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# Analysis of Human Factors Related Accidents and Near Misses

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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

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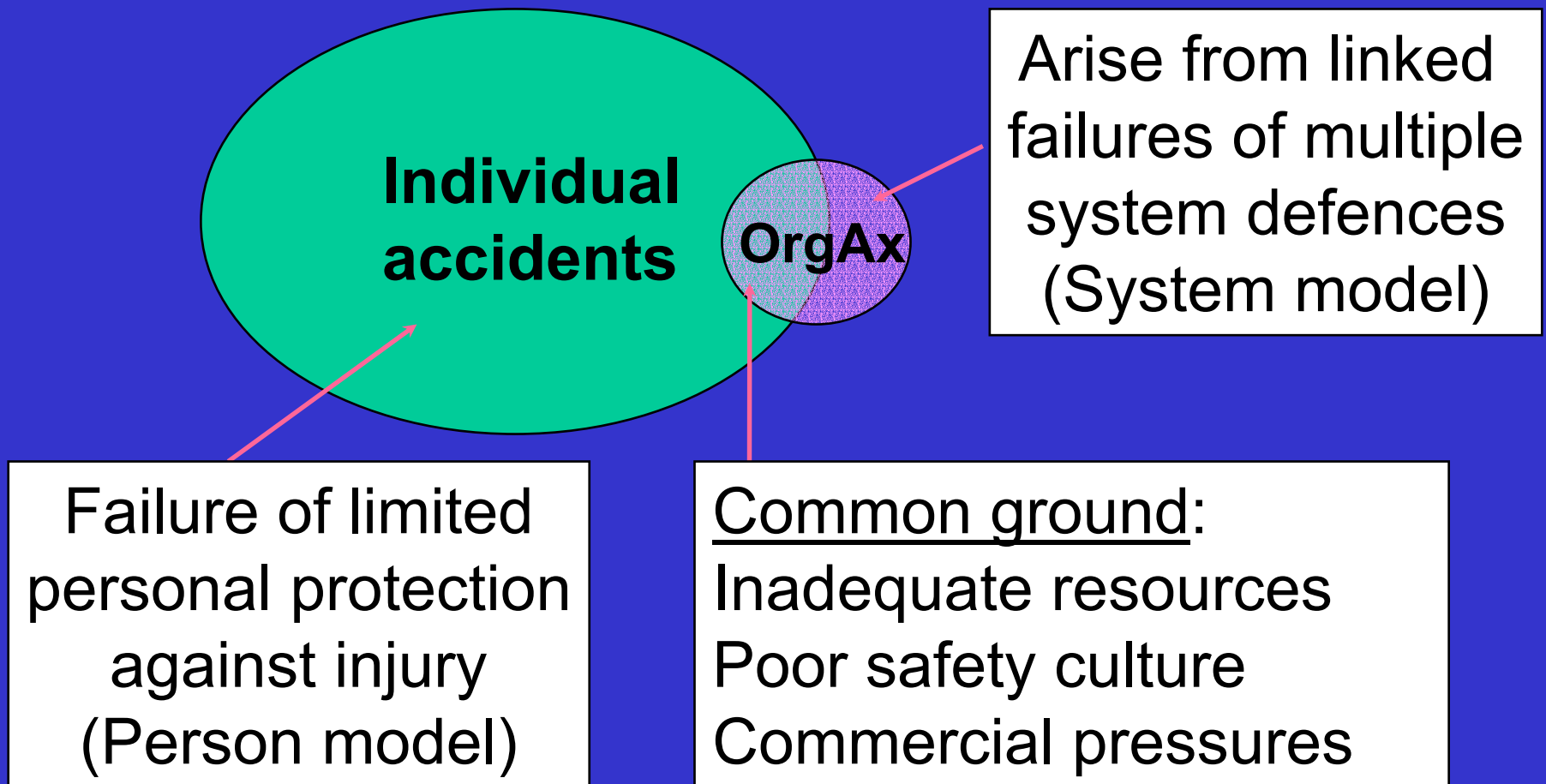
# *Two kinds of bad event*

- **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

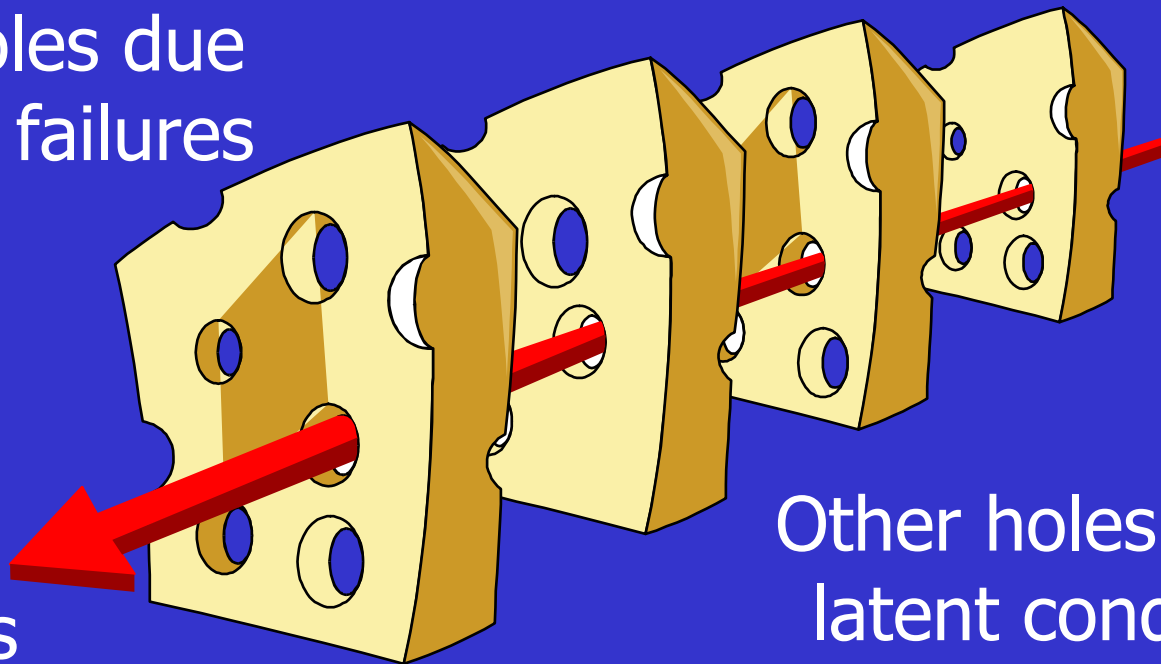
# *Individual & organizational ax have different causal sets*



# *The 'Swiss cheese' model of accident causation*

Some holes due to active failures

Hazards



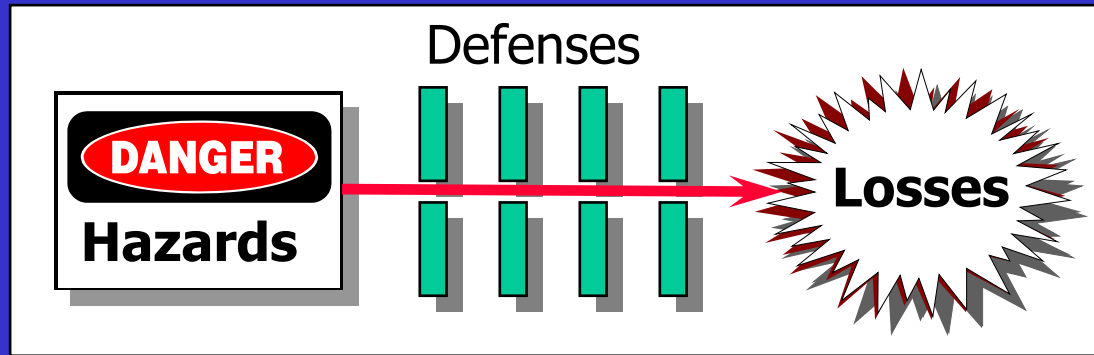
Losses

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

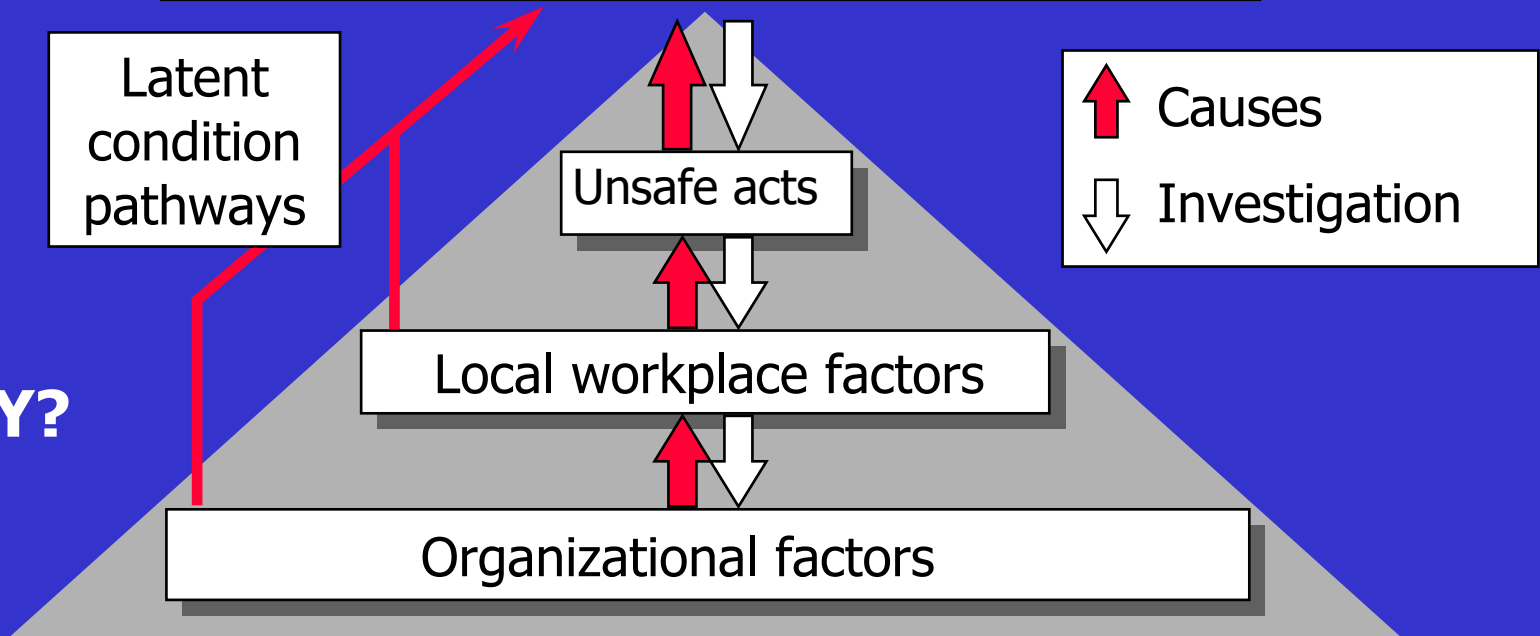
Successive layers of defences, barriers, & safeguards

# 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.

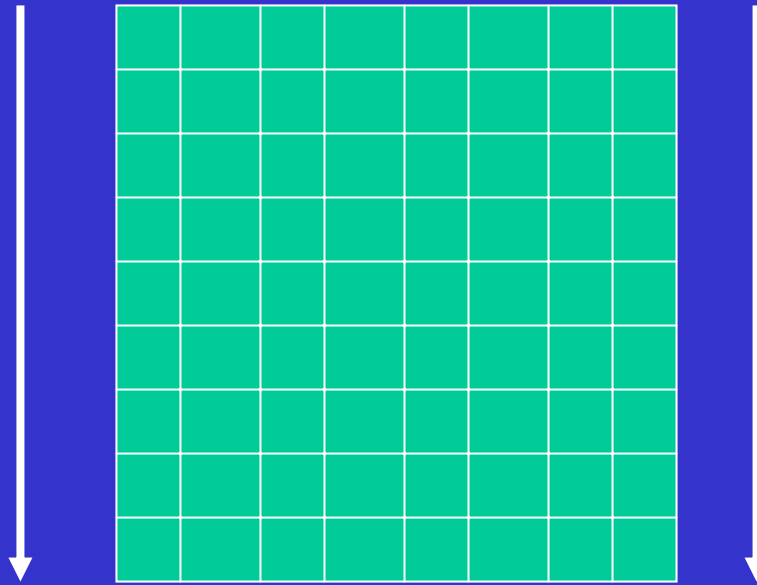
# *Accident investigation steps*

- 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?

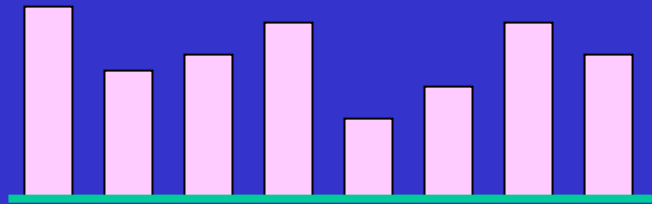
# *System contributions* *(Single or multiple events)*

## 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.**