

ROOT CAUSE ANALYSIS – THE FIVE WHYS

After an occurrence, some operators ‘fix’ what they see as the most obvious cause of a failure. And they’re perplexed when the failure happens again, because they ‘fixed’ it, didn’t they? But the real cause could be buried deep inside the operation, ready to trigger another unpleasant surprise.



Let’s say a pilot of a small cargo operation has an occurrence. The internal investigation finds pilot error to be the cause and the pilot receives extra training.

Then another pilot in the same operation does something similar. There’s obviously something going on other than pilots making decisions that led to occurrences.

An investigation that asked ‘why’ the first pilot made the decision they did might have found they were fatigued. Asking why they were fatigued might have found they were overworked. Asking why they were overworked may have found there was a seasonal influx of work and too few pilots to meet the demand.

And asking why that had happened may have identified poor personnel management practices at the operation – employing just the adequate number of pilots to meet the requirements of low season work, but not employing extra personnel to cover high season needs.

Diving deep like this into the possible cause of an occurrence is called root cause analysis and the method described here is called the five whys.

It’s used by CAA’s safety investigators.

“We ask, ‘is it training that caused this?’” says CAA Safety Investigator Colin Grounsell, “Or is it the ergonomics of the aircraft – have the manufacturers made the landing gear selector handle look similar to the flap lever and have them in close proximity to each other?”

“Could it be poor maintenance practice, or is the maintenance manual deficient?”

“Or is it the way the company is organised?”

Fellow CAA Safety Investigator Dan Foley says it’s easy to blame human error.

“Blame is the enemy of safety,” he says. “Phrases like ‘he ought’, ‘she should’ – those are ‘blame words’ and using them often veils the true cause of an issue.

“They’re part of a faulty set of conclusions called ‘hindsight bias’. This prejudice arises when someone not involved in an incident looks at all the factors involved laid out in front of them and thinks, ‘well it’s obvious to me what happened; they should have seen it too’.

“Whereas, when you’re in the decision-making environment itself and things are unfolding and you cannot necessarily see what is going to happen next, all the factors that led to the occurrence are not obvious at all,” says Dan.

“It’s very rare that a pilot or engineer does something deliberately foolish. So you have to put yourself in their position and think, ‘right, they were flying along, or in the workshop, and they made these decisions and those decisions made sense to them at the time.

“Now why is that’, why didn’t they do the things that seem so obvious to us?”

Colin Grounsell says most organisations do a good job of investigating an occurrence.

“But what can be really difficult is when the investigation leads you down into the culture of the organisation. It’s like throwing rocks inside your own glasshouse, and may not be taken very well.

“So you can understand internal investigators’ reluctance to start asking the harder questions of the CEO.”

But Dan Foley says the real value comes from asking those difficult questions.

“It’s a mark of the organisation’s maturity – and its resourcing – to be able to do it. But an organisation will sometimes struggle if one or two people are wearing multiple hats. In that situation, contracting an outside investigator can be a good move.”

Colin says the ‘five’ in five whys should not be taken literally.

“You could go on to 11 whys if needed. Or you might find the cause in three.”

An Australian quality system consultant, Mike Sondalini, says at each stage of the five whys, investigators must have concrete evidence that they’re on the right track.

“[Otherwise] they end up fixing problems that did not cause the failure incident ... it is never certain that you have found the root cause unless there is real evidence to confirm it.”¹

He says if physical evidence is truly impossible to get, clear logic can also be used to map the path from cause to occurrence.

“Impeccable logic that withstands scientific scrutiny can also be used to identify the failure path,” he says.

“It is evidence and clear logic that decides the path to take, not someone’s opinion.”

Dan Foley says if some issue along the way is found to have contributed to the incident, even if it isn’t the root cause, identifying it gives an opportunity to fix it.

“Let’s say someone slips in a pool of water. That’s traced to a leaking air conditioner. That’s tracked back to a seal that’s been faulty for some time, and the ‘why’ of the long-term faulty seal leads back to a poor reporting culture.”

“While the poor reporting culture is the root cause of the incident, identifying the faulty seal clearly gives the opportunity to fix it.”

An internal investigation also needs to question why its safety management system didn’t identify the potential risk, or if it had, why the risk escalated to a fully formed occurrence.

“Following an investigation,” says CAA Safety Management System Specialist Charlotte Brogan, “operators should review their risk controls to ensure those they’ve documented and have in place actually worked.

“Or if the controls they had in place weren’t effective in stopping the occurrence happening, operators should look at what controls will be effective.

“And if the occurrence was something unrecognised as a potential risk, it now needs to be captured within the risk register.”

Colin Grounsell says anyone struggling with an internal investigation can contact the Safety Investigation Unit at the CAA and ask for help.

“We’re happy to help, and it’s free of charge,” he says. ➡

¹ Web article: *Understanding How to Use The 5-Whys for Root Cause Analysis*, Lifetime Reliability Solutions.

Five whys analysis example

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graph TD
    A[Caught speeding] -- Why? --> B[Late for work]
    B -- Why? --> C[Got up late]
    C -- Why? --> D[Alarm clock didn't work]
    D -- Why? --> E[Dead batteries]
    E -- Why? --> F[Root cause: Forgot to replace them]
    F --> G[Remedy: Get a plug-in alarm clock or replace the clock's batteries at set times before they run out.]
            
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By repeatedly asking the question "Why?" you can peel away the layers of an issue and get to the root cause of a problem. Keep asking "Why"? until you reach an actionable level.

Chart courtesy of Impac.

// OCCURRENCE INVESTIGATION WORKSHOP

Colin and Dan are presenting a new CAA workshop on occurrence investigation.

See the back cover for dates and places where the workshop will be held.

Email publications@caa.govt.nz for your free copy of the updated booklet, *How to report occurrences*.