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## CASE STUDY: ROOT CAUSE CORRECTIVE ACTION

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**Industry:** Aerospace and Defense  
**Company Type:** Guidance and Control Electronics  
**Project Title:** Reduce Rework and Late Shipments  
**Tools Used:** Root Cause Corrective Action (RCCA) – Analysis and Remedy

**Project Timeline:** Three days. Monitored results for 10 weeks.

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### PROBLEM STATEMENT

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Our client looked to Juran Manufacturing to support their investigative team with the tools and knowledge to quickly identify the root cause of why bent pins on resistor boards were discovered on units after testing was completed and prior to final inspection. These bent pins were the cause of major rework and potential project delays. Project support was requested by the client since the problem occurred multiple times, causing shipments to be impacted by extensive required rework just before shipment of the completed product.

On the positive side, the defects were discovered before leaving the facility, ensuring that this was not causing problems later in overall development. However, the team had to prevent bent pins from occurring or being sent down the line, only to be discovered after testing was completed. The risk of not discovering or preventing this defect—rework, potential schedule slippage, and dissatisfied customers—was too high.

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### PROJECT GOAL

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The goal was to eliminate the occurrence of bent pins, and reduce the amount of rework that prevented completed units from shipping on time.

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### PROJECT

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The team addressed the problem using Juran's four-phase RCCA approach.

To correctly *identify the problem*, the team had to write a clear problem statement with measurable goals of what they wanted the project outcome to be. In order to *diagnose the cause*, resources, data-collection objectives to test cause theories, and the process to achieve this had to be defined. Agreement on the project goals and approach had to be reached with the team sponsor. *Remedy the cause* involved developing the solution to eliminate the cause. The



final phase to *hold the gains* involved the implementation of the solution; achieving and documenting higher levels of performance, and developing the necessary controls to sustain the gains.

Step one for the team was to document a workflow to clarify the as-is steps in the process. The team decided to begin characterizing the location, frequency, and type of damage by collecting data at various locations in the process. They soon realized that they had to expand to include process steps upstream from the original area where they thought the problem occurred. It turns out damage was found in other areas as well.

To really understand the manufacturing process and the areas under observation, operators were closely observed performing the different process steps and were asked to explain step by step what they do. Some discrepancies between the formally prescribed process and actual process were uncovered. These findings were addressed with the Assembly Engineer and many were corrected immediately to improve the overall process. This knowledge also served to improve subsequent steps in the process.

The entire team, upstream and downstream from where the problem occurred, got together to brainstorm potential causes of the damage. Cause-effect analyses using both fault tree and fishbone diagrams were developed to help them determine what the potential causes were and where in the process they were occurring. The team used run charts to look at the frequency and trends of when the problem occurred.

Different theories that could cause the bent pins were developed. The top three prioritized for further investigation and testing were:

1. Test operator handling causes damage
2. Tooling causes damage
3. Method of testing causes damage

It was suspected that “operator handling” of the connector was the most probable cause. More data was collected to prove which, if any, of these suspected causes was the root cause. Analysis of the data and theories led to a decision by the team to address the proven cause by implementing a pilot solution that prevented the damage that operator handling can cause.

The piloted solution was to tape the flex harness to keep the connector from being able to “flop around.” Another temporary corrective action was to provide a visual reminder that this process step is a sensitive area that needs caution during handling.

The impact and results of the pilot were observed through continual data collection for ten weeks. No further occurrences of bent pins were found. The team verified with data that this was a viable solution that could be implemented at minimal cost, could be done “immediately,” and with minor impact to the process flow.

Taping the harness was a low-risk solution and also served to:

1. Retain the harness enough to keep it from getting in the way when handling
2. Keep the connector parallel to the pins that were getting damaged

Work instructions were modified to specify taping the loose harness and taping the protective cover in place. Compliance to the work instructions are audited on a regular basis. An added



bonus was that the tape could be verified with the protective cover in place during a final inspection step by observing the presence of the visual reminder “flag.”

Once all four phases were realized and the project goals were achieved, the team armed with the knowledge transferred to them by Juran, had the opportunity to identify more opportunities for corrective action.

The Juran Management Solutions - Manufacturing team worked with the Client’s team to facilitate open mindedness and thinking outside the box. The analysis, design, and implementation of the solution were done in a culture where everyone works together, no one is blamed and everyone takes the credit for success.

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## **SUMMARY OF RESULTS**

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After implementing the solution no further damage was found. A control plan and continued data collection indicated that the solution was effective and sustained.

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## **FOR MORE INFORMATION**

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