



# NSC

## Maximizing Audit ROI: Effective Corrective Action

### Assessments and Investigations Office (AIO) Webinar– July 16, 2020

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# Overview

- **Terminology**
- **Corrective Action Plan (CAP)**
  - Correction: First things first
  - Containment: Limit the impact
  - Cause Analysis: Investigating the problem
  - Scope of Investigation: When is enough, enough?
  - Planned Actions: What does it take?
- **Summary**
- **CAP Discussion – Center Reflection**

# Overview

Scenario = requirement implementation costs too much money



# Terminology

Three phases of a Corrective Action:

- **Corrective Action Plan (CAP)**  
(5 sub-phases)
  - Correction
  - Containment
  - Cause Analysis
  - Scope of Investigation
  - Planned Actions
- **Implemented Actions (not part of the CAP)**
- **Verification of Effectiveness**



*phases*



*sub-phases*

# Correction – First Things First

## cor·rec·tion

*Action taken on an issue, its  
noncompliance identified*

- What is the first action (
- **Example:** What would be the first action if you found an expired calibrated tool in an inspection area?

Is it ever appropriate to stop after you have made a Correction?

# Containment – Limit the Impact

The next step in a CAP is **Containment**. It is important to understand the difference between correction and containment because when we review CAPs, we often see one or the other, but not both.

## con·tain·ment

***Action taken to mitigate risks** to customers, both internal and external, due to an identified item, process, or condition that was found noncompliant. Includes actions taken to ensure compliance and/or risk acceptance in the **short term** while causes and permanent Corrective Actions are being investigated and implemented.*

# Containment – Limit the Impact

## Containment (continued)

- The goal of containment is to protect people, facilities, and missions from the risks involved in the noted noncompliance.
- Containment includes the actions to ensure compliance and/or risk acceptance in the short term while causes and permanent Corrective Actions are investigated and implemented.
- **Examples of containment:** Short-term waiver, an approved short-term process tailoring, 100% inspection, or elevation to a risk-tracking process at the Center Director or Program Manager level, such as having a formal Abatement Plan or entering the problem into a Center-level risk matrix, per NPR 8000.4.

# Cause Analysis – Investigating the Problem

## cause a·nal·y·sis

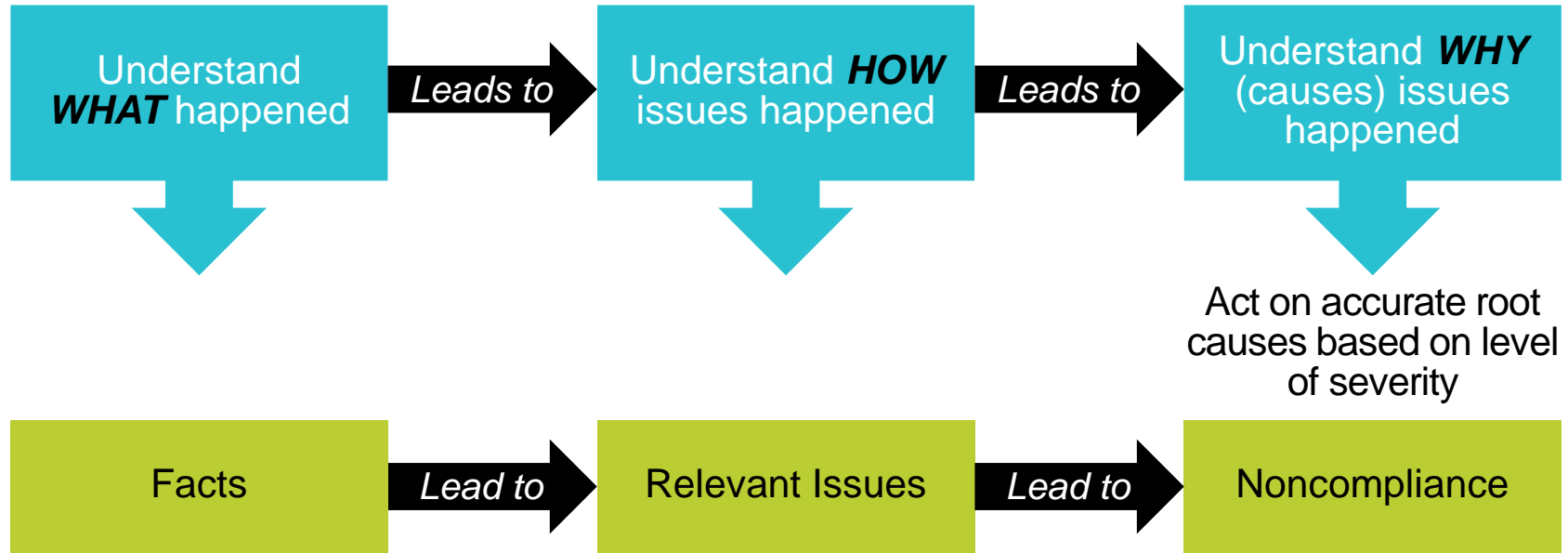
*A structured **method** to **identify**, at the finest level of detail possible, the **reasons** (causes) that an item, process, or condition was **noncompliant**.*

**Primary objective** = to find the **real reasons** (causes) that issues (noncompliances) **occur** and facilitate determination of appropriate planned actions to **prevent the recurrence** of noncompliances.



# Cause Analysis – Investigating the Problem

## *Fact-Finding Approach to Cause Analysis*



*Eliminating the **cause** of the relevant issues prevents the noncompliance from recurring.*

# Cause Analysis – Investigating the Problem

*The **noncompliance** (what we want to prevent) must provide focus for the entire investigation process; therefore, it should be **clearly and concisely stated**.*

## STEP 1A: Identify the Facts

Methods for fact identification:

- Investigate the site and interview people involved.
- Consider apparent causes and analyze timelines.
- Look for the process/procedure weakness(es).
- Brainstorm and list unknowns.

*A thorough investigation by uncovering all the facts usually leads to appropriate root cause determination and effective Corrective Action(s).*

# Cause Analysis – Investigating the Problem

## STEP 1A: Identify the Facts

- What happened?
- When?
- Where?



### Hard Data

Facts, results, requirements, events, history, statistics, forces, goals, procedures, trends, deviations, time factors, productivity, quality and performance levels.

### Soft Data

Feelings, opinions, human factors - frictions, attitudes, satisfaction levels, frustrations, personality conflicts, behaviors, hearsay, intuition, “gut” reactions, mental blocks.

# Cause Analysis – Investigating the Problem

## STEP 1A: Identify the Facts

- **Significance:** safety, environmental, impact, frequency
  - Was this a **safety** issue to humans, property or hardware/material?
  - Was this an **environmental** issue?
  - What was the immediate **impact**?
  - Is this a recurring problem (**frequency**)?
    - Check prior audits, problem reports, logs, discussions with personnel
  - Use metrics/measurement **data**

# Cause Analysis – Investigating the Problem

## STEP 1A: Example - Identify the Facts

- Let's try to **clearly** and **concisely** define an event:

*On 10/6, Tom used the bathroom. After flushing the toilet, it overflowed. He reported it to his supervisor who immediately contacted Public Works (PWs) to service the toilet, and posted a “DO NOT USE” sign on the stall door. All 3 toilets on the project site were now out-of-order (the other 2 toilets were plugged during the previous week). The nearest working toilet was located about a 15 minute walk away. After 2 weeks, PWs arrived and found a big, hard ball of food stuck in the toilet drain. PWs also found that the other two toilets were plugged with food.*

- **What Happened? When? Where?**
- **Significance:** Safety to personnel, property or hardware/material; environmental; impact/delays; frequency

# Cause Analysis – Investigating the Problem

## Step 1B. Organizing the Facts

- Facts should be organized to provide a clear picture of **what caused the noncompliance to happen**.
- Separate technical data (e.g. form, fit, function) from performance data (cost, schedule, resources) because they lead to different lines of authority (technical vs. program/project).

*“It is a capital mistake to theorize before one has data. Insensibly one begins to twist facts to suit theories, instead of theories to suit facts.”*

— Sherlock Holmes

# Cause Analysis – Investigating the Problem

## Step 1B. Example – Organizing the Facts

| Fact # | What Happened (Fact)?  | What Should Have Happened? (Relevant Issue) | What Caused this to Happen? (Contributing Cause) (The Fact was caused by?) | New Problem Description (Combined Fact and Cause) | Resp. Office |
|--------|--|---|--|---|--------------|
| 1      | On 10/3, worker #2 ate lunch and couldn't finish the meal.   |   |  |   |              |
| 2      | Sign says, "No food allowed in the trash can" (cockroach problem)".  |   |  |   |              |
| 3      | On 10/3, worker #2 flushed uneaten food down the toilet.   |   |  |   |              |
| 4      | The food became a big sticky ball that plugged the entire toilet drain.  |   |  |   |              |
| 5      | On 10/6, worker #1 used the bathroom and flushed the toilet.   |   |  |   |              |
| 6      | <b>Noncompliance:</b> On 10/6, the toilet overflowed causing production delays in the work schedule. This was the 3rd occurrence in two weeks. |   |  |   |              |
| 7      | Correction: "DO NOT USE" sign posted on the wall   |   |  |   |              |
| 8      | Correction: Called Public Works  |   |  |   |              |

4. Find out Why?  
How did food get in the toilet?

2. Work backward, gathering facts that are relevant to the event.

1. Start with the noncompliance...the finding.

3. Don't forget to record actions taken after the event.

# Cause Analysis – Investigating the Problem

## Step 2. Identify Relevant Issues and Describe the Problem

- Relevant issues are difficulties that, if eliminated, would have either prevented the noncompliance or reduced its severity.
  - First we must ascertain the potential relevant issues (What should have happened) from the facts (What happened).
    - If “What should have happened” will prevent recurrence of the noncompliance, then it is a relevant issue.
  - Next, we will determine the contributing cause of the relevant issue.
  - Then use this information to restate the original fact and contributing cause as a specific problem.



# Cause Analysis – Investigating the Problem

## Step 2. Identify Relevant Issues and Describe the Problem

- Ascertaining relevant issues from the facts.

| Fact # | What Happened (Fact)?  | What Should Have Happened? (Relevant Issue)            | What Caused this to Happen? (Contributing Cause) (The Fact was caused by?) | New Problem Description (Combined Fact and Cause)  | Resp. Office |
|--------|--|--|--|--|--------------|
| 1      | On 10/3, worker #2 ate lunch and couldn't finish the meal.   |  |  | <b>Ask Two Questions</b><br>1. <b>What Happened?</b> On 10/3, worker #2 ate lunch, and couldn't finish the meal.<br>2. <b>What Should Have Happened?</b> On 10/3, worker #2 ate lunch, and couldn't finish the meal.<br><br><b>SAME!</b><br>It is a FACT. Go to the next fact and ask two questions. |              |
| 2      | Sign says, "No food allowed in the trash can" (cockroach problem)".  |  |  |  |              |
| 3      | On 10/3, worker #2 flushed uneaten food down the toilet.   | Worker #2 should not have flushed food down the toilet |  | <b>DIFFERENT!</b><br>Rewrite Fact to include, "What Should Have Happened"  |              |
| 4      | The food became a big sticky ball that plugged the entire toilet drain.  |  |  |  |              |
| 5      | On 10/6, worker #1 used the bathroom and flushed the toilet.   |  |  |  |              |
| 6      | <b>Noncompliance:</b> On 10/6, the toilet overflowed causing production delays in the work schedule. This was the 3rd occurrence in two weeks. |  |  |  |              |
| 7      | <b>Correction:</b> "DO NOT USE" sign posted on the wall  |  |  |  |              |
| 8      | <b>Correction:</b> Called Public Works   |  |  |  |              |

# Cause Analysis – Investigating the Problem

## Step 2. Identify Relevant Issues and Describe the Problem

- Ascertaining relevant issues from the facts.

| Fact # | What Happened (Fact)?   | What Should Have Happened? (Relevant Issue)            | What Caused this to Happen? (Contributing Cause) (The Fact was caused by?) | New Problem Description (Combined Fact and Cause) | Resp. Office |
|--------|---|--|--|---|--------------|
| 1      | On 10/3, worker #2 ate lunch and couldn't finish the meal.              |  |  |   |              |
| 2      | Sign says, "No food allowed in the trash can" (cockroach problem)".     |  |  |   |              |
| 3      | On 10/3, worker #2 flushed uneaten food down the toilet.                | Worker #2 should not have flushed food down the toilet | No other receptacles for food in the area                                  |   |              |
| 4      | The food became a big sticky ball that plugged the entire toilet drain. |  |  |   |              |

|   |   |   |
|---|---|---|
| 5 | <p><b>Potential Issue</b></p> <p><b>Ask,</b> "Would eliminating this issue prevent recurrence of the noncompliance?"</p> <p><b>YES:</b><br/>It is a <b>RELEVANT Issue</b> to the noncompliance!</p> <p><b>NO:</b><br/>It is <b>not</b> relevant, go on to the <b>next Fact</b>.</p> | <p><b>Ask,</b><br/>"What caused this to happen?"<br/>(The Fact was caused by)</p> <p><b>Contributing Cause (Answer):</b><br/>No other receptacles for food in the area.</p> |
| 6 |   |   |
| 7 |   |   |
| 8 |   |   |

# Cause Analysis – Investigating the Problem

## Step 2. Identify Relevant Issues and Describe the Problem

- New Problem Description brings focus to each fact and related cause that is contributing to the noncompliance.

|  |  | What Should Have Happened? (Relevant Issue)            | What Caused this to Happen? (Contributing Cause) (The Fact was caused by?) | New Problem Description (Combined Fact and Cause)   | Resp. Office |
|--|--|--|--|---|--------------|
| <p><b>Next Ask</b>, “Is the contributing cause an error related to supervision, training, procedure, equipment, etc.?”</p> <p><b>YES: Equipment Failure (No receptacles in area)</b></p> <p><b>This identifies a problem related to the noncompliance!</b></p> <p>Note: If “No”, keep asking “What caused this to happen?”</p> |  |  |  |   |              |
| 3  | On 10/3, worker #2 flushed uneaten food down the toilet. | Worker #2 should not have flushed food down the toilet | No other receptacles for food in the area                                  | On 10/3, a worker flushed food down the toilet because there were no other receptacles for food in the area, resulting in the toilet becoming plugged and unusable. |              |

**Restate** the fact and what caused it to happen as a combined *New Problem Description*.

**Fact:** On 10/3, worker #2 flushed uneaten food down the toilet.

**What Caused This to Happen:**  
No other receptacles for food in the area.

# Cause Analysis – Investigating the Problem

## STEP 3. Determine relevant issue severity level/risk associated with the noncompliance.

In the interest of time we will not determine the severity level/risk associated with each relevant issue – this is an opportunity to ensure CAPs are appropriate based on associated risks.

## STEP 4. Determine cause for the new problem descriptions.

- Cause investigation should be commensurate with severity/risk of the noncompliance.
- There are several methods to determine the cause of a problem (e.g., **5 Whys**, Cause and Effect Diagram, Cause Mapping, Fault Tree Analysis). *We will be employing the 5-Why Approach.*

# Cause Analysis – Investigating the Problem

## root cause

The **fundamental reason(s)**, under the control of the audited organization, for an item, process, or condition to be **noncompliant**, which, if corrected, would prevent recurrence.

### Determine causes for the list of relevant problems.

- How to know when a real cause has been reached (when to stop asking why?)
- Stop asking “why” when you reach a point in which the problem can be eliminated by:
  - Using or improving a process.
  - Writing a process.
  - Resolving an equipment issue.

# Cause Analysis – Investigating the Problem

## 5 Whys demonstrated in our example:

- **Problem:** On 10/3, a worker flushed food down the toilet because there were no other receptacles for food in the area, resulting in the toilet becoming plugged and unusable.
- **Why:** Why was food flushed down the toilet?
- **Causes:**
  - No receptacles for disposal of food.
  - Why? Cockroach problem.
  - Why? No daily task to empty receptacles for food, which would prevent cockroach problem.

# Cause Analysis – Investigating the Problem

## Case Study Exercise: Determine Cause

| Fact # | What Happened (Fact)?  | What Should Have Happened? (Relevant Issue)             | What Caused this to Happen? (Contributing Cause) (The Fact was caused by?) | New Problem Description (Combined Fact and Cause)   | Resp. Office | “5 Whys” List of Cause(s)   |
|--------|--|---|--|---|--------------|---|
| 1      | On 10/3, worker #2 flushed uneaten food down the toilet.   | Worker #2 should not have flushed food down the toilet. | No other receptacles for food in the area                                  | On 10/3, a worker flushed food down the toilet because there were no other receptacles for food in the area, resulting in the toilet becoming plugged and unusable. |              | <ul style="list-style-type: none"> <li>• No receptacles for disposal of food.</li> <li>• Cockroach problem.</li> <li>• No daily task to empty receptacles for food, which would prevent cockroach problem.</li> </ul> |
| 2      | <b>Noncompliance:</b> On 10/6, the toilet overflowed causing production delays in the work schedule. This was the 3rd occurrence in two weeks. |   |  |   |              |   |

# Scope of Investigation – When Is Enough, Enough?

## scope of in·ves·ti·ga·tion

*Organized approach to investigate additional items, processes, and conditions **outside** the original **noncompliance**. Investigation to include an evaluation of areas where similar causes may exist and risk posture justifies application of similar corrective steps.*

- Investigate and determine the full scope (total population) of the noncompliance and related causes.
- Did the finding affect critical work, critical item or critical process, including aerospace/aero flight hardware/software, systems, or critical ground support equipment?
- Additional Corrections may be needed to correct any other issues or noncompliance identified during the scope of investigation.



# Scope of Investigation – When Is Enough, Enough?

## Case Study Exercise: Scope of Investigation

| Fact # | What Happened (Fact)?  | What Should Have Happened? (Relevant Issue)             | What Caused this to Happen? (Contributing Cause) (The Fact was caused by?) | New Problem Description (Combined Fact and Cause)   | Resp. Office | “5 Whys” List of Cause(s)   | Scope of Investigation   | Planned Actions |
|--------|--|---|--|---|--------------|---|--|-----------------|
| 3      | On 10/3, worker #2 flushed uneaten food down the toilet.   | Worker #2 should not have flushed food down the toilet. | No other receptacles for food in the area                                  | On 10/3, a worker flushed food down the toilet because there were no other receptacles for food in the area, resulting in the toilet becoming plugged and unusable. |              | <ul style="list-style-type: none"> <li>No receptacles for disposal of food.</li> <li>Cockroach problem.</li> <li>No daily task to empty receptacles for food, which would prevent cockroach problem.</li> </ul> | Identify all other locations that need receptacles for disposal of food. |                 |
| 4      | <b>Noncompliance:</b> On 10/6, the toilet overflowed causing production delays in the work schedule. This was the 3rd occurrence in two weeks. |   |  |   |              |   |  |                 |

# Planned Actions— What Does It Take?

## Don't move to a solution phase until you have performed thorough causal analysis

- Once the proper cause of a problem is identified, the corrective action to eliminate (or reduce) the cause is usually self-evident and will typically involve:
  - Using a process.
  - Writing a process.
  - Improving a process.
  - Resolving an equipment issue.

## planned actions

*The **actions planned**, based on cause analysis and scope investigation, in order to **prevent the recurrence** of noncompliant items, processes, and/or conditions.*

# Planned Actions— What Does It Take?

## Guidelines for Developing Planned Actions:

- Ensure Containment Actions have been identified to address the noncompliance and are adequate to prevent problem recurrence until permanent/long-term Corrective Actions are implemented.
  - Assess if Containment Action needs to be removed once the long-term corrective action is taken.
- Ensure permanent Corrective Action is codified and matches the cause it is paired with.
  - Establish appropriate completion dates and assign responsible person for all Corrective Actions.
  - Ensure permanent Corrective Action independent of project or personnel.
  - Assess previous similar noncompliances and associated Corrective Actions to ensure you are not repeating history.

# Planned Actions – What Does It Take?

## CAP Checklist

1. Have you reached a logical stopping point?
2. Have all conversations come to a positive end?
3. Is there consensus that the cause and planned actions will prevent recurrence?
4. Does the cause explain why the problem exists from all points of view?
5. Has a comprehensive review from the beginning of the situation been explored and understood?
6. Do the causes make sense, explain facts and dispel all confusion?
7. Are the causes something you can influence, control, and deal with realistically?
8. Do the causes enable something constructive to be done about the situation?
9. Is organizational control established (codified) by a policy, procedure or instruction?
10. Is there a stable, long-term resolution of the situation and is it feasible with appropriate recurrence probability?

# Scope of Investigation – Planned Actions

## Case Study Exercise: Planned Actions

| Fact # | What Happened (Fact)?  | What Should Have Happened? (Relevant Issue)             | What Caused this to Happen? (Contributing Cause) (The Fact was caused by?) | New Problem Description (Combined Fact and Cause)   | Resp. Office | "5 Whys" List of Cause(s)   | Scope of Investigation   | Planned Actions   |
|--------|--|---|--|---|--------------|---|--|---|
| 3      | On 10/3, worker #2 flushed uneaten food down the toilet.   | Worker #2 should not have flushed food down the toilet. | No other receptacles for food in the area                                  | On 10/3, a worker flushed food down the toilet because there were no other receptacles for food in the area, resulting in the toilet becoming plugged and unusable. |              | <ul style="list-style-type: none"> <li>• No receptacles for disposal of food.</li> <li>• Cockroach problem.</li> <li>• No daily task to empty receptacles for food, which would prevent cockroach problem.</li> </ul> | Identify all other locations that need receptacles for disposal of food. | <ul style="list-style-type: none"> <li>• Properly locate receptacles for food disposal.</li> <li>• Revise policy to require daily removal of receptacles for disposal of food.</li> </ul> |
| 4      | <b>Noncompliance:</b> On 10/6, the toilet overflowed causing production delays in the work schedule. This was the 3rd occurrence in two weeks. |   |  |   |              |   |  |   |

# Summary

## Cause Analysis is the building block for determining Corrective Action.

- Primary objectives of Cause Analysis:
  - Finding the real reasons that problems occur.
  - Facilitating identifying actions that will prevent recurrence of problems.
- Cause Analysis should be the systematic process of gathering all relevant data.
  - Making sure the issues are properly identified.
  - Identifying the **RELEVANT** causes that have generated or allowed the noncompliance.
  - Identifying the relevant causes for decision-makers so effective Corrective Actions can be implemented.

# CAP Discussion: Center Reflection

## Maximizing Audit ROI: Effective Corrective Action

### Missed Opportunities

- Issues are opportunities for improvement or a Return on Investment (ROI).
- Without a systematic approach (CAP) to solving issues we allow our actions to be set by opinion and conjecture, rather than a process that keys to the actual cause/circumstances of an event/noncompliance.
  - Decreases potential ROI.
  - Undermines the potential gains that can be achieved by an effective audit program.

# CAP Discussion: Center Reflection

## Maximizing Audit ROI: Effective Corrective Action

- Adequate review processes must be established and working to maximize CAP submission and effectiveness.
  - At your Center, do the personnel responsible for submitting the CAPs have authority to request additional information from CAP owners (QAAR: owners or IFOSA: designees) if the CAPs do not meet the requirements?
- Are effective controls in place at your Center to ensure CAPs meet the requirements before they are finalized/submitted to auditing body?

NOTE: Go to the link below and scroll to the Wednesday 8:15 am slot of the Agenda to the Handouts for Group Activity Section for forms and examples:

<https://nsc.nasa.gov/audits/aa-operational-meeting/aa-operational-meeting/agenda-nov-19-21>