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Analysis of Human Factors Related Accidents and Near Misses

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Reason, James, "Analysis of Human Factors Related Accidents and Near Misses" (2002). *United States Department of Transportation -- Publications & Papers*. 24.
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2cnd International Workshop on Human Factors
In Offshore Operations. April 8-10, Houston.

*Analysis of Human Factors
Related Accidents and Near
Misses*

James Reason

Emeritus Professor

University of Manchester, UK

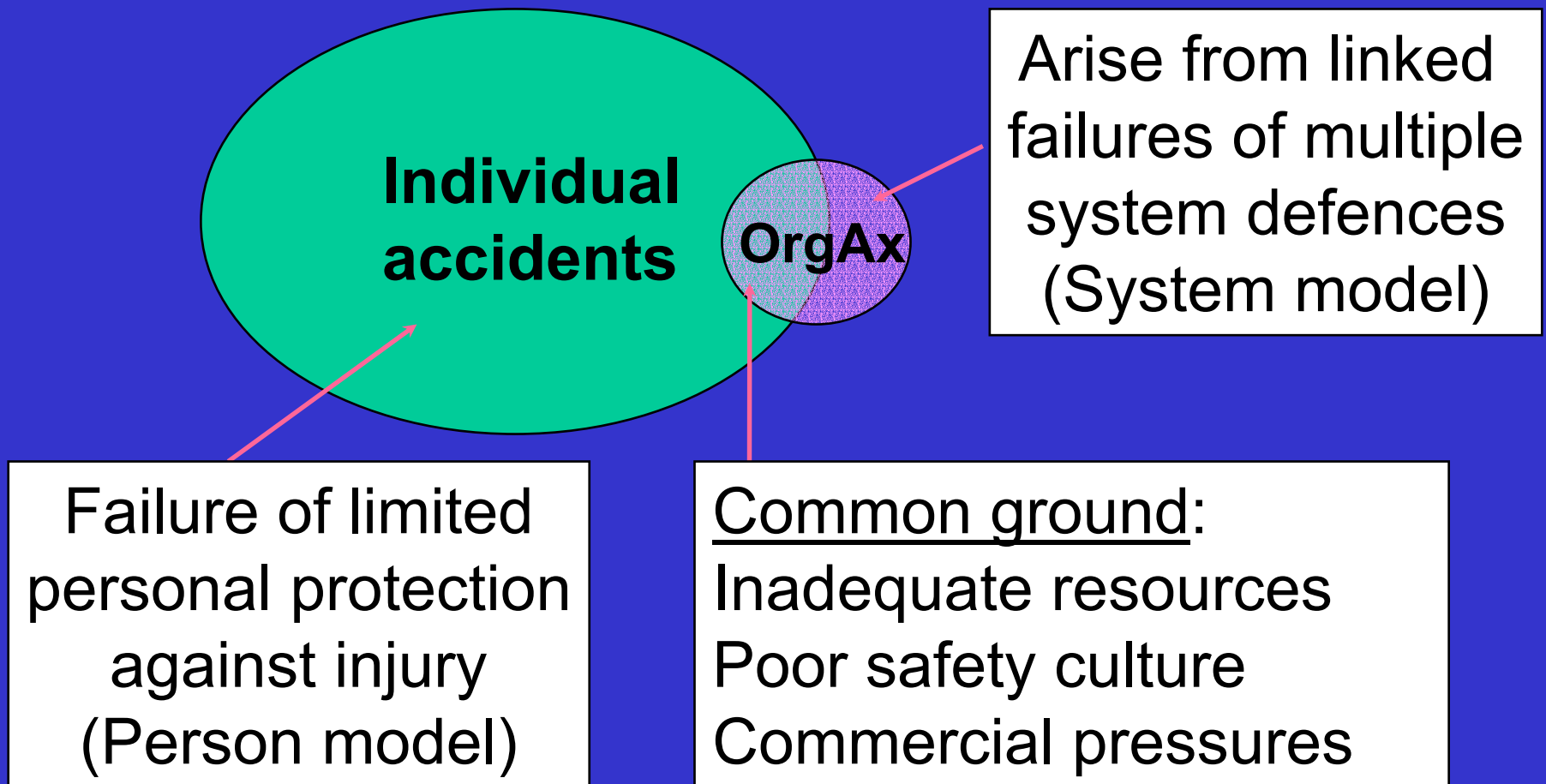
Two kinds of bad event

- **Individual accidents:** high frequency/low severity events—slips, trips, falls, bangs and knocks usually resulting in a few days absence from work (lost time injuries).
- **Organizational accidents:** low frequency/high severity events—explosions, collisions, collapses, releases of toxic substances, etc. Is system vulnerability adequately assessed by LTIs? **NO!**

Two ways of looking at human factors problems

- The PERSON approach
- The SYSTEM approach

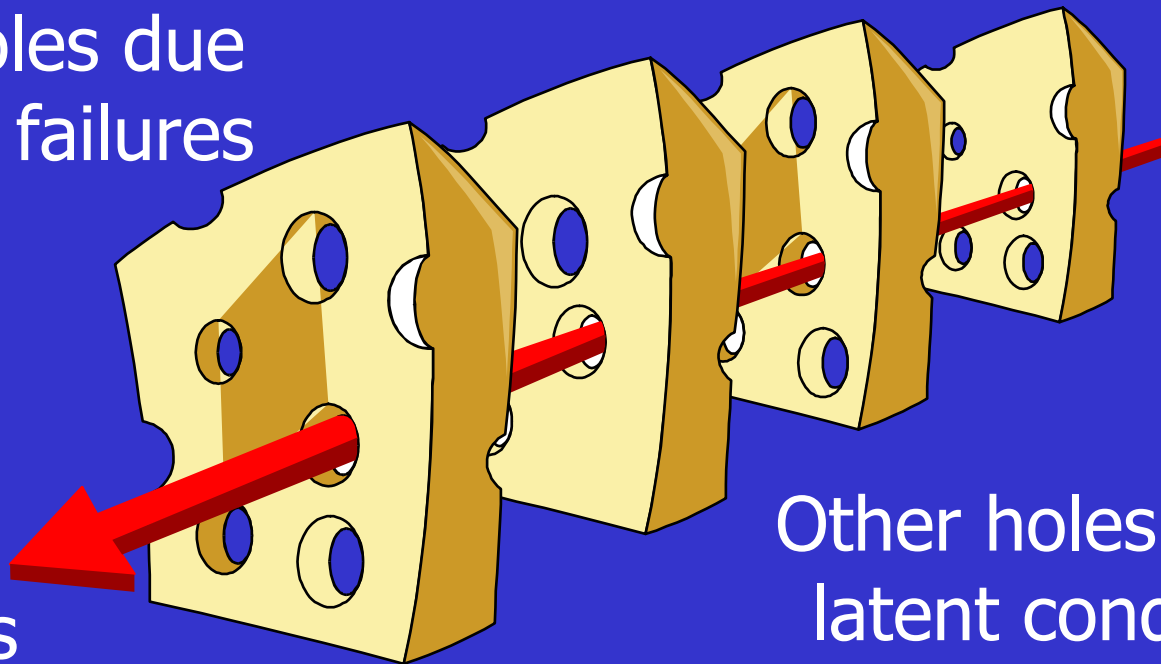
Individual & organizational ax have different causal sets



The 'Swiss cheese' model of accident causation

Some holes due to active failures

Hazards



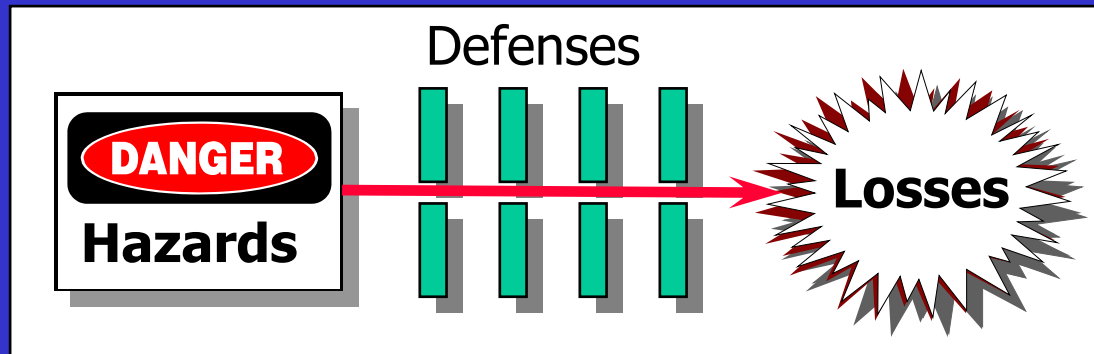
Losses

Other holes due to latent conditions (resident 'pathogens')

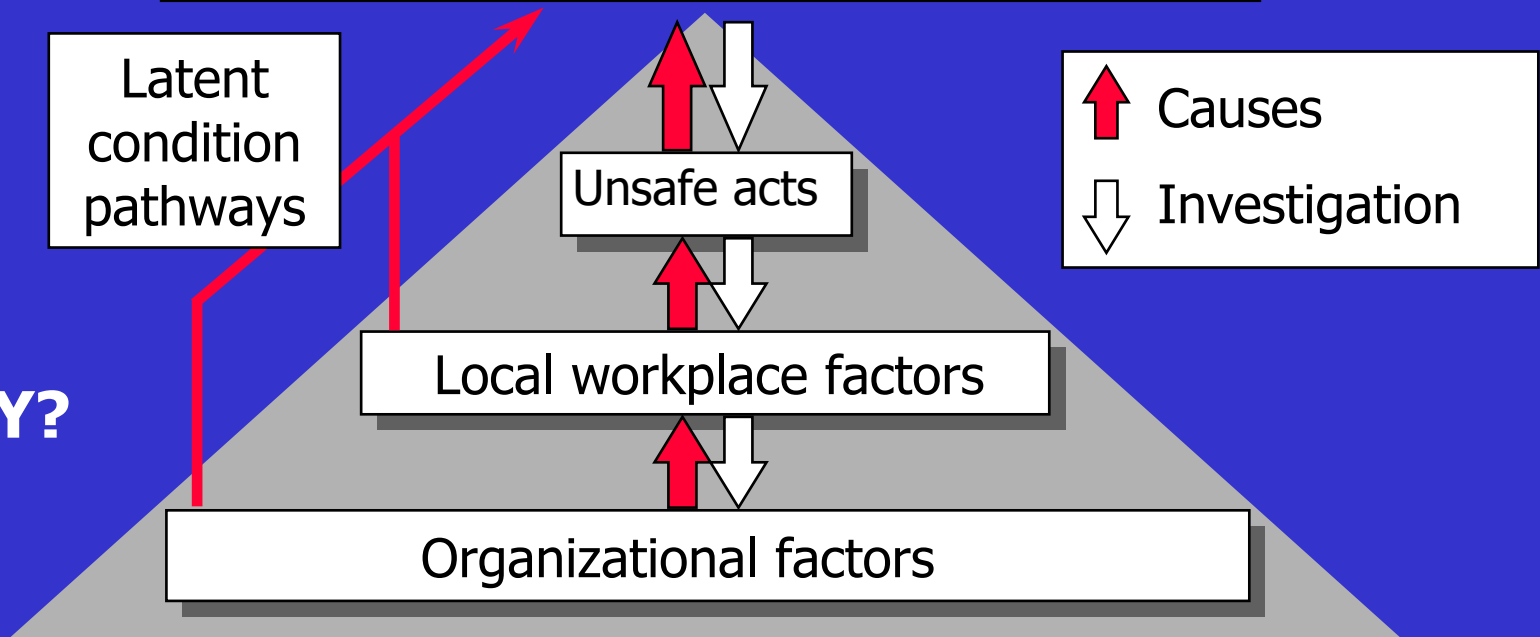
Successive layers of defences, barriers, & safeguards

How and why defenses fail

HOW?



WHY?

























Matrix for defensive failures

MODE

FUNCTION	MODE				
	Engineered safety features	Standards policies controls	Procedures Instruction Supervision	Training briefings drills	Personal protective equipment
Awareness					
Detection Warning					
Protection					
Recovery					
Containment					
Escape					

Piper Alpha: Defensive failures

FUNCTION	MODE				
	Engineered safety features	Standards policies controls	Procedures Instruction Supervision	Training briefings drills	Personal protective equipment
Awareness					
Detection Warning					
Protection					
Recovery					
Containment					
Escape					

Unsafe acts

- Slips, lapses, trips and fumbles
- Rule-based mistakes
- Knowledge-based mistakes
- Violations
 - Routine
 - Optimising
 - Situational

Rule-related behaviours

- Correct compliance
- Mistaken compliance (mispliance)
- Malicious compliance (malpliance)
- Mistaken circumvention (misvention)
- Successful violation
- Mistaken improvisation
- Correct improvisation

Workplace factors

- **Error factors**

- Change of routine
- Poor interface
- Ambiguity
- Educational mismatch
- Negative transfer
- Poor S:N ratio
- Inadequate tools
- Etc.

- **Violation factors**

- Violations condoned
- Equipment problems
- Time pressure
- Unworkable procedures
- Supervisory example
- Easier way of working
- Poor tasking
- Etc.

Organizational factors

- Training
- Tools & equipment
- Materials
- Design
- Communication
- Procedures
- Pressures
- Maintenance
- Planning
- Managing operations
- Managing safety
- Managing change
- Budgeting
- Inspecting, etc.

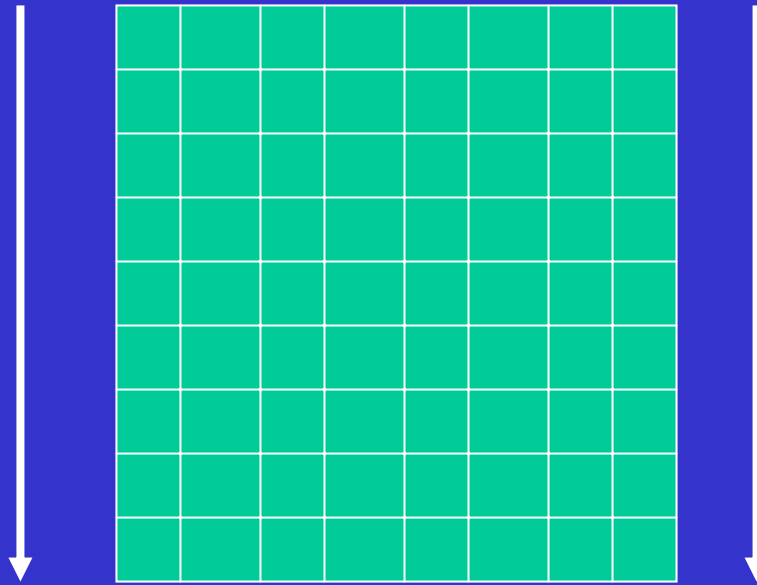
Accident investigation steps

- What defenses failed (mode/function)?
- How did each defense fail?
- Were there contributing unsafe acts?
- Workplace factors for each unsafe act?
- Organizational factors (latent conditions) contributing to defensive failures and workplace factors?

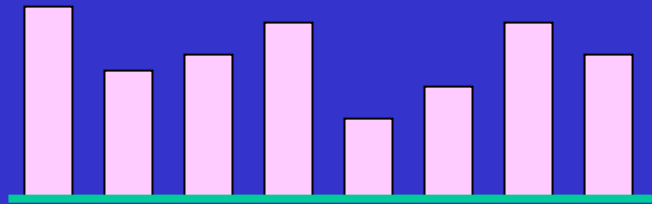
System contributions *(Single or multiple events)*

Organizational factors

Failed
defenses



Workplace
factors



Latent condition profile

Aims of HF event analysis

- Identify recurrent error traps
- Identify how and why defenses fail
- Identify upstream ‘pathogens’
- Rectify systemic weaknesses

TAKE HOME MESSAGE: YOU CAN'T CHANGE THE HUMAN CONDITION, BUT YOU CAN CHANGE WORKING CONDITIONS.