

Root Cause Analysis Workshop



Workshop Outline

- Presentation of facilitator and participants;
- Course goals, concept, contents and structure;
- Administrative information.

Presentation of Facilitator

- ❖ Peter Budd
- ❖ Please call me “Peter”
- ❖ Work as a safety and security advisor
- ❖ Advisor to the Vice Chairman
- ❖ ICAO SMS instructor and auditor
- ❖ Airline pilot 25 years
- ❖ Aircraft accident investigator

Presentation of Participants

❖ The 5 W's

➤ **Who** are you?

- ✓ What is your preferred name in class?

➤ **Where** do you work?

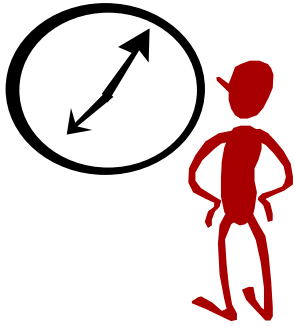
➤ **What** is your job title?

➤ **What** are your main responsibilities?

➤ **Why** are you attending the workshop?

- ✓ What are your expectations from the workshop

Housekeeping



Punctuality



Participation



Phones



No smoking

Workshop Schedule

- 09:00 – 09:45 – Session activity
- 09:45 – 10:00 – **Break**
- 10:00 – 10:45 – Session activity
- 10:45 – 11:15 – **Coffee/Tea break**
- 11:15 – 12:00 – Session activity
- 12:00 – 12:15 – **Break**
- 12:15 – 13:00 – Session activity
- 13:00 – 14:00 – **Lunch**
- 14:00 – 14:45 – Session activity
- 14:45 – 15:15 – **Coffee/Tea break**
- 15:15 – 16:00 – Session activity



Course Goals

- **Develop a working document on root cause analysis**
- Understand what is root cause;
- Understand the relationship between root cause and safety management system (SMS);
- The role of root cause analysis in safety management;
- Enhance root cause analysis skills;
- Other goals?

Reference Document

- ICAO Doc 9859-Safety Management Manual

Course Structure

- Discussion on a concept;
- Group(s) exercise on concept discussed;
- Groups report individually;
- Summarize the findings.

Course Content-1

- Exercise #1-experience
- What is a Causal Factor
- Exercise-Causal Factor-Engine failure
- What is a Root Cause?
- Exercise-salesman
- How does root cause analysis relate to SMS?
- What are the benefits of root cause analysis?
- Exercise-

Course Content-2

- Review of SMS principals
- Exercise Root Cause

Group Exercise

- Task: Identify a successful event or an activity that you have participated in and indicate the reasons why it was a success.

What is a Causal Factor?

➤ Group discussion-

What is a Causal Factor?

- a causal factor is a contributing factor but not originating nature.

What is Root Cause?

- a common consensus can probably be found in determining a root cause as **“a cause, if altered or removed, would have either have eliminated or substantial altered the outcome.”**

Five Why's

A tool for quickly getting to the 'root causes' of an issue before developing solutions. A great team-builder because it gets the group's buy-in as part of the process

Objectives of Using 5 Why's

- To help the team understand all the causal factors that have a bearing on an issue / problem (i.e. fix the real problem rather than treating the symptoms)

Group Exercise-Symptoms vs Root Cause

- Symptoms: Are not the cause, but signs of a problem.
- Failure to perform a root cause analysis will lead you to treat the symptoms instead.
- ❖ **TASK: Give an example of a symptom of a problem that is not the cause of the problem.**

When Would You Use THE 5 WHY'S?

- When you have a problem -- it's a simple diagnostic tool to explore an issue that is hard to deal with
- Always use 5 why's before developing a solution -
 - that way you avoid slipping into 'fix-it' mode and addressing symptoms rather than causes

Are There Any Rules?

- Always go through a root cause analysis phase of difficult problems -- otherwise solutions may only work for a short time.
- Don't debate each point to death.
- Identify issues and move onto the next as quickly as possible.
- It's important to complete it so you can see the whole picture before drawing conclusions.

Resources required

- A willing group of people
- A large square piece of blank paper big enough for everyone to stand around and see comfortably (1m high by 3m long is normally enough)
- Wall space to put the paper up on
- A private quiet open space surrounding the paper
- Marker pen for the facilitator (at least one with some spares if required)
- No tables and chairs – this is a standing high-energy exercise

Roles & Responsibilities

Facilitator	Participants
Focused on getting through the process	Contributes their ideas and expertise
Keeps the process on track and avoids getting stuck talking at length about issues	Follows the process
Ensures all notes made on the tree are unpacked, clear and understood by not only the participants but people outside the process so it can be used later	Helps the team attain the goal
	Stays positive throughout (lots of issues will be uncovered)

Process

1. The **Facilitator** starts the analysis with a concise statement of the challenge you are facing -- in this example the challenge is:
“Revenue budgets not balanced”.

The Five Whys analysis identifies underlying causes to a challenging issue



Process

2. Having captured the issue on the left, move to the right and pose the question: “Why is that?”
3. The **Facilitator** captures the answers to the question as short, succinct phrases rather than single words. For example, rather than ‘Costs’ or ‘Income’, unpack these topics by describing the causes in a succinct phrase, such as ‘Cost are too high’ and ‘Income is too low’.

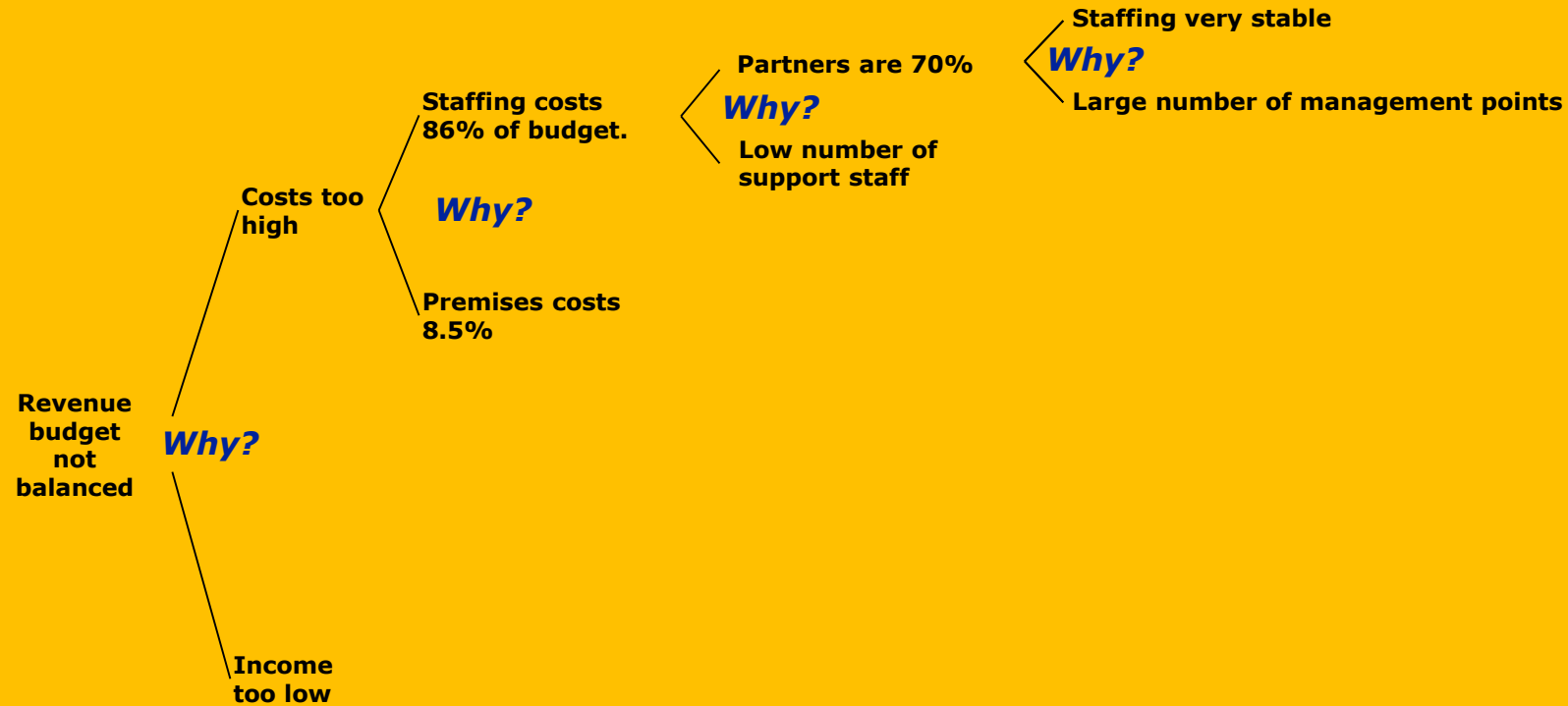
The Five Whys analysis identifies underlying causes to a challenging issue



Process

4. Gradually work across, from left to right, as you pose the same question “Why?” at each successive level of your analysis. In this example I have worked the staff cost issues through four levels of analysis.
5. Try to work a branch of your analysis to five levels or until you reach a ‘root’ cause -- whichever comes first -- before returning to a higher level and analysing another branch of the issue.

Posing the question “Why?” at successive levels of analysis



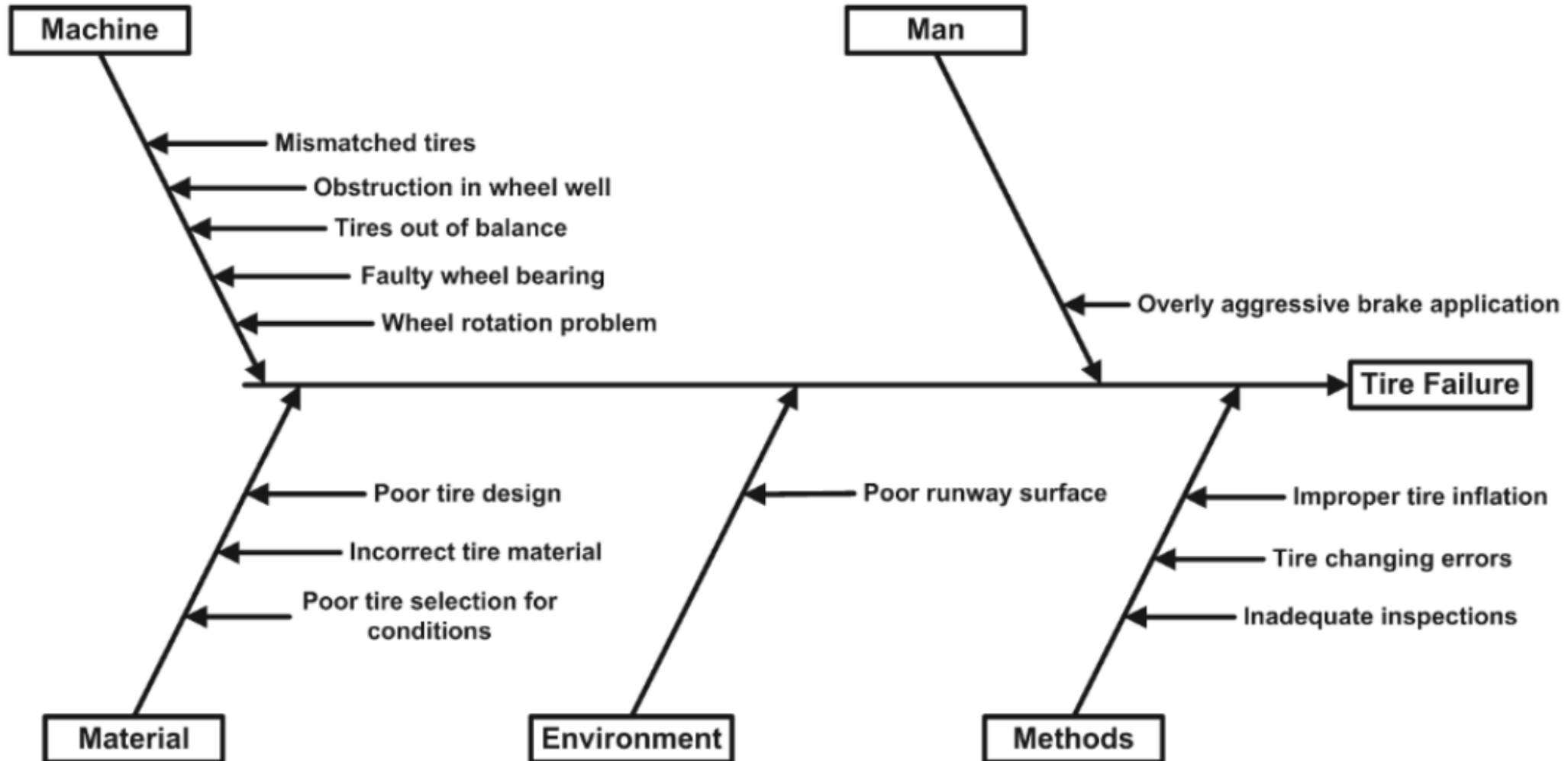
Process

6. The completed analysis identifies all the 'root' causes that must be taken into account in your solution to the issue.

The Five Whys helps us to understand all the causes of a challenging issue



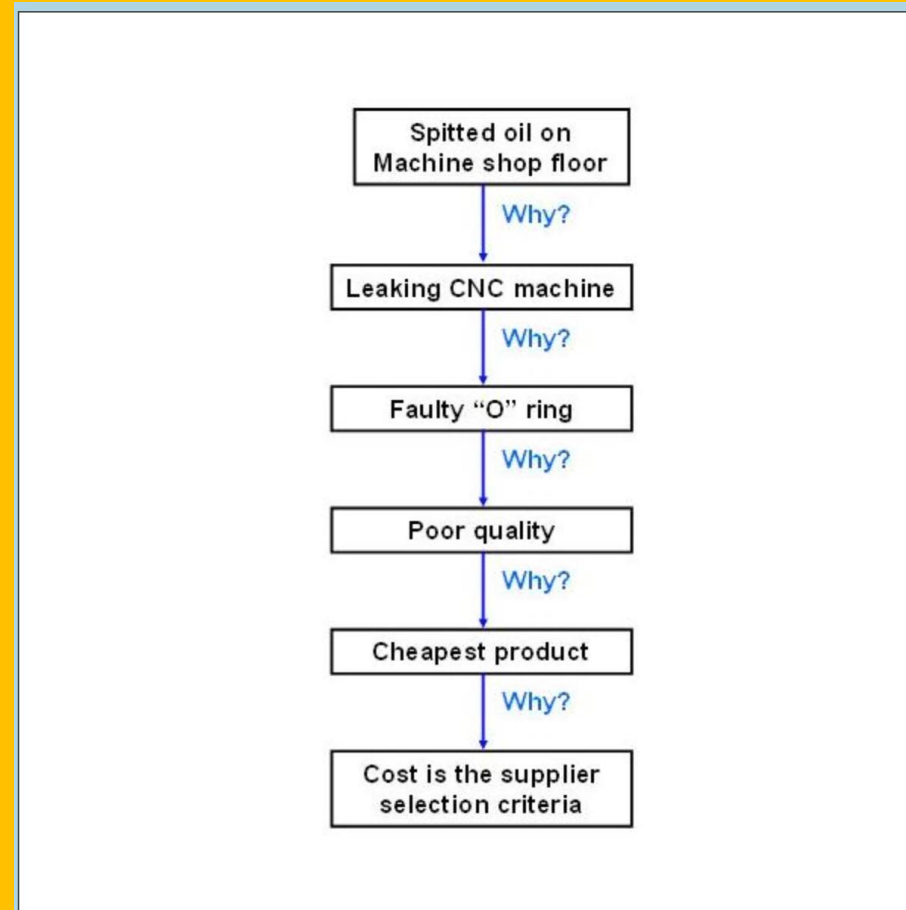
Fishbone or Ishikawa Diagram



Secret Sauce

- When deciding how best to capture the answer, it is good practice to check whether someone not involved in the analysis could nonetheless follow the logic of the analysis by reading your output afterwards.
- Note: For illustrative purposes in this example I have identified just two causes at each level. In your analysis there may well be more than two answers to “Why?” at each level.
- You might not be able to solve all the root causes you identify, but don’t worry, having the insights from your analysis will ensure that your solution will be better informed and more embracing.

Root Cause Diagram Chart



TASK-Determine the Causal Factors

- a causal factor is a contributing factor but not originating nature.

➤ Engine failure

- why ? The fuel pump failed.
- Why? Because it got clogged up.
- Why ? Because the fuel was contaminated.
- Why ? because the fuel provider had contaminated fuel.
- Why ? the company took fuel from a non-licenses but cheap provider

TASK-What is the Root Cause - Engine Failure?

➤ Group Task.

- The fuel pump failed.
- Because it got clogged up.
- Because the fuel was contaminated.
- Because the fuel provider had contaminated fuel.
- The company took fuel from a non-licensed but cheap provider..

Challenges with Solving a Problem

Typically, when there is a problem, those who are closely involved tend to believe they can quickly identify the solution.



Challenges with Solving a Problem— Quick Solutions

Unfortunately, this often leads to a “band-aid” approach for correcting a discrepancy or non-conformity, and does not prevent recurrence.



Challenges with Solving a Problem- Accepting the Current Situation

We often accept substandard performance and failure as:

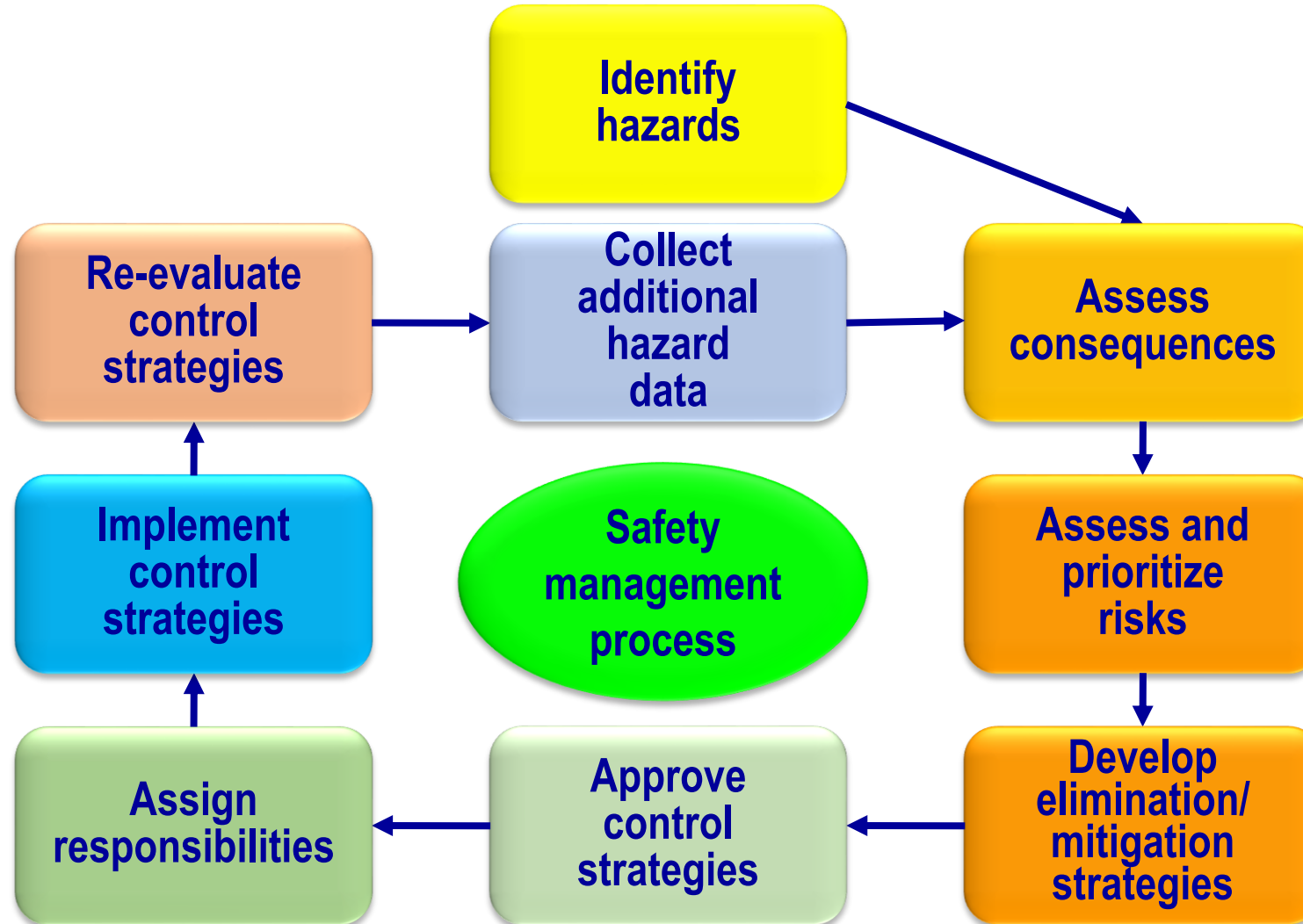
- “That’s just the way it is”
- “It has always been a problem”
- “It can’t be fixed”
- “Not my job”

How Does Root Cause Relate to SMS?

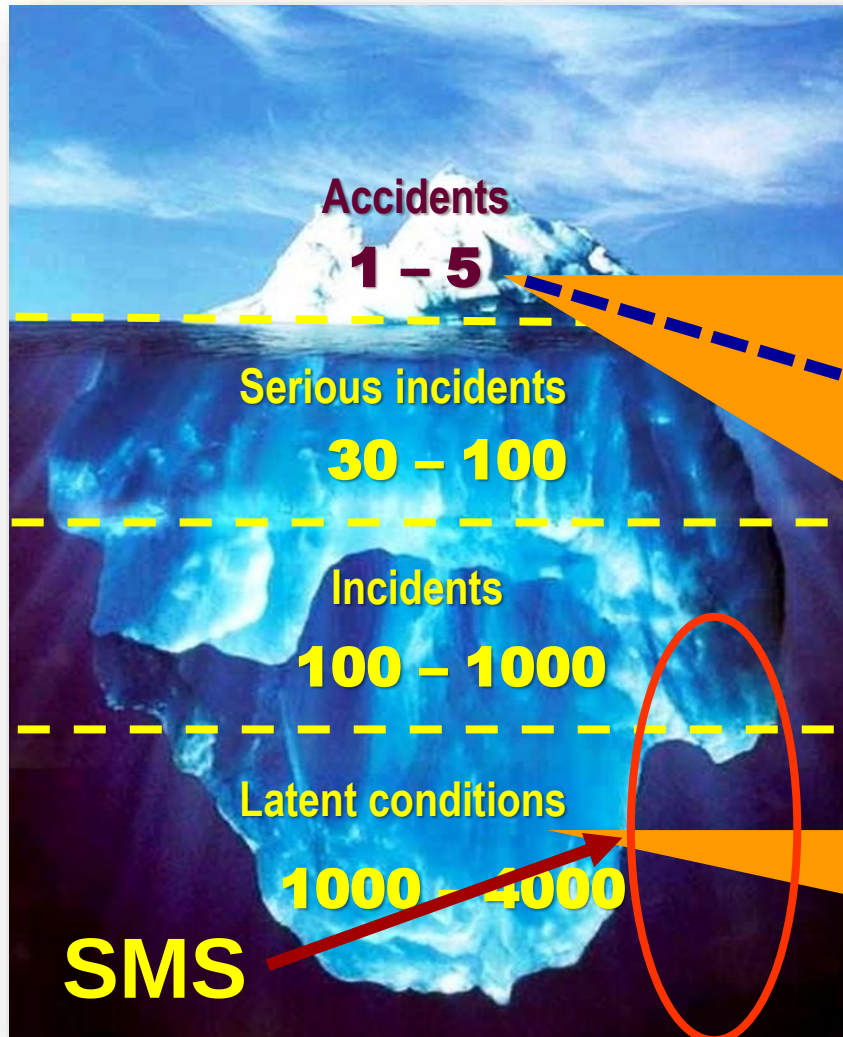
➤ TASK:

1. Document your ideas

The safety management process at a glance



The focus of hazard identification

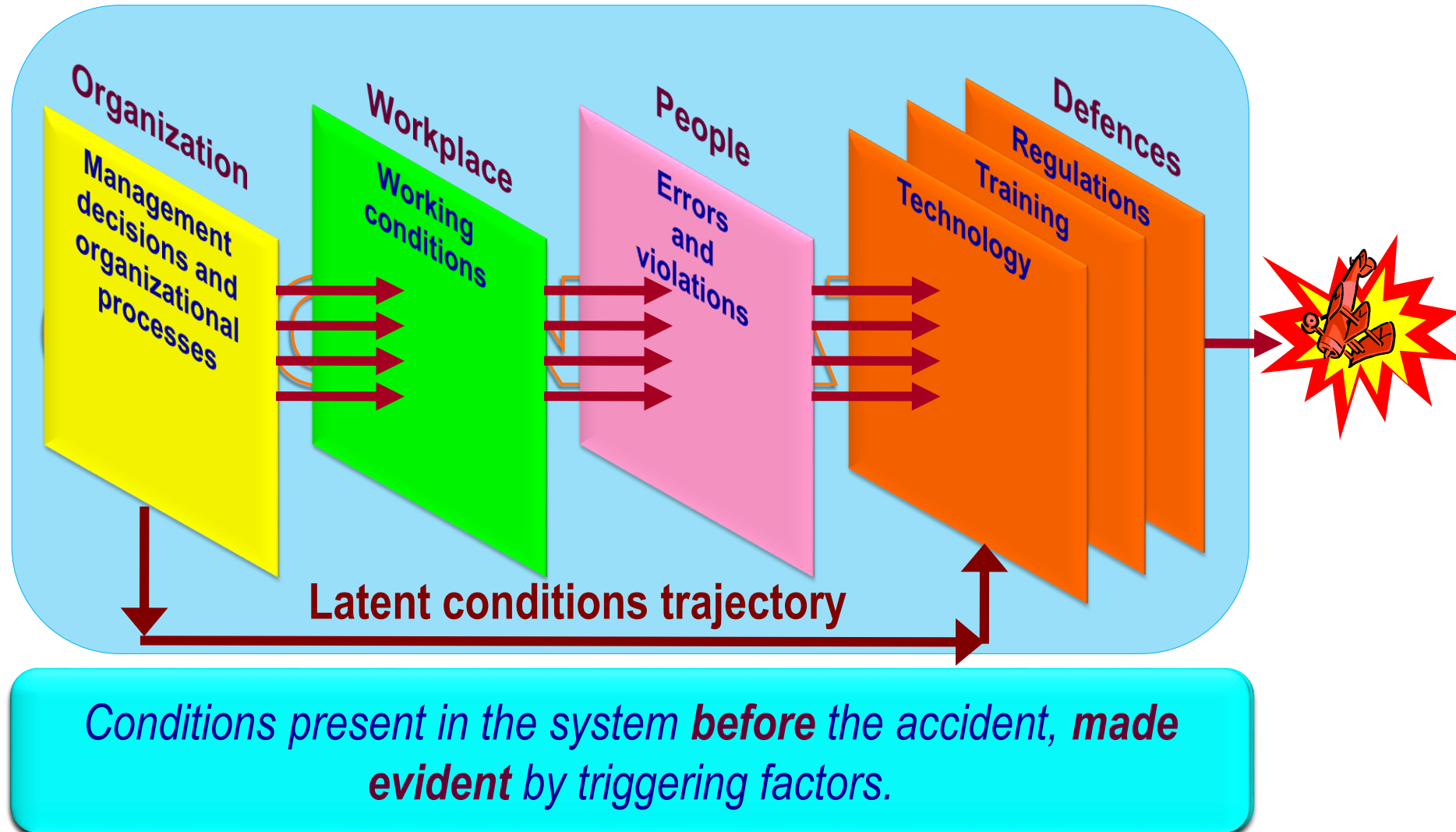


❖ Hazard identification is a wasted effort if restricted to the aftermath of rare



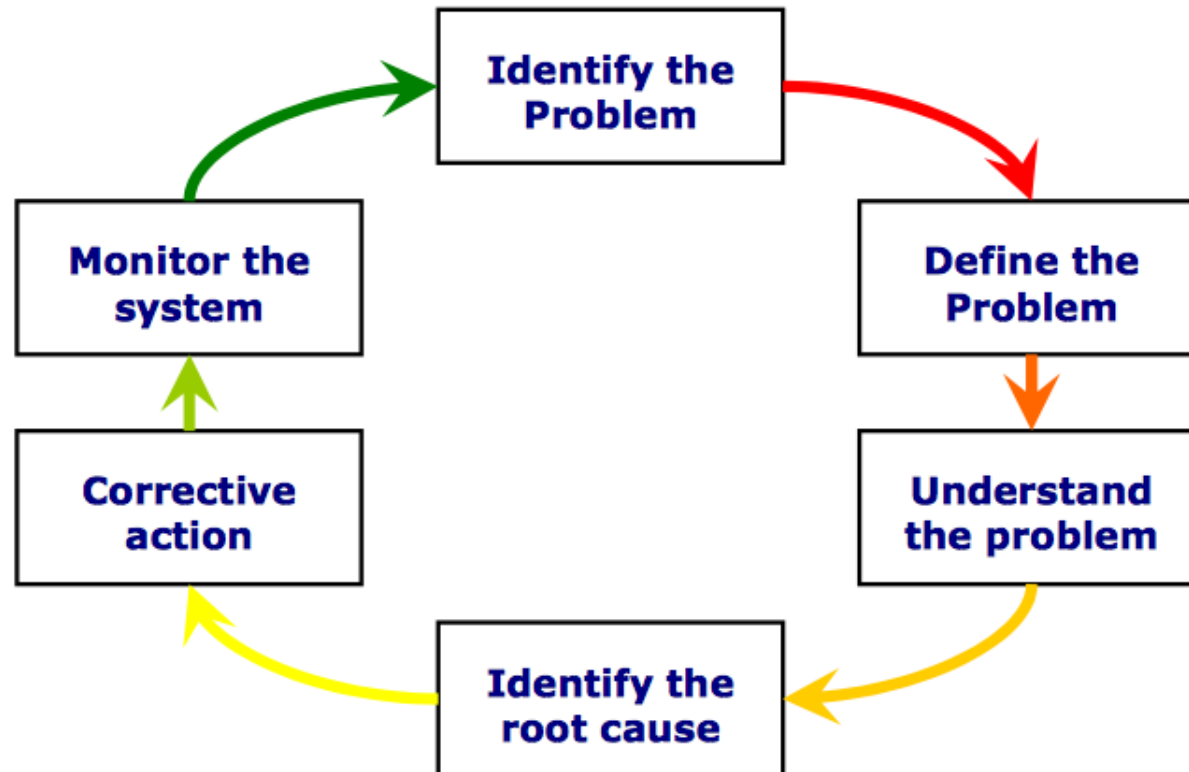
“Practical drift”

A concept of accident causation



Root Cause Analysis

RCA is simply the application of a series of well known, common sense techniques which can produce a systematic, quantified and documented approach to the identification, understanding and resolution of underlying causes. Below are a number of definitions which encapsulates the main points of this technique:



Definition of a Problem

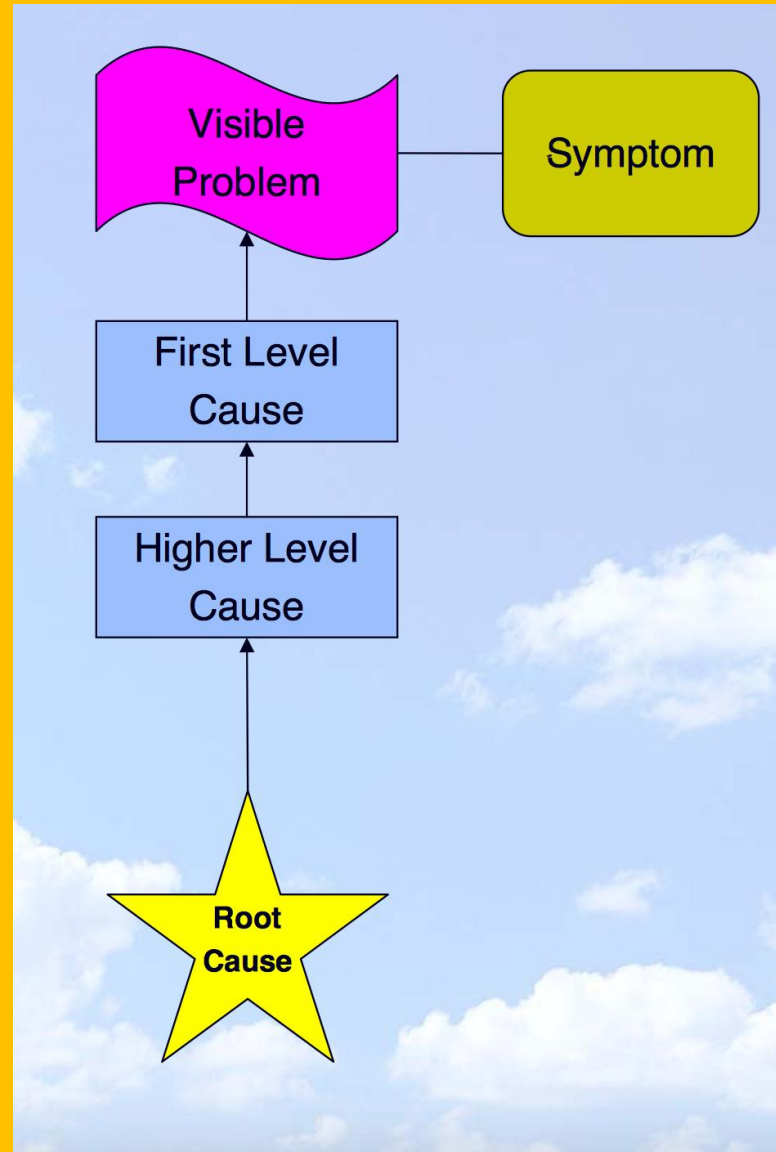
- “A question proposed for a solution”
- “A state of difficulty that needs to be resolved”

Clearly state in writing the problem that you want to solve.

How to Solve a Problem

- Every problem has a cause;
- Some problems have multiple causes, but
- Most problems have one main cause or a root cause;
- The goal of problem solving is to find the root cause and eliminate it in order to prevent its recurrence (ISO Clause 8.5).

Finding the Root Cause

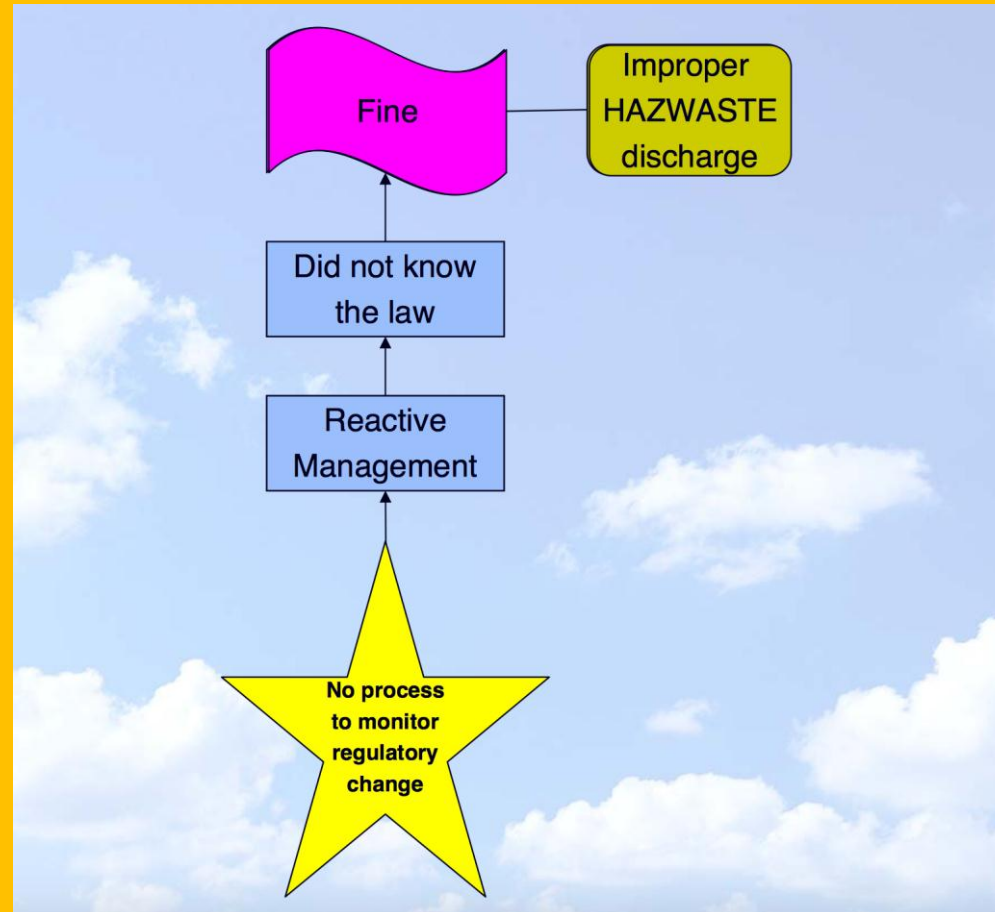


Different Levels Of Causes

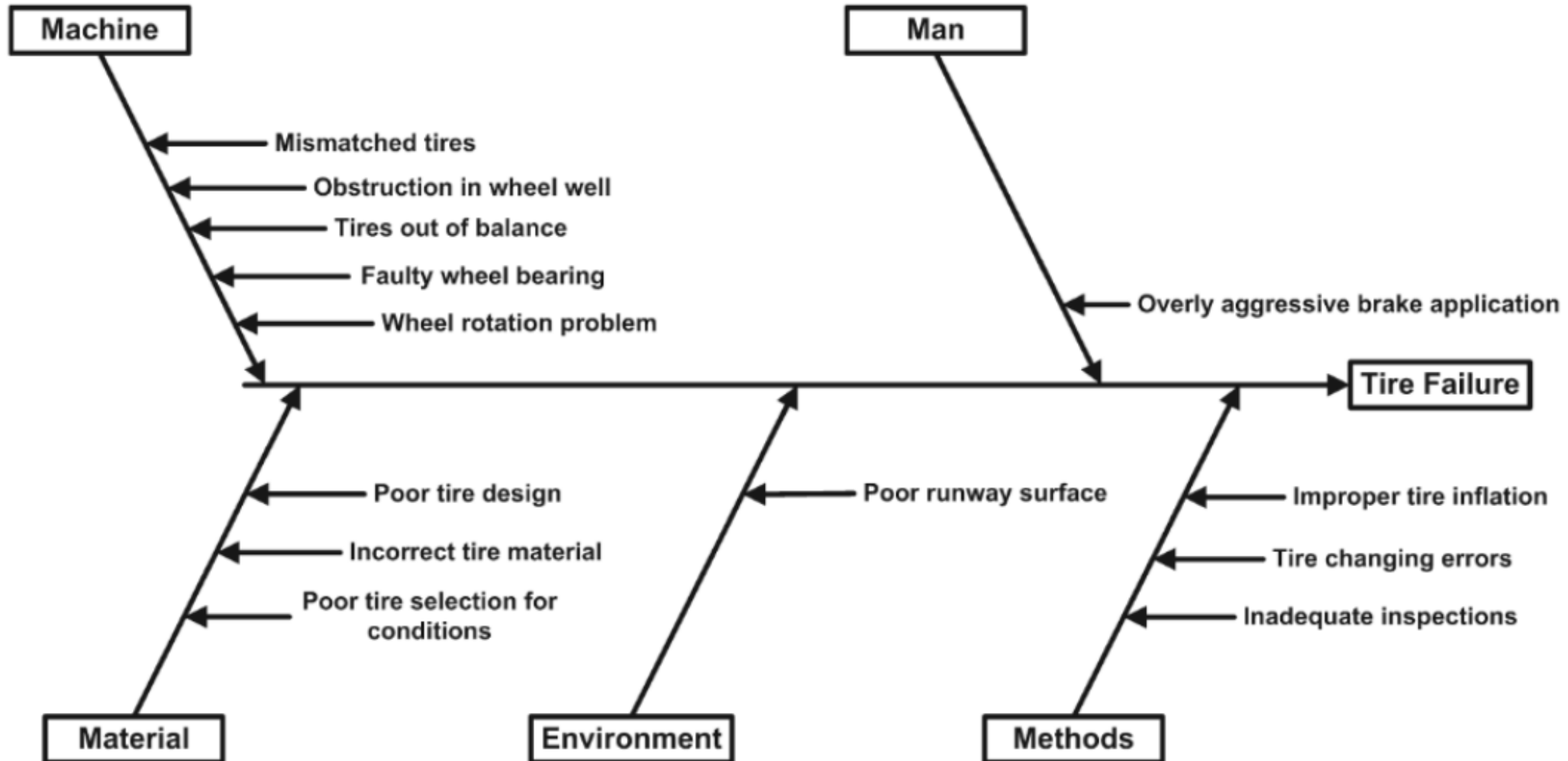
- First Level: directly lead to a problem
- Higher Level: directly lead to the first level

Example: A well known aviation maintenance company received a fine for improper HAZWASTE disposal.

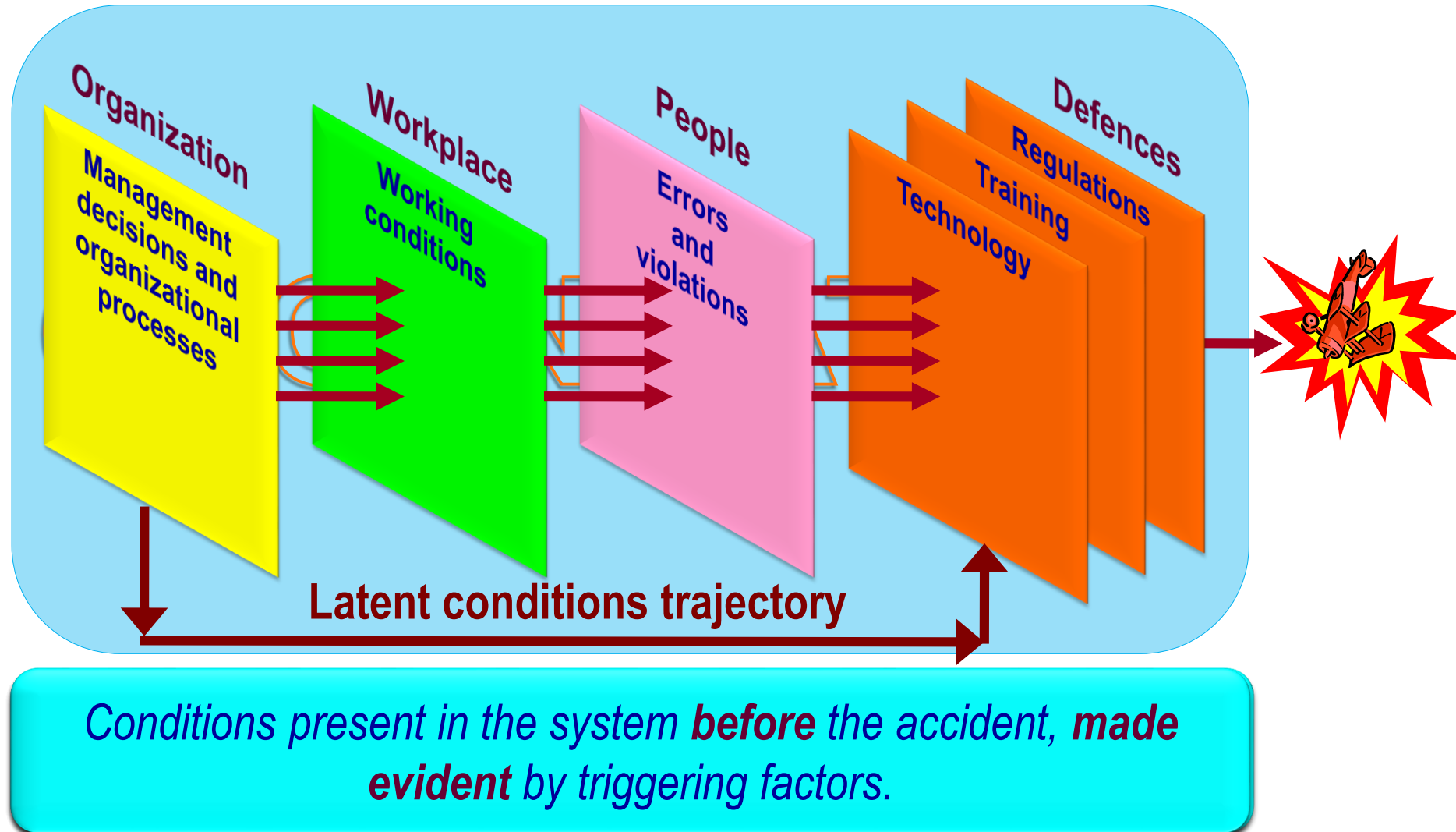
Different Levels of Causes



Fishbone or Ishikawa Diagram



A concept of accident causation



Fishbone Diagram-Does it Need Modification?

➤ Group Exercise:

1. Determine if the Fishbone diagram needs modification for use in your operation?
2. Identify any modifications required?
3. Produce revised Fishbone diagram.

TASK

- DRAW THE ROOT CAUSE DIAGRAM FOR THE EXAMPLE IN THE HAND OUT TITLED “SMS FOR SMALL ORGANISATIONS.”

TASK-IDENTIFY ROOT CAUSE OF THE F28 EXCURSION

❖ **Runway excursion**

- Normal touchdown
- Left landing gear separated after landing
- 60 cycles since overhaul
- Installed at 3 AM on 4th day of 10 hour shift
- Gear installed with hydraulic fluid at level used to transport gear and topped up with nitrogen
- Foreman position nationalized by Board decision 6 years previously

Root Cause Analysis-Corrective Action Steps

1. Factually describe and document the whole event.
2. Now, gather the evidence to support your description of the event.
3. Classify your evidence along a proper timeline in which the events occurred ending with the final failure.
4. Identify the causes by asking "why" along each step. Remember the 5 Whys method.
5. Separate root causes along each step that impacted the event in any way from the casual causes without direct impact on the final failure.
6. Identify all possible preventive measures and place them in order with the most simplest and cost-effective measure at the top.
7. Classify these measures further by identifying the ones that have a group consensus and are likely to have the highest possible rate of preventing the problem in the future without creating other disturbances.
8. Seek any other methods necessary to reach the root cause depending on the complexity of your problem and field.
9. Apply these corrective measures to ensure future prevention and safety.

Corrective and Preventive Actions

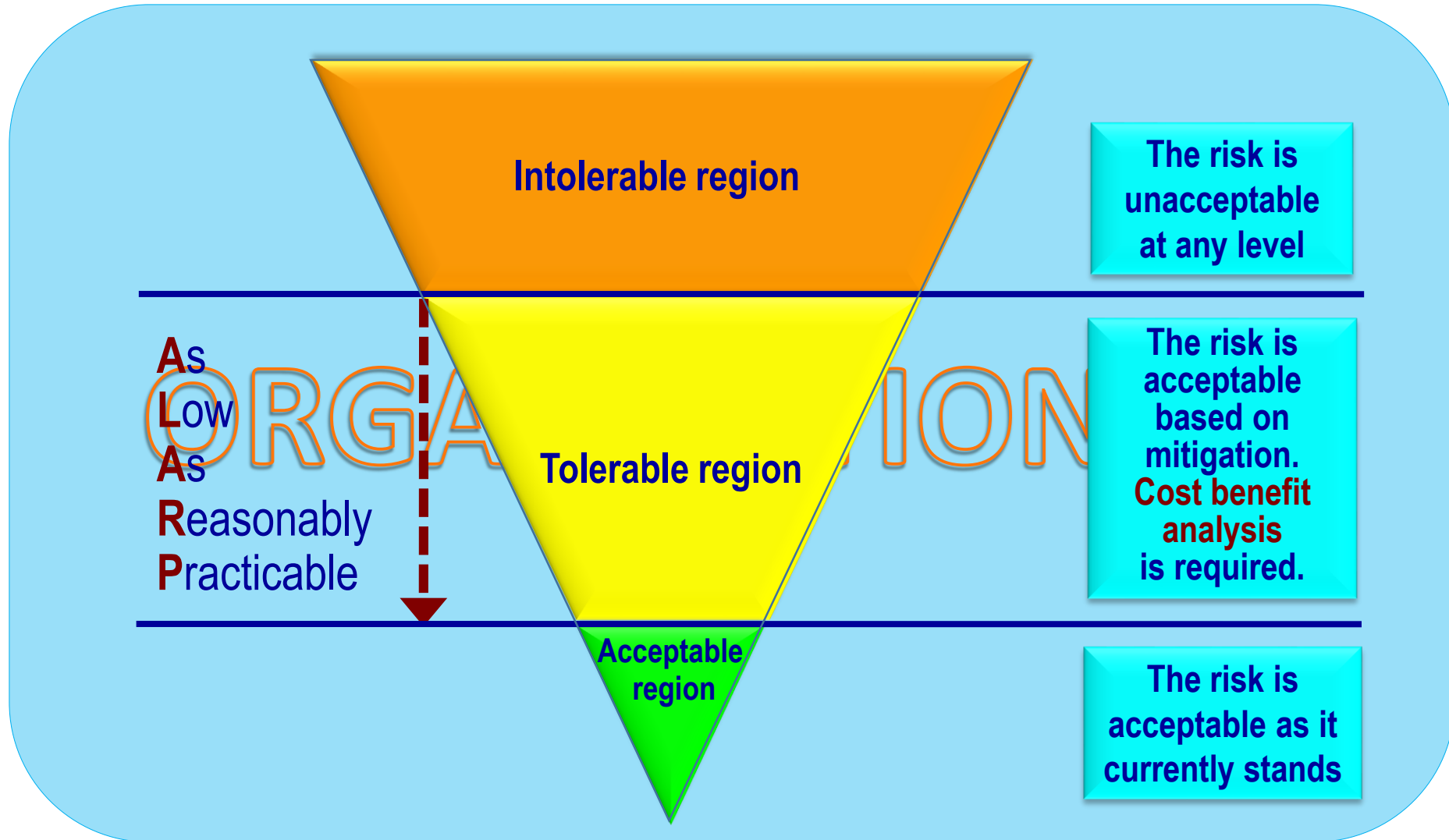
➤ **Corrective Action**

The organization shall take action to eliminate the cause of non-conformities in order to prevent recurrence .

➤ **Preventive Action**

The organization shall determine the action to eliminate the causes of potential non-conformities in order to prevent their occurrence .

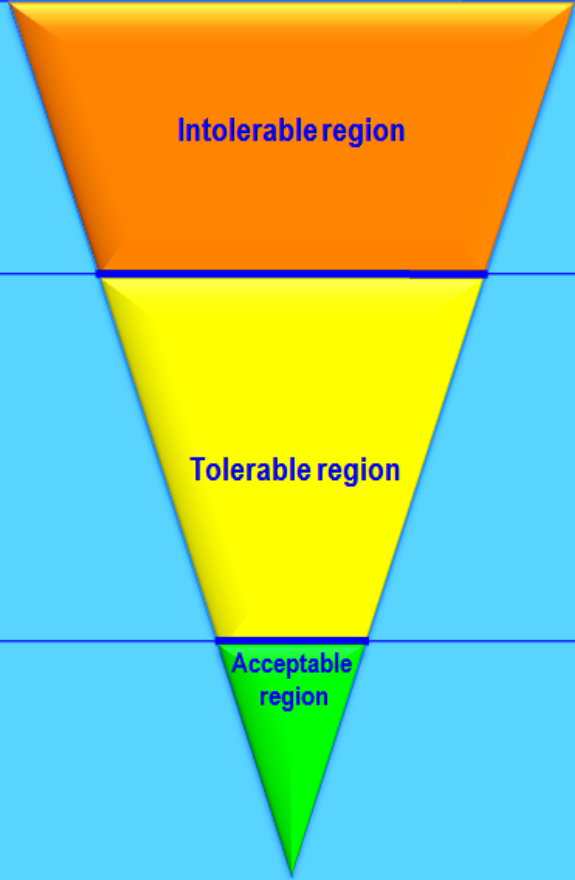
Risk management



Fourth fundamental – Risk index/tolerability

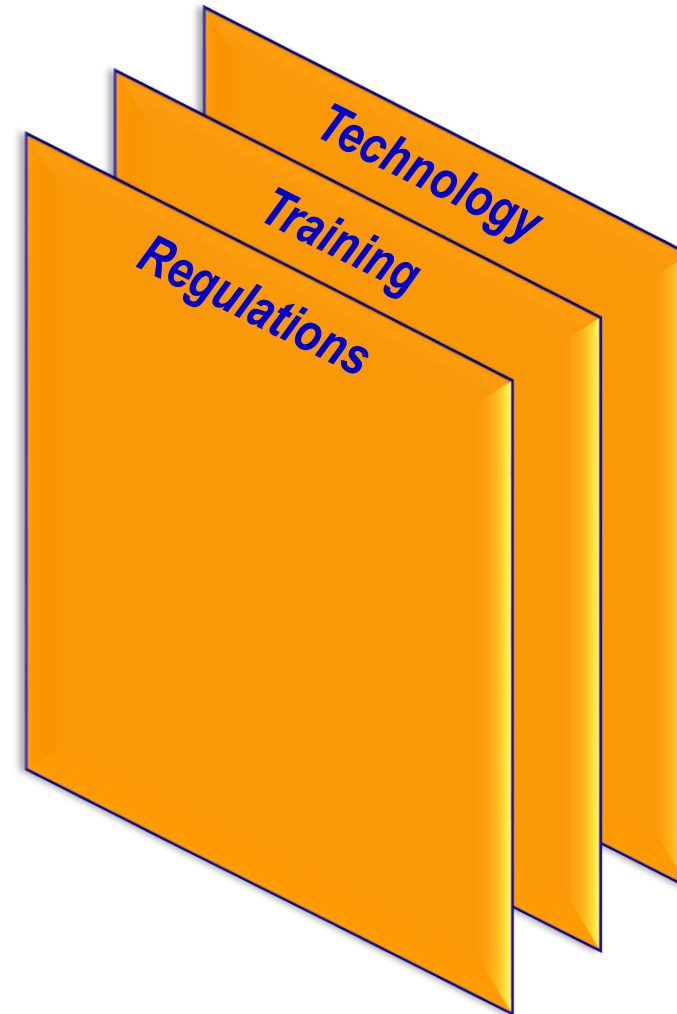
Risk probability	Risk severity				
	Catastrophic A	Hazardous B	Major C	Minor D	Negligible E
Frequent 5	5A	5B	5C	5D	5E
Occasional 4	4A	4B	4C	4D	4E
Remote 3	3A	3B	3C	3D	3E
Improbable 2	2A	2B	2C	2D	2E
Extremely improbable 1	1A	1B	1C	1D	1E

Fourth fundamental – Risk index/tolerability

Risk management	Assessment risk index	Suggested criteria
 Intolerable region	5A, 5B, 5C, 4A, 4B, 3A	Unacceptable under the existing circumstances
Tolerable region	5D, 5E, 4C, 4D, 4E, 3B, 3C, 3D, 2A, 2B, 2C	Acceptable based on risk mitigation. It might require management decision
Acceptable region	3E, 2D, 2E, 1A, 1B, 1C, 1D, 1E	Acceptable

Risk mitigation – Defences

- Recalling the three basic defences in aviation:
 - Technology
 - Training
 - Regulations



Root Cause Analysis

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