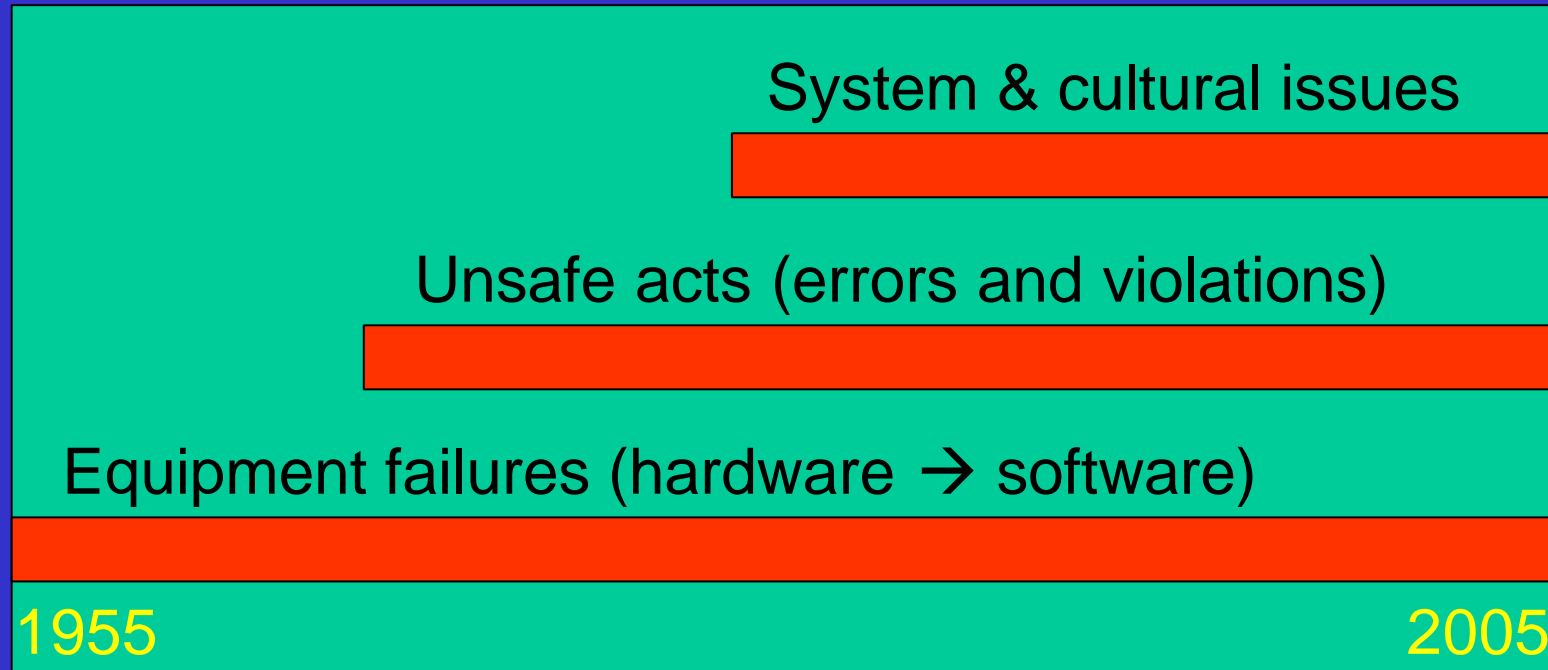


Management of Human Factors Risk in Safety-Critical Industries
Royal Aeronautical Society, 11th May 2006

Human Factors Risk Culture

James Reason
Emeritus Professor
University of Manchester

Expanding focus of safety concern across industries



1960s

Metal fatigue
Aberfan
Ibrox

1970s

Flixborough
Seveso
Tenerife
TMI
Mt Erebus

1980s

Chernobyl
Zeebrugge
Bhopal
Piper Alpha
Dryden

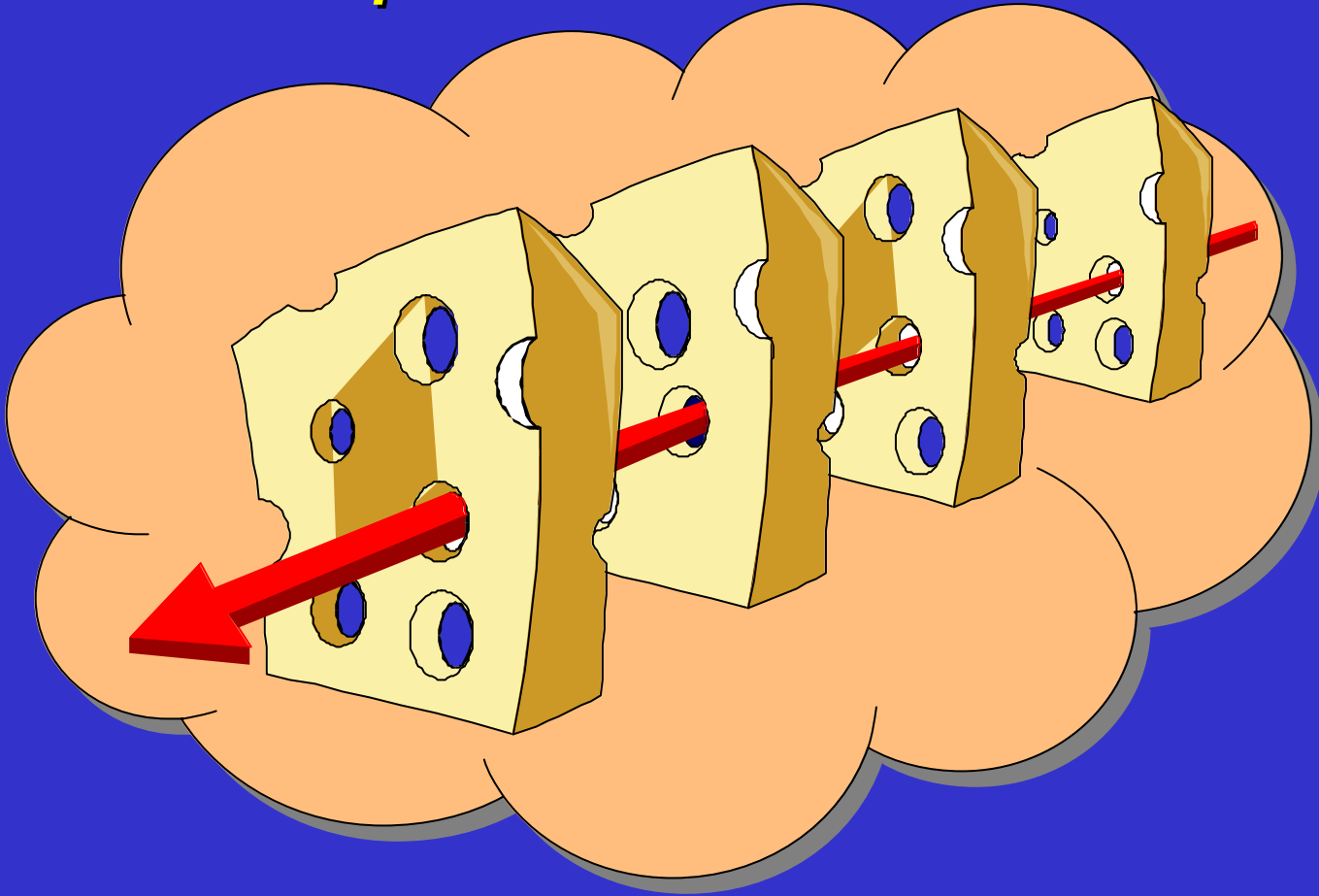
1990s

Paddington
Long Island
Alabama
Estonia
Eschede

2000s

Linate
Überlingen
Columbia

The importance of culture



Only culture can reach all parts of the system.
Only culture can exert a consistent influence,
for good or ill.

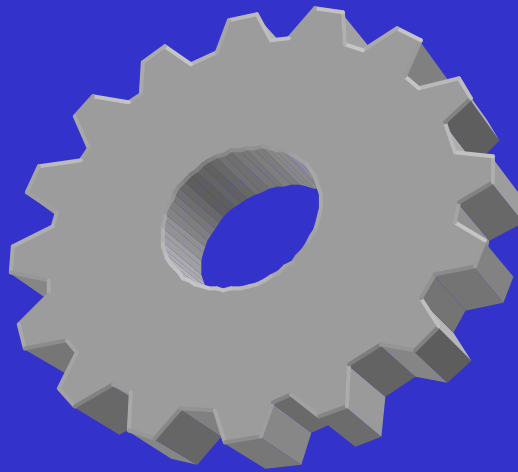
Culture: Two aspects

- Something an organisation is: shared values and beliefs.
- Something an organisation has: structures, practices, systems.
- Changing practices easier than changing values and beliefs.

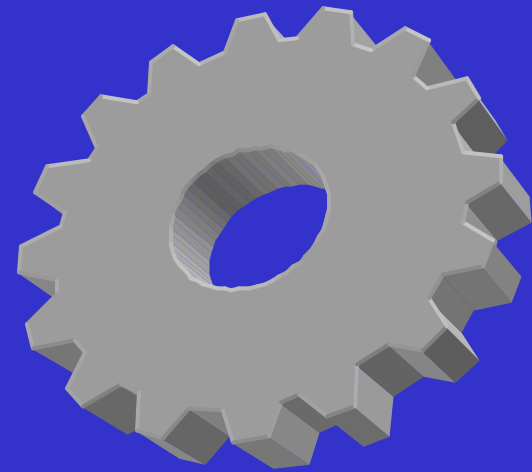
A safe culture: Interlocking elements



Just
culture



Reporting
culture

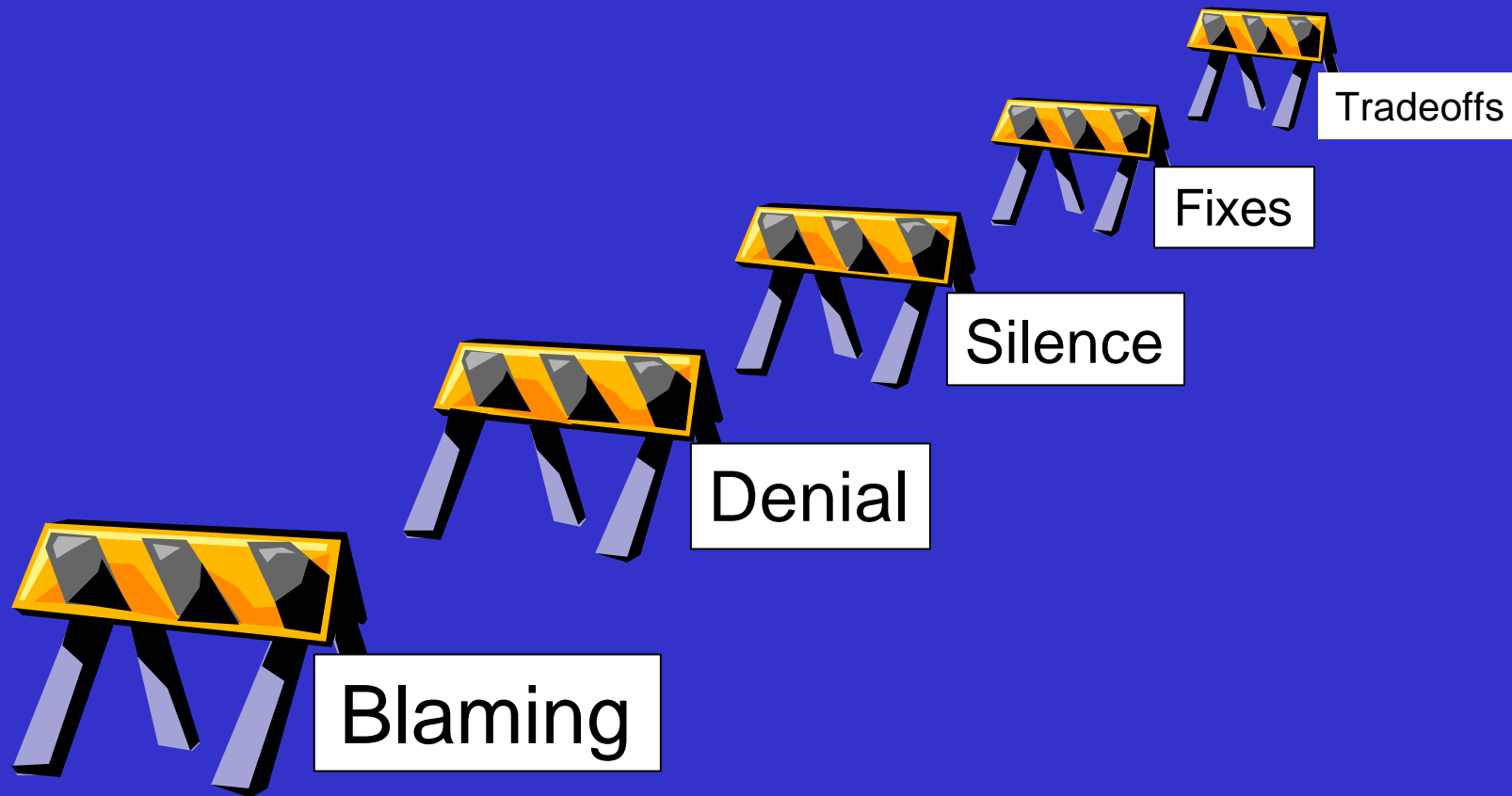


Learning
culture

Cultural 'strata'

GENERATIVE	Respects, anticipates and responds to risks. A just, learning, flexible, adaptive, prepared & informed culture. Strives for resilience.
PROACTIVE	Aware that 'latent pathogens' and 'error traps' lurk in system. Seeks to eliminate them beforehand. Listens to 'sharp enders'.
CALCULATIVE	Systems to manage safety, often in response to external pressures. Data harvested rather than used. 'By the book'.
REACTIVE	Safety given attention after an event. Concern about adverse publicity. Establishes an incident reporting system.
PATHOLOGICAL	Blame, denial and the blinkered pursuit of excellence (Vulnerable System Syndrome). Financial targets prevail: cheaper/faster.

Some barriers to cultural progression



Culture change: a continuum

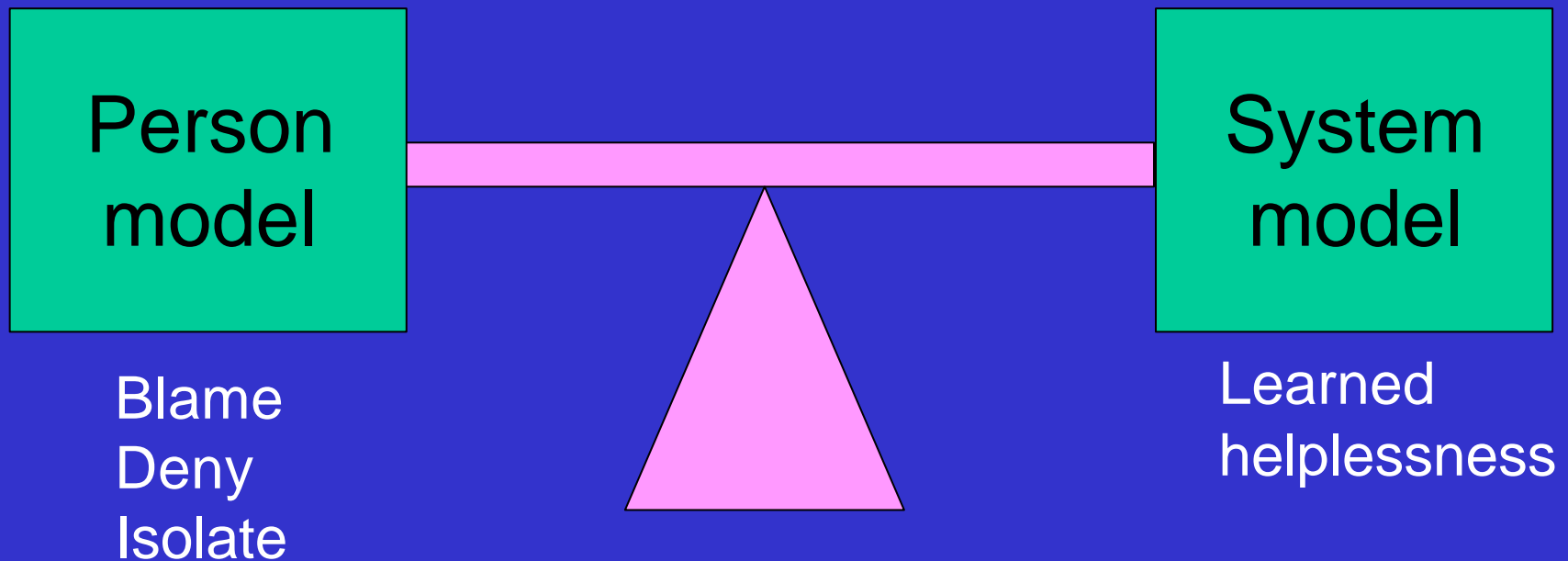
- Don't accept the need for change.
- Accept need, but don't know where to go.
- Know where to go, but not how to get there.
- Know how, but doubt it can be achieved.
- Make changes, but they are cosmetic only.
- Make changes, but no benefits—model doesn't align with real world.
- Model aligns today, but not tomorrow.
- Successful transition—model keeps in step with a changing world.

Contrasting perspectives on the human factor

- Person model vs system model
- Human-as-hazard vs human-as-hero

'Reliability (safety) is a dynamic non-event'
(Karl Weick)

Getting the balance right



Both extremes have their pitfalls.

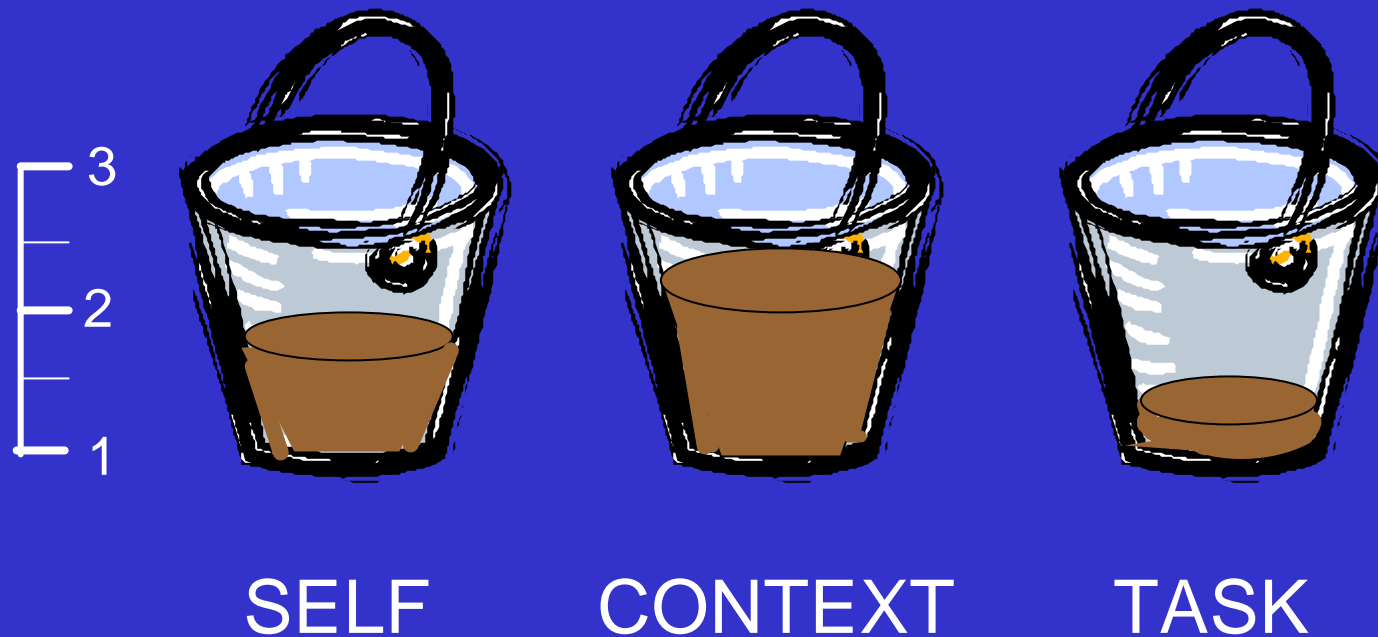
On the front line . . .

- People at the sharp end have little opportunity to improve the system overall.
- We need to make them more risk-aware and 'error-wise' – mental skills that will:
 - Allow them to recognise situations with high error/risk potential.
 - Improve their ability to detect and recover errors that are made.

Risk-awareness on the front line: Lessons from various industries

- Western Mining Corporation: 'Take time, take charge'.
- Thinksafe SAM: Steps are **S**=spot the hazard, **A**=assess the risk, **M**=Make changes.
- Esso's 'Step back five by five'.
- Defensive driver training.
- Three-bucket assessments

The 3-bucket model for assessing risky situations



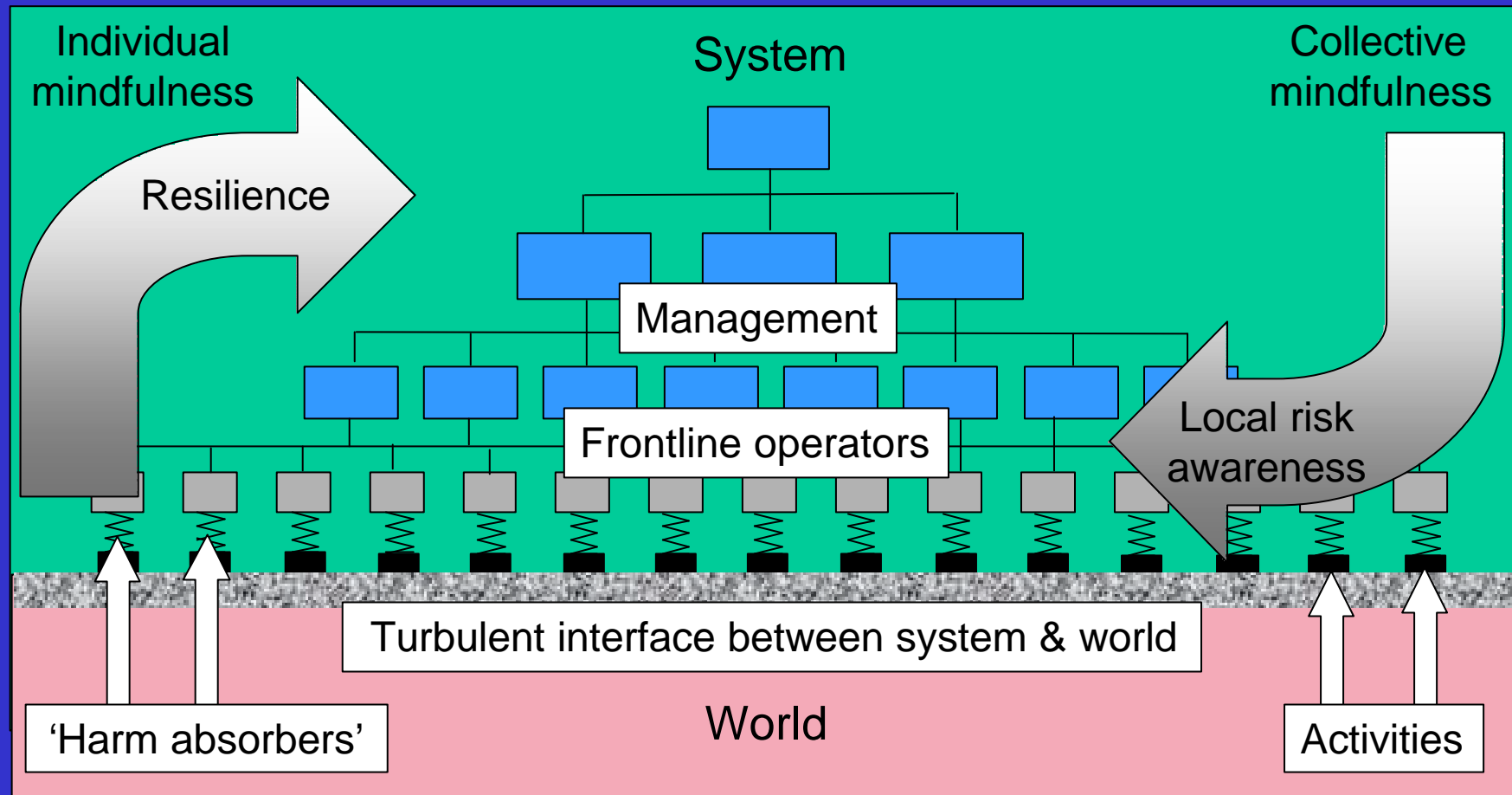
How the model works

- In any given situation, the probability of unsafe act(s) being committed is a function of the amount of bad stuff in all three buckets.
- Full buckets do not guarantee an unsafe act, nor do empty ones ensure safety. We are talking probabilities not certainties.
- But with foreknowledge we can gauge these levels for any situation and act accordingly.
- Don't go there—challenge assumptions, seek help.

Preaching risk awareness is not enough—needs system back up

- Western Mining Corporation
 - Each day supervisors ask workers for examples of 'take time take charge'.
 - What makes this happen is that, at weekly meetings with managers, supervisors provide examples of 'take time take charge'.
 - Feedback to original reporters.
 - A manager at corporate level whose sole task is to make the process work.

Resilience



D→A

Backlash from management, patients and lawyers. Renewed eagerness to automate fallible people out of the loop. Increased reliance on administrative controls. Reduced autonomy.

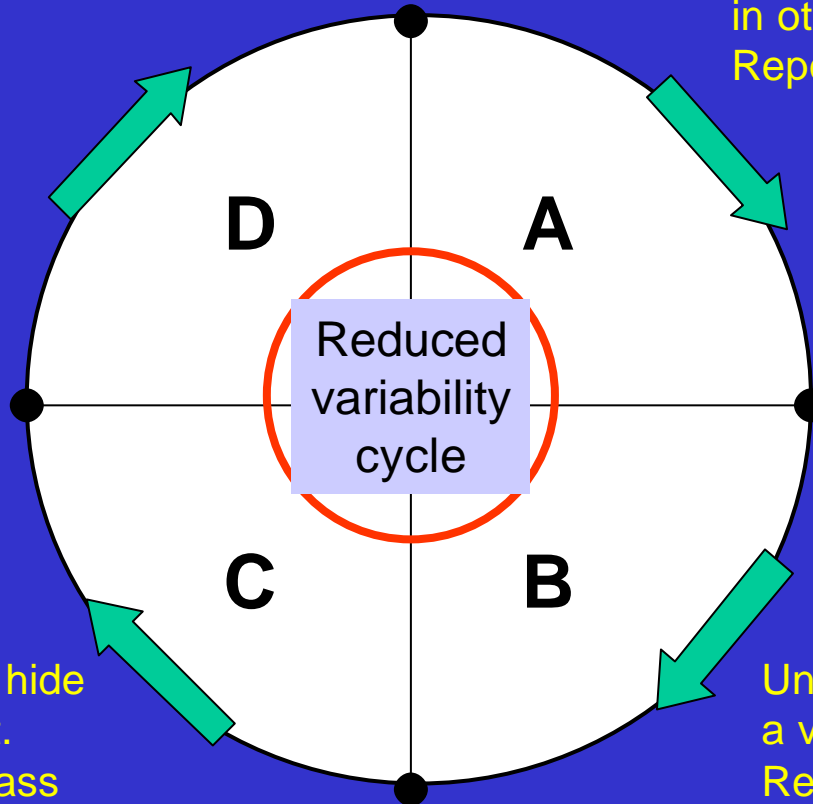
A→B

Recognition that blaming has no remedial value. Realisation that system model has been applied successfully in other domains (aviation). Reporting identifies error traps.

Human as hazard
Errors & violations

Systemic factors concealed

Systemic factors revealed



C→D

Local fixes & workarounds hide system problems from mgt. Attempts to be helpful bypass system defences & barriers. Forgetting to be afraid. Doing too much with too little.

B→C

Unlike aviation, healthcare is a very personal business. Recognise need for 'error wisdom' on the frontline. Surgical excellence = ability to detect and recover errors.

Human as hero
Adjustments, compensations & improvisations

Something to aim for?

- It is hoped that as an organization learns and matures, variability will diminish.
- The tensions and transitions implicit in the cycle will remain, but the perturbations should be less disruptive.
- Eventually (one hopes), the person and system models will operate cooperatively rather than competitively.
- Enhanced resilience (one hopes) will be an emergent property of this greater harmony.

Summary

- In all hazardous industries, there has been an increasing involvement of systemic/cultural factors in the understanding of safety.
- It was argued that a balance needs to be struck between system & person models.
- The person model usually means 'human as hazard'. But there is also 'human as hero'.
- Speculative cycles around two-sided person & system axes are outlined.