LOCKHEED MARTIN

RCCA

Root Cause Corrective Action Problem Solving Guidebook

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Lockheed Martin UK Ampthill Ltd

Contents

1. Introduction

1.1. Root Cause Corrective Action Problem Solving

Root cause corrective action (RCCA) is an effective process for finding the causes of an event and facilitating effective corrective actions to prevent recurrence. RCCA has been a requirement of the aviation, space and defence industry for many years. A process of determining the causes that led to a non-conformance or event. Requirements are not new, but they may not have been aggressively enforced in the past.

1.2. The Requirement - ISO 9001 / AS 9100 10.2 Nonconformity and Corrective Action

When a nonconformity (non-fulfilment of a requirement) occurs, including any arising from complaints, the organization shall: React to the nonconformity and, as applicable, take action to control and correct it, deal with the consequences, evaluate the need for action to eliminate the cause(s) of the nonconformity, in order that it does not recur or occur elsewhere, by reviewing and analysing the nonconformity to determine the causes of the nonconformity, including, as applicable, those related to human factors. Determine if similar nonconformities exist, or could potentially occur. Implement any action needed and review the effectiveness of any corrective action taken. Update risks and opportunities determined during planning. Make changes to the quality management system if necessary. Flow down corrective action requirements to an external provider when it is determined that the external provider is responsible for the nonconformity. Take specific actions when timely and effective corrective actions are not achieved.

1.3. Aim

The aim of this document is to set out the steps that should be taken when undertaking problem solving with root cause corrective action. The most up to date version of this document is maintained online at https://www.lockheedmartin.com/en-gb/suppliers/mfc-uk.html.

2. Failure Event

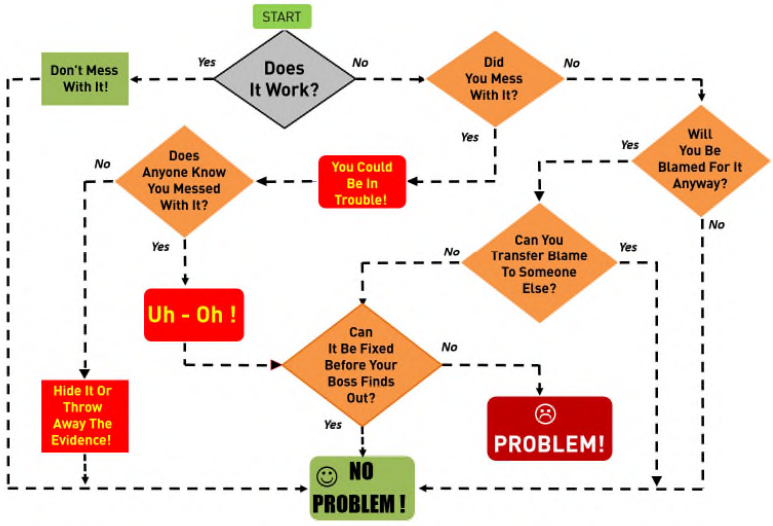
2.1. What Are Failure Events?

Events that can trigger RCCA include: -

- Product or Process Failure
- Incident
- Non Conformance
- Audit finding
- Statistical Process Control output
- Accident
- Customer complaint
- Failure Mode (FMEA)

2.2. Incorrect But Traditional Approach

- Problem
- ~~Containment~~
- ~~Establish Team~~
- ~~Identify Problem~~
- ~~Gather & Analyze Data~~
- ~~Find the Root Cause~~
- ~~Determine Corrective Action~~
- ~~Implement Corrective Action~~
- ~~Review Corrective Action~~
- Fix it.



2.3. The Quick Fix Problem

- Not taking adequate time for analysis.
- Only replacing, repairing or reworking the product
- Going from one crisis to another.
- Looking for the guilty party - "Who did that?" Blaming or transferring responsibility.
- Generate laundry list of solutions to firefight the symptoms.
- Narrow focus taken to address the immediate problem.
- Focus on performance metrics/measures (e.g., sales, profits) with hope that processes will improve by themselves.

2.4. Expected Behaviors To Get Systemic Solutions

- Understanding that many factors contribute to a complex situation.
- Fully understanding the actual problem and then addressing the systemic root cause(s).
- Permanently fixing and improving performance.
- Seeking total understanding of the process - "How did that happen?"
- Taking time to understand the big picture; to dialogue and elicit diverse perspectives before applying the solution.
- Focusing on improving processes; actually effecting process performance.

2.5. Taking Action

To assure customer satisfaction, aviation, space, and defence industry organisations must produce and continually improve safe, reliable products that meet or exceed customer and regulatory authority requirements. This includes having processes in place to detect and eradicate significant and recurrent issues. Actions taken must be to a degree appropriate to the magnitude of the problem and proportionate with the risks encountered

3. Root Cause Corrective Action Using the 8D Process

Eight Disciplines (8D) Problem Solving is a method developed at Ford Motor Company used to approach and to resolve problems, typically employed by engineers and quality professionals. Focused on product and process improvement, its purpose is to identify, correct, and eliminate potential and recurring problems.

- D0 – Start Immediate containment action
- D1 – Build the team
- D2 – Define the problem
- D3 – Complete and optimise containment action
- D4 – Identify root cause
- D5 – Define and select permanent corrective actions
- D6 – Implement corrective actions and check effectiveness
- D7 – Standardise and transfer the knowledge across the business
- D8 – Recognise and close the team

3.1. D0 Immediate Containment Action

Objective: To mitigate the impact of the problem, to protect the customer and LMUK (i.e., stop the problem from getting worse), and verify that the situation does not deteriorate until the root cause and contributing causes are known.

- Stop – Prevent further production of nonconformities or worsening of the problem
- Identify & Evaluate – Affected product, process, persons and equipment
- Quarantine – Control identified product or equipment
- Communicate – Inform affected stakeholders (including the customer if escapes are suspected)

3.2. D1 Build the Team

Objective: To ensure that all process performers and applicable stakeholders and functions (e.g., organizations, departments, suppliers, customers) that may have an influence on the corrective action process and associated investigation are included in the team.

3.2.1. The Natural Team

- Who owns the problem?
- Who has a stake in the outcome and the solution to the problem?
- Who are the vested owners of both the problem and the solution?
- Who knows the process – have data and experience?
- Who will have to implement and live with the corrective action?

Assignment of wrong personnel a common problem. Common to assign only Quality.

3.2.2. The Qualified Team

- Those who can provide additional information
- Those who have technical expertise – Subject Matter Experts (SME)
- Those who may need to act as advisors
- Those providing management support

Without the full buy-in and support of the stakeholders, long-term solutions are not likely

3.3. D2 Define the Problem

Objective: To understand the significance, impact, and size of the problem (i.e., depth and breadth of current conditions) and ensure the situation (i.e., problem) is accurately defined and thoroughly understood by the team and applicable stakeholders.

- You must understand the problem.
- Is there more than one problem?
- You must know what you don't know, to be able to find out.
- Keep it simple! If you cannot say it simply, you do not understand the problem!

3.4. D3 Complete and Optimize Containment Actions

Objective: To ensure containment actions suitably address the problem statement and to verify that immediate corrective action is commensurate with the problem, implemented and effective.

Ensure that all nonconforming product or data has been isolated and corrected to prevent escape, and optimize immediate corrective action(s).

Additional containment actions may include:

- Correction of product - Replacement, repair or rework of affected parts
- Agree with customer supply chain representative on credit or replacement arrangement
- Temporary increase of production to support product needs
- Over-inspection upstream in the process
- Product recall, stock segregation at suppliers and sub-tiers, as applicable

3.5. D4 Root Cause Identification & Analysis

Objective: To identify, through structured root cause analysis, the root cause for the undesirable condition, situation, nonconformity, or failure, including the reason it was not detected. Root cause analysis should identify the direct cause, contributing causes and the root cause for the problem. Root Cause Analysis is a systematic approach to determining all the contributors to a problem before attempting to implement a corrective action plan.

3.5.1. The Causal Chain

Root Cause > Contributing Causes > Direct Cause > Problem

- The direct cause is the cause that immediately caused the problem
- Causes in-between are contributing causes
- A root cause is the last cause in the cause chain

Root Cause is not always the most significant cause in the chain. Just focus on the fact that it is the LAST cause in the chain

3.5.2. 5 Why Process

The '5 why' is one method that can be used to find the cause chain. State the Problem as an event question starting with why?
An event question is short, concise, and focused on ONE problem. Do not believe that the 5 Why process restricts you to asking why 5 times
A root cause may be found with 3 Whys or it may take 7 Whys

- Keep it simple!
- Simple 'Why' question
- Simple concise answer

3.6. D5 Define and Select Corrective Actions

Objective: To define, prioritize, and select corrective actions that should be implemented to address the causes (root causes and contributing causes) and permanently prevent the undesirable condition, situation, nonconformity, or failure from recurring.

3.6.1. Corrective Action

A set of planned activities (actions) implemented for the sole purpose of permanently eliminating the cause of a nonconformity and to prevent recurrence. (Ref.: ISO 9000 3.12.2)

3.6.2. What Corrective Action is Not

Corrective action is sometimes perceived as the activities to replace, repair, rework or put right nonconforming products (the quick fix). This activity should form part of the secondary containment actions (D3). Too often the RCCA team only correct symptoms.

3.6.3. Types of Corrective Action

- Specific corrective action addresses the direct cause or the effect.
- Sustaining corrective action addresses contributing and root causes to prevent recurrence of the event

If you have only identified one cause, you probably won't get a 100% effective fix. Remember – today's contributing cause is tomorrow's root cause.

3.6.4. Effective Corrective Action

- Must correct the root cause
- Must correct contributing causes
- Must be workable (SMART objectives)
- Must have a effectivity date
- Must be sustainable
- Must not be the cause of other unforeseen nonconformances
- Must be reviewed

3.6.5. Review the Corrective Action

Establish a review process to ensure corrective actions are completed per the plan and will continue to be effective over time:
Process confirmation, confirming that all planned actions have been completed.
Definition of type and number/frequency of additional checks and audits.
Identify measures required to verify effectiveness of actions (e.g., who, what, where, frequency, conditions). Measure and analyse new process performance (as planned) and compare results with performance measured.

3.6.6. Verify Effectiveness of the Proposed Solutions

If the RCCA is not effective, return to D4 (Identify Root Cause) and revisit the root cause analysis process to check if the failure was with the identification of the root cause(s) and/or in the development/implementation of the corrective action. If they are effective, evaluate which containment actions may be eliminated (e.g., stop over inspection and over production, return to normal transportation means) without adversely affecting the product and process output / performance. Record evidence of actions completed and associated results (i.e., what works and what does not).

3.7. D6 Implement Corrective Actions

Objective: To ensure all selected corrective actions are implemented (as defined) and to assess their effectiveness in preventing the undesirable condition from recurring and/or in detecting it sufficiently upstream in the process.
Too often, at this step of the corrective action process, focus is only on the implementation of the easiest and quickest solutions and there is no plan to verify timely implementation of the actions and their overall effectiveness; resulting in the corrective action plan being only partially implemented. At this stage, the key role for the team leader is to ensure that the entire corrective action plan (proposed solutions) has been implemented in a timely manner and was effective.

3.7.1. Review Process

Establish a review process to ensure corrective actions are completed per the plan and will continue to be effective over time:

- Process confirmation, confirming that all planned actions have been completed.
- Definition of type and number/frequency of additional checks and audits.
- Identify measures required to verify effectiveness of actions (e.g., who, what, where, frequency, conditions). Measure and analyse new process performance (as planned) and compare results with performance measured at Steps 2 and 4.
- Verify effectiveness of the proposed solutions:
- If the RCCA is not effective, return to D4 (Identify Root Cause) and revisit the root cause analysis process to check if the failure was with the identification of the root cause(s) and/or in the development/implementation of the corrective action.

- If they are effective, evaluate which containment actions may be eliminated (e.g., stop over inspection and over production, return to normal transportation means) without adversely affecting the product and process output / performance.
- Record evidence of actions completed and associated results (i.e., what works and what does not).

3.8. D7 Risks and Opportunities – Preventive Action

Objective: To document analysis, results, and changes to capture and share learning with applicable stakeholders to prevent similar undesirable condition, situation, nonconformity or failure occurring on other products, production lines, factories, or suppliers.

3.8.1. Preventive Action

A set of planned activities (actions) implemented for the sole purpose of permanently eliminating the cause of a potential nonconformity or other potential undesirable situation. Preventive action is taken to prevent occurrence whereas corrective action is taken to prevent recurrence. (Ref.: ISO 9000 3.12.1)

3.8.2. Lessons Learned

Identify all other data, products, production lines, factories, or suppliers that may potentially be affected by the same or similar undesirable condition, situation, nonconformity, or failure (e.g., similar design, process, material source/supplier, location, function/use, environment, training, machines/tools). Identify applicable information that can be shared from this incident and transfer across those identified business units, production lines, factories or suppliers.

3.9. D8 Recognise and Close the Team

Objective: To ensure all team members and stakeholders are aware of the successful implementation of all corrective action, to confirm that the activity is closed, and to recognize and reward their work and accomplishment. Ensure lessons learned are shared appropriately.
Confirm that all actions have been successfully implemented; record synthesis of causes, actions, and methodology; inform applicable stakeholders affected by the undesirable condition, situation, nonconformity, or failure that the activity is complete; recognize those who have been involved in the corrective action process; and disband the team. Why? Too often action items are left open, diverting people from their primary roles. Furthermore, closed-loop corrective action is not achieved because there is no feedback of actions/results to applicable stakeholders and team efforts are not recognized, which negatively affects the dynamics of the RCCA culture.

4. When to Apply a Structured Root Cause Analysis and Problem Solving Process

The process should always be applied, if one or more of these conditions exist:

- Safety impact (product/personal).
- Product strength, performance, and/or reliability issue.
- High impact on production/maintenance operations.
- Stop the production/maintenance line; prevent next operation to occur satisfactorily, etc.
- Regulatory authorities and/or customer dissatisfaction.
- Costs issue (generated to the customer or the organization).
- Disruption of supplier's process or customer's operations.
- Repetitive problems to one part or similar activities/processes.
- Difficulty to detect.
- Customer request.
- Significant quality or QMS issue.

Complex problem that cannot be solved without assistance of other people than those located where the problem occurred. The impact of an issue and the frequency of its occurrence should always be considered when deciding to launch or not launch a formal root cause analysis.

Document Issue Control

Date	Iss	Clause	Changes	By
1 Sep 2022	1	All	Root Cause Corrective Action Problem Solving Guidebook established	Konrad Burgoyne
26 Feb 2025	2	NA	Minor amendments and Lockheed Martin branding change	Konrad Burgoyne

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