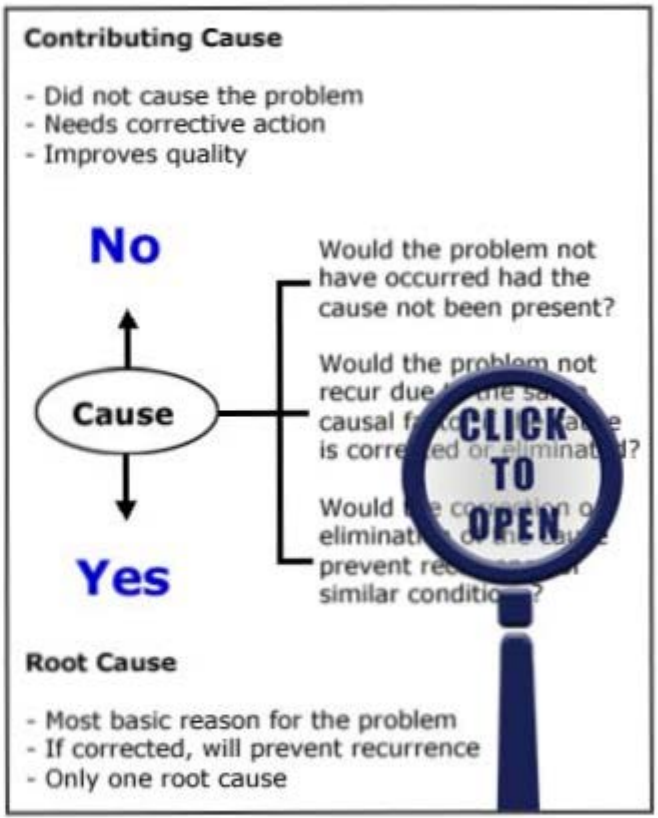
View CR Submit CR

Case Study Introduction and Training Aid

To further help you understand how to recognize the difference, the definitions of Contributing and Root Cause have been added to a training aid with the three questions used to separate them.

The next series of frames will present you with a case study and a question. The training aid may be accessed while reviewing the case study by clicking on the provided hyperlink.

Click here to open the training aid.



Case Study Knowledge Review 1

View CR Submit CR

Based on the best information available, your supplier has provided you a list of potential causes for a problem with On/Off Indicator lamps on a U.S. Army power panel. They have documented ideas and photographed the defect. The lamps were reversed. The ON lamp should be green and the OFF lamp should be red. This allows a soldier to determine the operating status of the equipment from across a room. Read the list of causes and view the photograph.

Click here to access the training aid.

Now answer the question "Is the last entry a contributing or root cause?"

- [ ] Root Cause
- [x] Contributing Cause

Check Answer

The correct answer is **Contributing Cause**. There is a "No" a

Case Study Knowledge Review 2

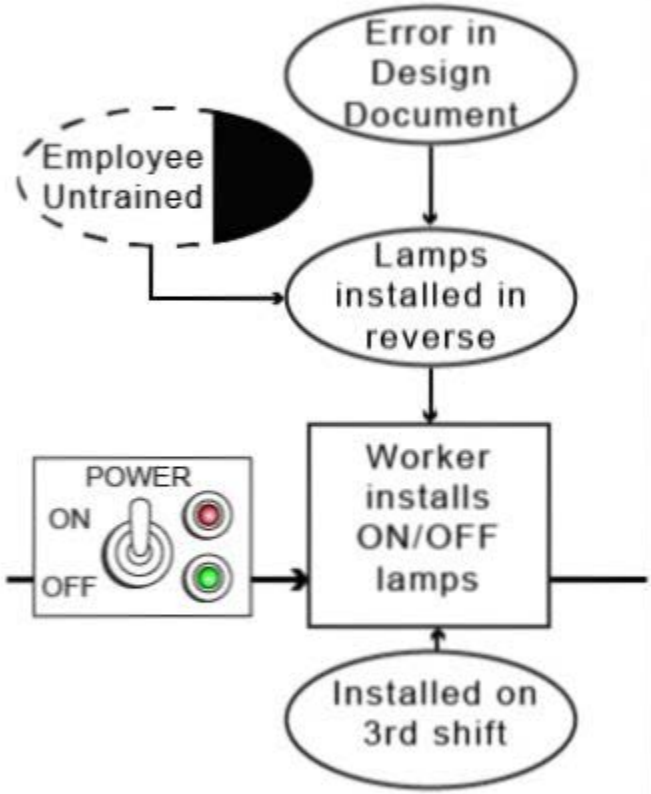
View CR Submit CR

Your supplier has created a causal factor chart for its problem with On/Off Indicator lamps on the power panel. Trace the causes on the chart.

Click here to access the training aid.

Now answer the question: "Is the cause labeled "Error in Design Document" a contributing or root cause?"

- [x] Root Cause
- [ ] Contributing Cause



The correct answer is **Root Cause**. There is a "Yes" answer to one of the questions.

D

Long Description

A drawing of a POWER switch is shown. The up position of the switch is labeled "ON", and the down position of the switch is labeled "OFF". Next to the drawing of the switch is a portion of an Event Sequence Timeline, which contains only one rectangle. The rectangle is labeled "Worker installs ON/OFF lamps". Pointing to this rectangle are two plain ovals, one of which is labeled "Installed on third shift", and the other of which is labeled "Lamps installed in reverse." Pointing to the plain oval labeled "Lamps installed in reverse" are two other ovals. One oval is a plain oval labeled "Error in Design Document". The other oval is dashed with right third shaded, and it is labeled "Employee Untrained".

Separating Root and Contributing Causes Knowledge Review

Which of the following is a question asked of each cause on a factor chart to determine whether it is a contributing or root cause?

- [ ] Would a presumptive cause without validation occur in the absence of this cause?
- [ ] Would a corrective action plan ensure the cause is not repeated?
- [ ] Would more supervision have prevented the cause from occurring?
- [x] Would the problem not have occurred had the cause not been present?

Check Answer

The best answer is that you should ask each cause one of three questions. The only one of those three questions listed here is – **Would the problem not have occurred had the cause not been present?**

Separating Root and Contributing Causes Summary

Do our suppliers really use three questions to sort their contributing causes from their root causes?

At DCMA, we review Corrective Action Plans that tend to summarize most analysis into a single root cause. Suppliers are not likely to share their factor charts. They tend to be focused on the corrective action.

Now, it is time to look at the methods to verify a root cause.

D

Long Description

The mentor and the DCMA specialist continue their conversation. The DCMA specialist asks, "Do our suppliers really use three questions to sort their contributing causes from their root causes?" The mentor replies, "At DCMA, we review Corrective Action Plans that tend to summarize most analysis into a single root cause. Suppliers are not likely to share their factor charts. They tend to be focused on the corrective action. Now, it is time to look at the methods to verify a root cause."

Root Cause Verification Methods

In the quality industry, there are four methods of verifying a root cause. Your suppliers may be able find a root cause without a verification method, but that does not always mean a cross-check is not necessary. At DCMA, be prepared to perform one of these four methods independently.

Click on each of the below verification methods to learn more about the method.

- Cross-check all facts
- Cross-check all analysis
- Resolve inconsistencies
- Check conclusions with trials

Popup Content

Review:

Witness statements or accounts
Physical and photographic evidence
Records and software
Expert testimony
General physical: engineering information
General historical: analytic information

Cross-check all analysis using verified facts

Review:

Barrier analysis
Change analysis
Event and causal factor analysis

Resolve inconsistencies and discrepancies

Look for and adjudicate the following artifacts:

Inaccurate or conflicting witness statements
Conflicts between drawings and photographs
Deviations from Design Documents
Poorly maintained records of configuration management

Check conclusions with trials

Although not always available (or financially prudent), a trial run of a product on an assembly line may help verify that the root cause is repeated and witnessed.

Software can be tested and verified (for root cause) using simulations, as well.

Root Cause Verification Methods Knowledge Review

View CR Submit CR

Acme Company is performing a corrective action against a nonconformance defect documented as:

CABINET FAILS TO MEET TWO-PERSON LIFT STANDARD

The U.S. Air Force rack-mounted radio cabinet requires three people to lift when the design specifies two. The root cause is published as:

TEST SCALE NOT CALIBRATED

Are there any inconsistencies in the physical evidence illustrated on the graphic?

- [x] Yes
- [ ] No

Check Answer

The correct answer is **Yes**. Note the one month gap on the Calib[illegible] radio [illegible]. There was no March record of calibration for the scale.

Root Cause Verification Methods Summary

I hope my suppliers provide comprehensive Corrective Action Plans with their root causes already verified.

Most do. DCMA suppliers must be held accountable to design requirements and specifications. It makes a difference to the U.S. Air Force and whether they send two or three airmen out to replace a radio cabinet on an aircraft.

You should still be prepared to recognize the three methods of verifying a root cause.

Now, let's take a look at a scenario that will help you identify root and contributing causes.

D

Long Description

The mentor and the DCMA specialist continue their conversation. The DCMA specialist states, "I hope my suppliers provide comprehensive Corrective Action Plans with their root causes already verified." The mentor replies, "Most do. DCMA suppliers must be held accountable to design requirements and specifications. It makes a difference to the U.S. Air Force and whether they send two or three maintainers out to replace a radio cabinet on an aircraft. You should still be prepared to recognize the three methods of verifying a root cause. Now, let's take a look at a scenario that will help you identify root and contributing causes."

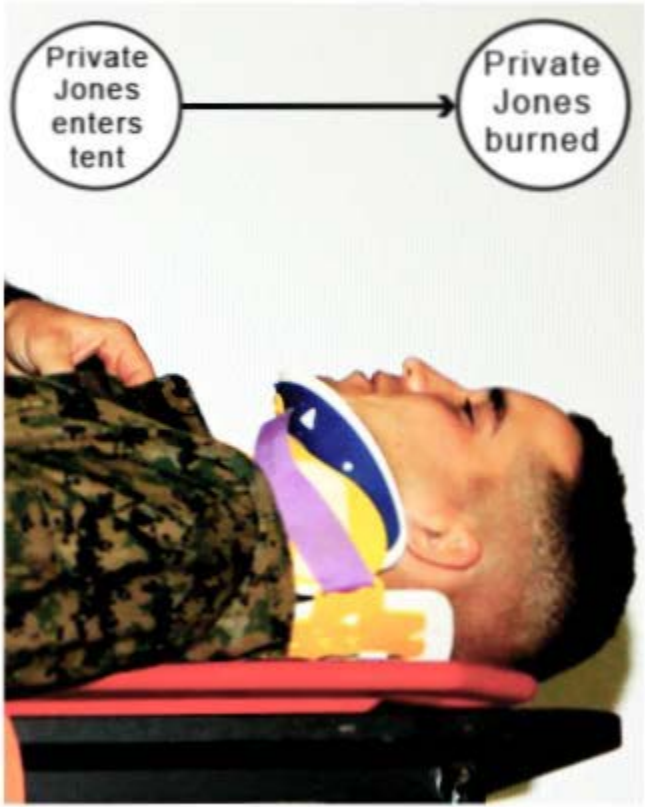
Case Study Introduction

To further help you understand how to identify root and contributing causes, we have a scenario.

This scenario involves Acme Company and its delivery of electrical fuses with its Combat Ready Multi-Purpose Tent.

No members of the U.S.M.C. were injured in the design of this training. It does end with a Private Jones (fictional character) in the hospital with burns suffered in an electrical fire.

Notice the start event and end event shapes superimposed on the photograph. The next frame will fill in the spaces between the start and end points.



The young Marine photographed here was a volunteer for a non-related medical demonstration. It is provided courtesy of the U.S.M.C. Photo by: Lance Corporal Paul S. Martinez.

D

Long Description

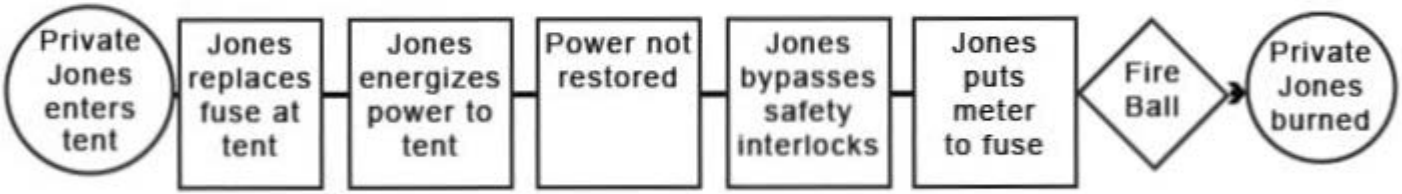
A soldier is laying on a gurney, apparently unconscious. He is wearing a neck brace. Superimposed above the soldier is an Event Sequence Timeline with only the start and end events shown. The start event circle is labeled "Private Jones enters tent". The end event circle is labeled "Private Jones burned".

Case Study

View CR Submit CR

Acme Company has shared its Event and Causal Factor chart with DCMA, and your supervisor has tasked you to independently identify the contributing and root causes.

First, trace the steps of Private Jones through the primary events. Remember, Acme Company supplies fuses for the tent.



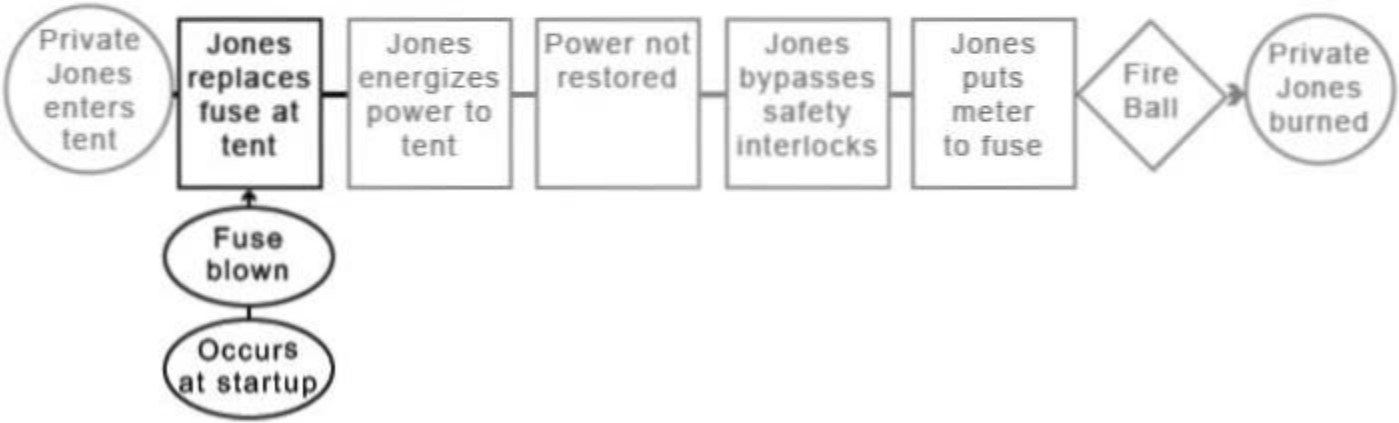
D

Long Description

An Event Sequence Timeline is shown. The starting circle is labeled "Private Jones enters tent". This points to a rectangle labeled "Jones replaces fuse at tent". This points to a rectangle labeled "Jones energizes power to tent". This points to a rectangle labeled "Power not restored". This points to a rectangle labeled "Jones bypasses safety interlocks". This points to a rectangle labeled "Jones puts meter to fuse". This points to a diamond labeled "Fire Ball", which finally points to the ending circle labeled "Private Jones burned".

Case Study, Cont.

Two ovals have been added to the Event and Causal Factor chart that point to the reason Private Jones replaced the fuses at the tent. Now remind yourself that Private Jones getting burned is the problem. Then answer the question on the next frame.



D

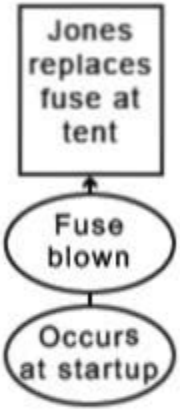
Long Description

The same Event Sequence Timeline from the previous page is depicted here, but now, shapes have been added to the first rectangle, which is labeled "Jones replaces fuse at tent". Pointing to the "Jones replaces fuse at tent" rectangle is now an oval labeled "Fuse blown" which is being pointed to by another oval labeled "Occurs at startup".

Case Study Knowledge Review 1

View CR Submit CR

Which statement best describes the oval labeled "Occurs at Startup"?



- [ ] It is a presumptive cause that needs validation?
- [x] It is a condition that contributed to an event?
- [ ] It is a contributing cause?
- [ ] It is a root cause?

Check Answer

The correct answer is that a blown fuse that occurs at startup **is a condition that caused Private Jones to replace the fuse at the tent.**

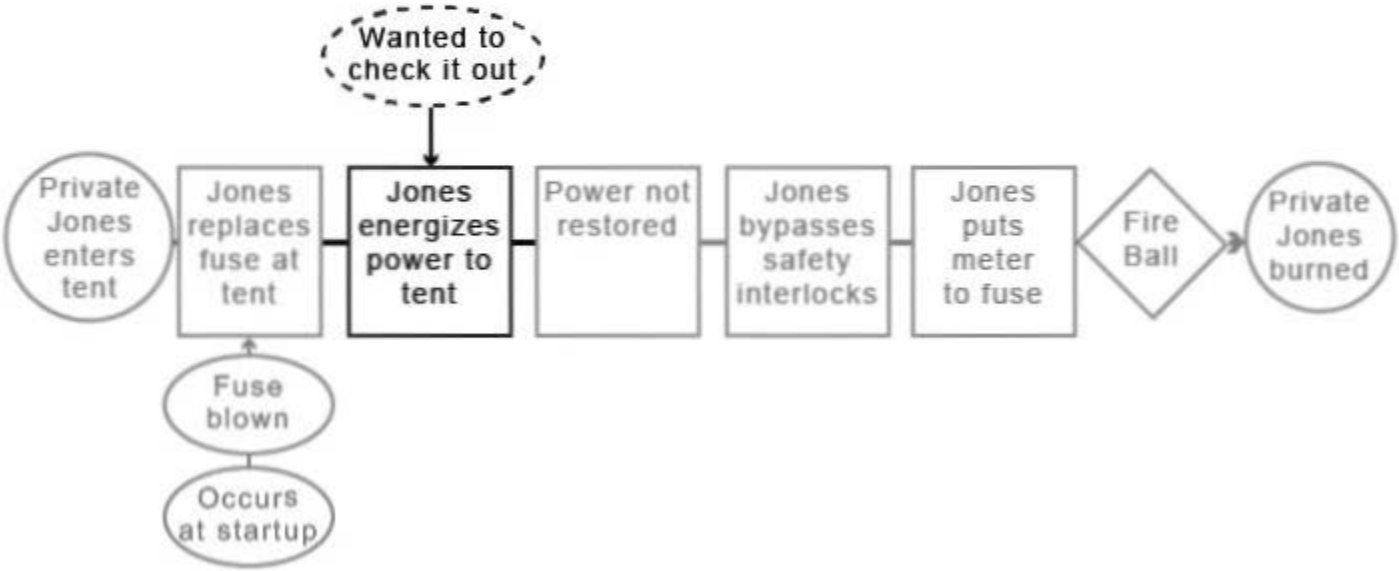
D

Long Description

A section of the same Event Sequence Timeline from the previous page is depicted here. The section depicted here is the rectangle labeled "Jones replaces fuse at tent", which is pointed to by the oval labeled "Fuse blown", which is pointed to by the oval labeled "Occurs at startup".

Case Study, Cont.

During his interview, Private Jones disclosed that after he replaced the fuse, he wanted to check it out. He applied power to the tent. There were no records of tag out or energizing the system at the power switch. Now answer the question on the next frame.



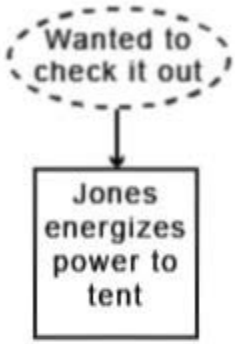
D

Long Description

e same Event Sequence Timeline from the previous page is depicted here, but now, a shape has been added to the second rectangle, which is labeled "Jones energizes power to tent". Pointing to the "Jones energizes power to tent" rectangle is now a dashed oval labeled "Wanted to check it out".

Case Study Knowledge Review 2

Which statement best describes the oval labeled "Wanted to check it out"?



- [ ] It is a condition that contributed to an event
- [x] It is a presumptive cause that needs validation
- [ ] It is a contributing cause
- [ ] It is a root cause

Check Answer

The correct answer is that a Private Jones' desire to check out the fuse by applying power is not documented. His motivation is assumed, therefore, the dashed oval **is a presumptive cause that requires validation**.

D

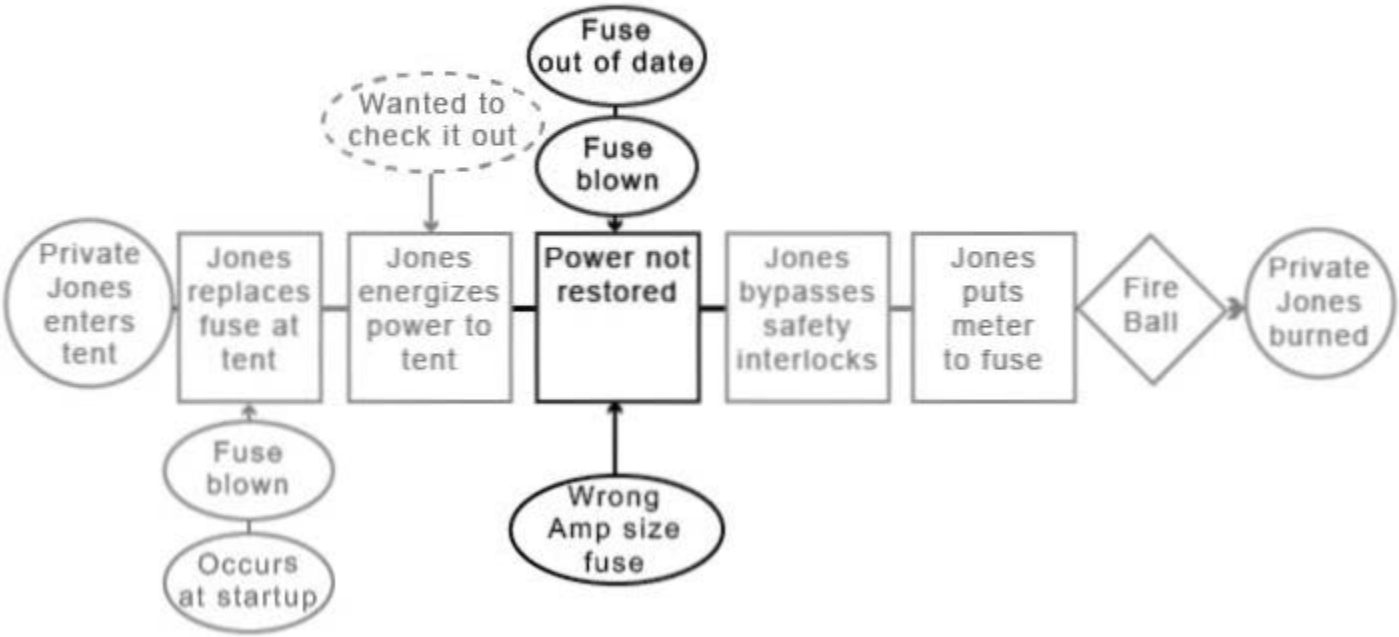
Long Description

A portion of the Event Sequence Timeline from the previous pages is depicted here. It is the portion that consists of the second rectangle labeled "Jones energizes power to tent" which is pointed to by the dashed oval labeled "Wanted to check it out".

Case Study, Cont.

View CR Submit CR

When power failed to restore, Acme Company added two new causes to its Event and Causal Factor chart. Engineers suggested power was not restored to the tent because Private Jones used the wrong amp size fuse or the replacement fuse blew like the first one.



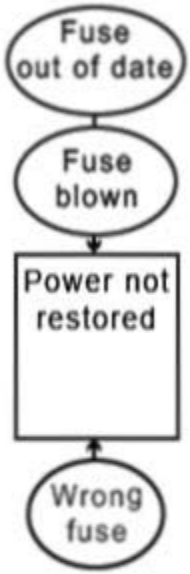
D

Long Description

The same Event Sequence Timeline from the previous page is depicted here, but now, shapes have been added to the third rectangle, which is labeled "Power not restored". Pointing to the "Power not restored" rectangle is now an oval labeled "Wrong fuse". Also pointing to the "Power not restored" rectangle is another oval labeled "Fuse blown", which is being pointed to by another oval labeled "Fuse out of date".

Case Study Knowledge Review 3

Which statement best describes the oval labeled "Fuse blown"?



- [ ] Is it a condition that contributed to an event?
- [ ] Is it a root cause?
- [ ] Is it a contributing cause?
- [x] Is it a presumptive cause that needs validation?

Check Answer

The correct answer is that the blown replacement fuse is a "**presumptive cause**", at least until the fuse is **verified** to have blown.

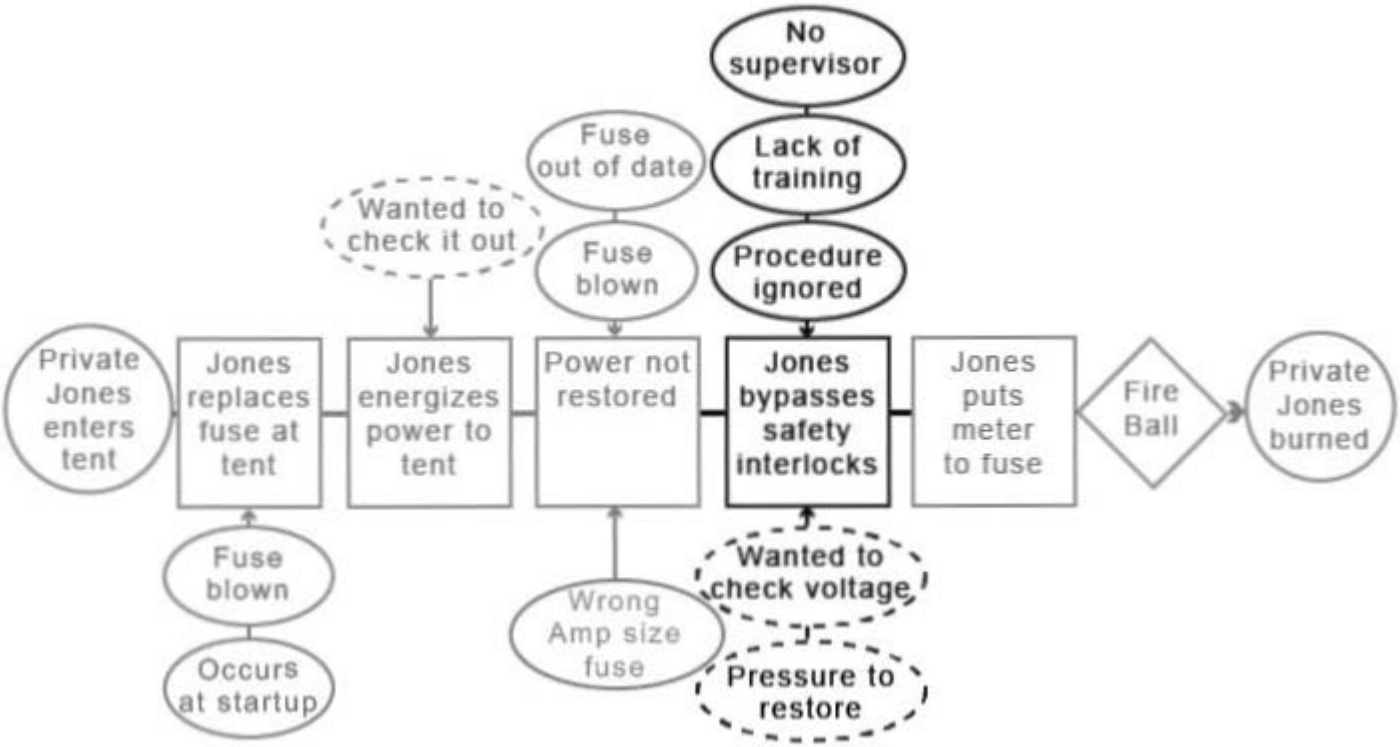
D

Long Description

A portion of the Event Sequence Timeline from the previous pages is shown here. It is the portion that shows the third rectangle which is labeled, "Power not restored", which is being pointed to by the oval labeled "Wrong fuse". Also pointing to the "Power not restored" rectangle is the oval labeled "Fuse blown" which is being pointed to by the oval labeled "Fuse out of date".

Case Study, Cont.

Private Jones' decision to bypass the interlocks on the fuse panel was certainly a poor choice. Acme Company listed three possible causes above the event and two presumptive causes below. Now answer the question on the next frame.



D

Long Description

The same Event Sequence Timeline from the previous pages is depicted here, but now, new shapes have been added to the fourth rectangle, which is labeled "Jones bypasses safety interlocks". Pointing to the "Jones bypasses safety interlocks" rectangle is a dashed oval labeled "Wanted to check voltage", which is being pointed to by another dashed oval labeled "Pressure to restore". Also pointing to the "Jones bypasses safety interlocks" rectangle is a plain oval labeled "Procedure ignored", which is being pointed to by another plain oval labeled "Lack of training", which is being pointed to by another plain oval labeled "No supervisor".

Case Study Knowledge Review 4

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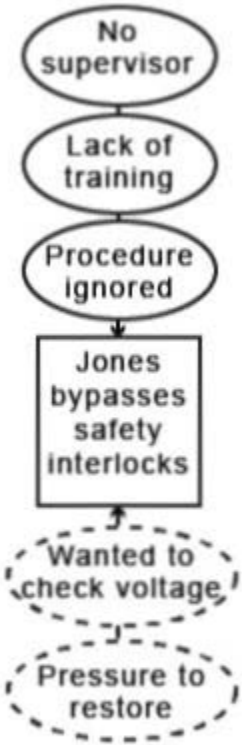
Why is the oval labeled "Pressure to restore" dashed?

- [ ] It is a root cause
- [x] It is a presumptive cause that needs validation
- [ ] It is a condition that contributed to an event
- [ ] It is a contributing cause

Check Answer

The correct answer is that **it is presumed that Private Jones was under pressure to restore power to the tent**. It is not uncommon for senior members of the Armed Forces to instill urgency in combat situations. We cannot rule out pressure as a contributing cause, but it still need to be validated as true. Once validated, it may be considered as a contributing cause.



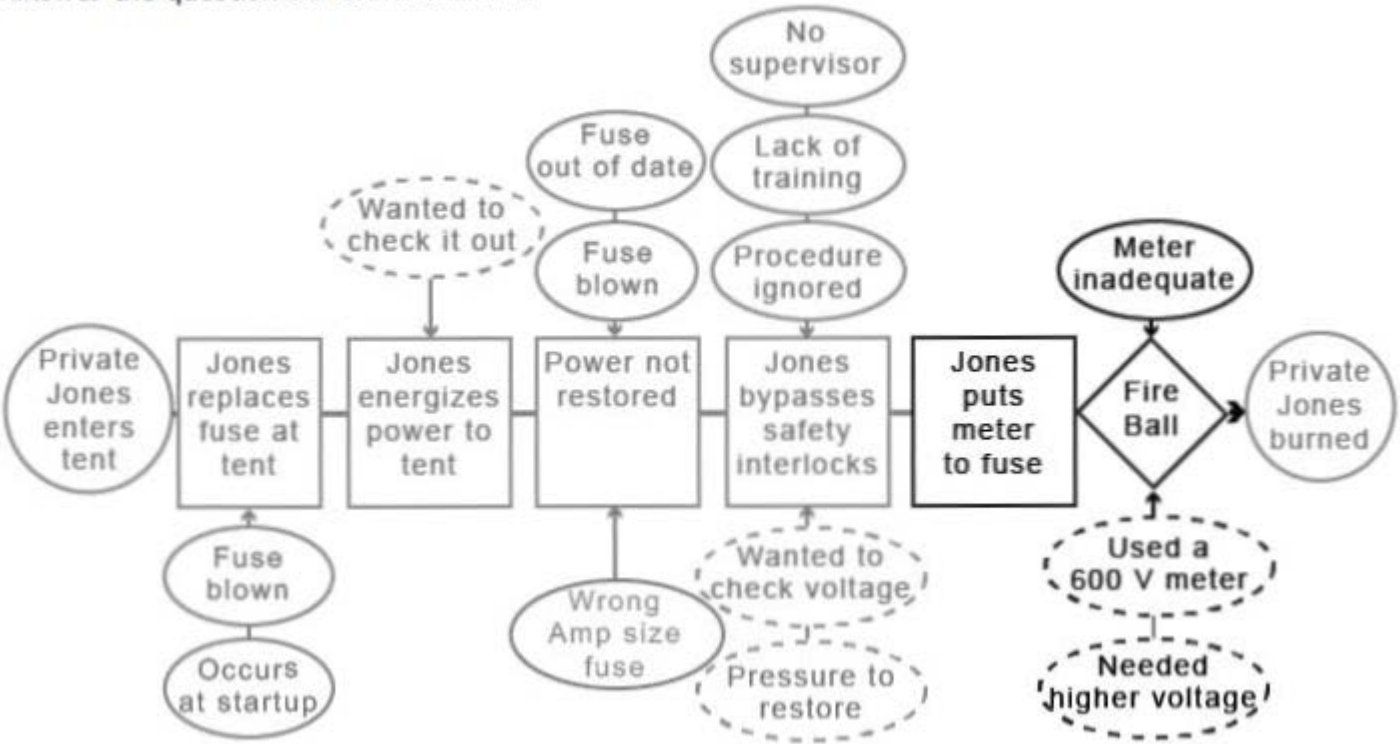
D

Long Description

A portion of the Event Sequence Timeline from the previous pages is depicted here. It is the section that corresponds to the fourth rectangle, which is labeled "Jones bypasses safety interlocks". Pointing to the "Jones bypasses safety interlocks" rectangle is a dashed oval labeled "Wanted to check voltage", which is being pointed to by another dashed oval labeled "Pressure to restore". Also pointing to the "Jones bypasses safety interlocks" rectangle is a plain oval labeled "Procedure ignored", which is being pointed to by another plain oval labeled "Lack of training", which is being pointed to by another plain oval labeled "No supervisor".

Case Study, Cont.

When Private Jones put his meter to the fuse, a fire ball erupted and burned him. Acme Company has added three causes to the event labeled "Fire Ball". He admitted to using a 600 Volt (V) meter in his interview. The maintenance procedure required a higher voltage meter. With his burns as the problem, answer the question on the next frame.



D

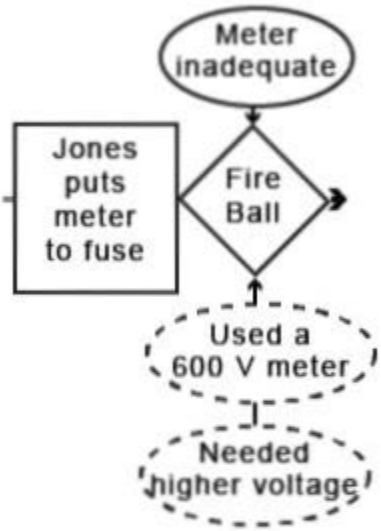
Long Description

The same Event Sequence Timeline from the previous pages is depicted here, but now, new shapes have been added to the diamond, which is labeled "Fire Ball". Pointing to the "Fire Ball" diamond is a dashed oval labeled "Used a six hundred volt meter", which is being pointed to by another dashed oval labeled "Needed higher voltage". Also pointing to the "Fire Ball" diamond is a plain oval labeled "Meter inadequate".

Case Study Knowledge Review 5

View CR Submit CR

Which statement best describes the oval labeled "Meter inadequate"?



- [ ] It is a presumptive cause that needs validation?
- [x] It is a root cause?
- [ ] It is a contributing cause?
- [ ] It is a condition that contributed to an event?

Check Answer

The correct answer is that **Private Jones' use of a meter without enough voltage is what lead to his burns, which was the focus of the problem.**

D

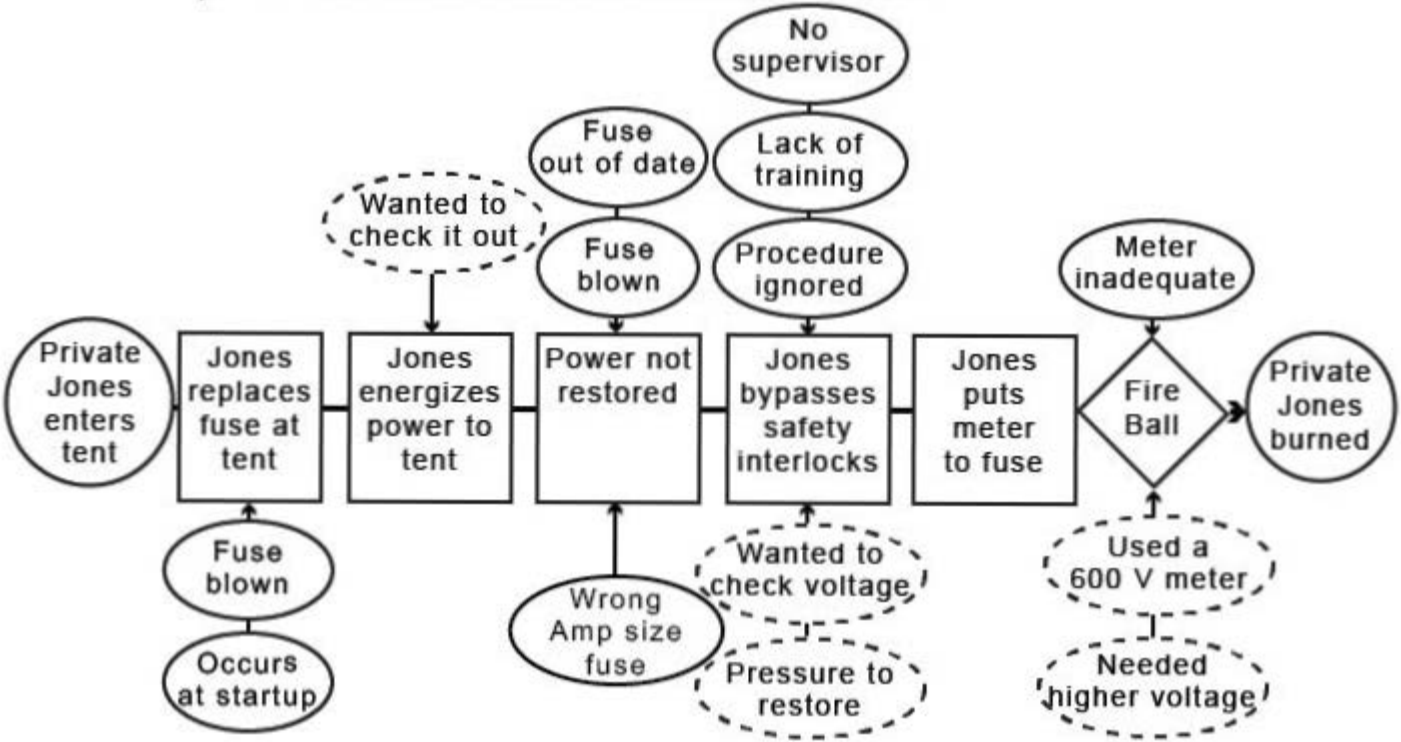
Long Description

A portion of the Event Sequence Timeline from the previous pages is depicted here. It is the section that corresponds to the diamond, which is labeled "Fire Ball". Pointing to the "Fire Ball" diamond is a dashed oval labeled "Used a six hundred volt meter", which is being pointed to by another dashed oval labeled "Needed higher voltage". Also pointing to the "Fire Ball" diamond is a plain oval labeled "Meter inadequate".

Case Study, Cont.

View CR Submit CR

Although his scenario has shades of safety written into it, it is still an exercise in identifying root and contributing causes. It may not be too fictional in light of a supplier looking to exonerate his fuse assembly process and put the focus on human causal factors. Private Jones needs many things, but it was his inadequate meter that is the most basic reason for his burns.



D

Long Description

The completed Event Sequence Timeline from previous page. Timeline begins on left with a Starting Event Circle labeled "Private Jones enters tent." A line branches into an Event Rectangle at right labeled "Jones replaces fuse at tent." A thin vertical arrow beneath this Event connects two Causal Factor ovals labeled "Fuse blown" and "Occurs at startup." Sequence continues to the right with another Event labeled "Jones energizes power to tent." Above this event is a Presumed Causal Factor oval labeled "Wanted to check it out." Sequence continues to the right with another Event labeled "Power not restored." Above this Event are two Causal Factors labeled "Fuse out of date" and "Fuse blown." Beneath this is another Causal Factor labeled "Wrong Amp size fuse." Sequence continues to the right with another Event labeled "Jones bypasses safety interlocks." Above this are three Causal Factors labeled "Procedure ignored," "Lack of training," and "No supervisor." Beneath this event are two Presumed Causal Factors labeled "Wanted to check voltage" and "Pressure to restore." Sequence continues to the right with an event labeled "Jones puts meter to fuse." Sequence continues to the right with an Unexpected Event diamond labeled "Fire Ball." Above this Unexpected Event is a Causal Factor labeled "Meter inadequate." Below this Unexpected Event are two Presumed Causal Factors labeled "Used a 600 V meter" and "Needed higher voltage." At the end of the Sequence is a Terminating Circle labeled "Private Jones burned."

Case Study Knowledge Review 6

Which of the following is the definition of a root cause?

- [ ] A root cause has origins at the beginning of a process. Its roots are what sets the foundation for the problem branches to grow.
- [x] A root cause is the most basic reason for a problem, which, if corrected, will prevent recurrence of that problem.
- [ ] A root cause is apparent at the beginning of the investigation and they explain the effects of the problem, but that need validation.
- [ ] A root cause would not have caused the problem but it is important enough to be recognized as needing corrective action to improve the quality of the process or product.

Check Answer

The best answer is that **a root cause is the most basic reason for a problem, which, if corrected, will prevent recurrence of that problem.**

Determine Causes of Events Job Aid

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This lesson is organized by its objectives and uses transitions to bridge the tutorial from one concept to the next. At your office, tasks are not organized that way. A job aid may assist you in bridging the concepts of training with your job.

It is your job to ensure that your suppliers products are conforming to contractual requirements.

This may require you to occasionally look at their corrective actions and perhaps, the results of their root cause analysis. Many suppliers use an industry standard set of procedures to arrive at their root causes. These have been assembled in a Job Aid for you use in the field.

Access and print this document. With your DCMA supervisor's approval, use the task lists as a potential roadmap to your suppliers' analysis process.

Click here to access the Job Aid for Determining Causes of Events.

Case Study Summary

Private Jones sure did a lot to contribute to his medical condition.

I am glad you are focused on that. Remember, it was his burns that were the problem in search of a root cause.

Some could argue the fire ball was the root cause or maybe his decision to bypass the interlocks. If anything, this helps emphasize just how subjective analysis can get.

For this scenario, it is likely that Acme Company would report that they had no fault in the burns. As far as they know, their fuses are good.

D

Long Description

The mentor and the DCMA specialist continue their conversation. The DCMA specialist states, "Private Jones sure did a lot to contribute to his medical condition." The mentor replies, "I am glad you are focused on that. Remember, it was his burns that were the problem in search of a root cause. Some could argue the fire ball was the root cause or maybe his decision to bypass the interlocks. If anything, this helps emphasize just how subjective analysis can get. For this scenario, it is likely that Acme Company would report that they had no fault in the burns. As far as they know, the fuses are good."

Lesson Completion

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You have completed the content for this lesson.

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