

ISRCS 2009



Tutorial

Session 4b: Human Performance and Organizational Resilience

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❖ Presenters

- Ron Farris
 - 8 yrs Nuclear Navy
 - 20+ yrs
 - ANLW—EBR11 Reactor operations
 - Safety Professional
 - INL Human Performance lead
- Bob Richards, PhD, Certified Performance Technologist
 - Instructional Systems
 - Human Factors
 - Human Reliability
 - Human Performance

Giants upon whose shoulders we stand

- ❖ Some of our Heroes in Systems, High Reliability Organizations and Human Performance and Error
 - James Reason – Managing the Risk of Organizational Accidents
 - Sidney Dekker—Field Guide to Human Error
 - Weick and Sutcliffe – Managing the Unexpected
 - David Marx (Just Culture) – Whack a Mole
 - INPO, Tony Muschara
 - Harold Blackman and Shane Bush (INL)
 - Karlene H. Roberts, U of California, Berkley
 - Earl Carnes, DOE Center for Human Performance
 - Jim Collins, Peter Senge, and Warren Bennis
 - Institute for Nuclear Power Operations (INPO) and International Society for Performance Improvement

Today we will...

- ❖ Overview three closely related approaches to individual and organizational change and performance
 - High Reliability Organizations (HRO)
 - borrowed heavily from Weick and Sutcliffe
 - Human Performance Improvement (HPI)
 - Our hybrid based on combining
 - INPO's human performance
 - INL and DOE's implementation,
 - ISPI performance improvement model
 - INL's IMA change model
 - Change management
- ❖ Topics -- Approach
 - Principles
 - Case studies
 - Tools

Approach to this Tutorial

- ❖ Be – values, desires/goals, character
 - Humility + Discipline (Level 5 leadership essential)
 - We (not an I vs you) People as people
- ❖ Know
 - Basic principles
 - Psychology
 - Sociology
 - Engineering
 - Management
 - System thinking (i.e. dynamics)
 - Change management
- ❖ Do
 - Its all academic until it is implemented

High Reliability Organizing

- ❖ Principles
- ❖ Case Studies
- ❖ Exercise

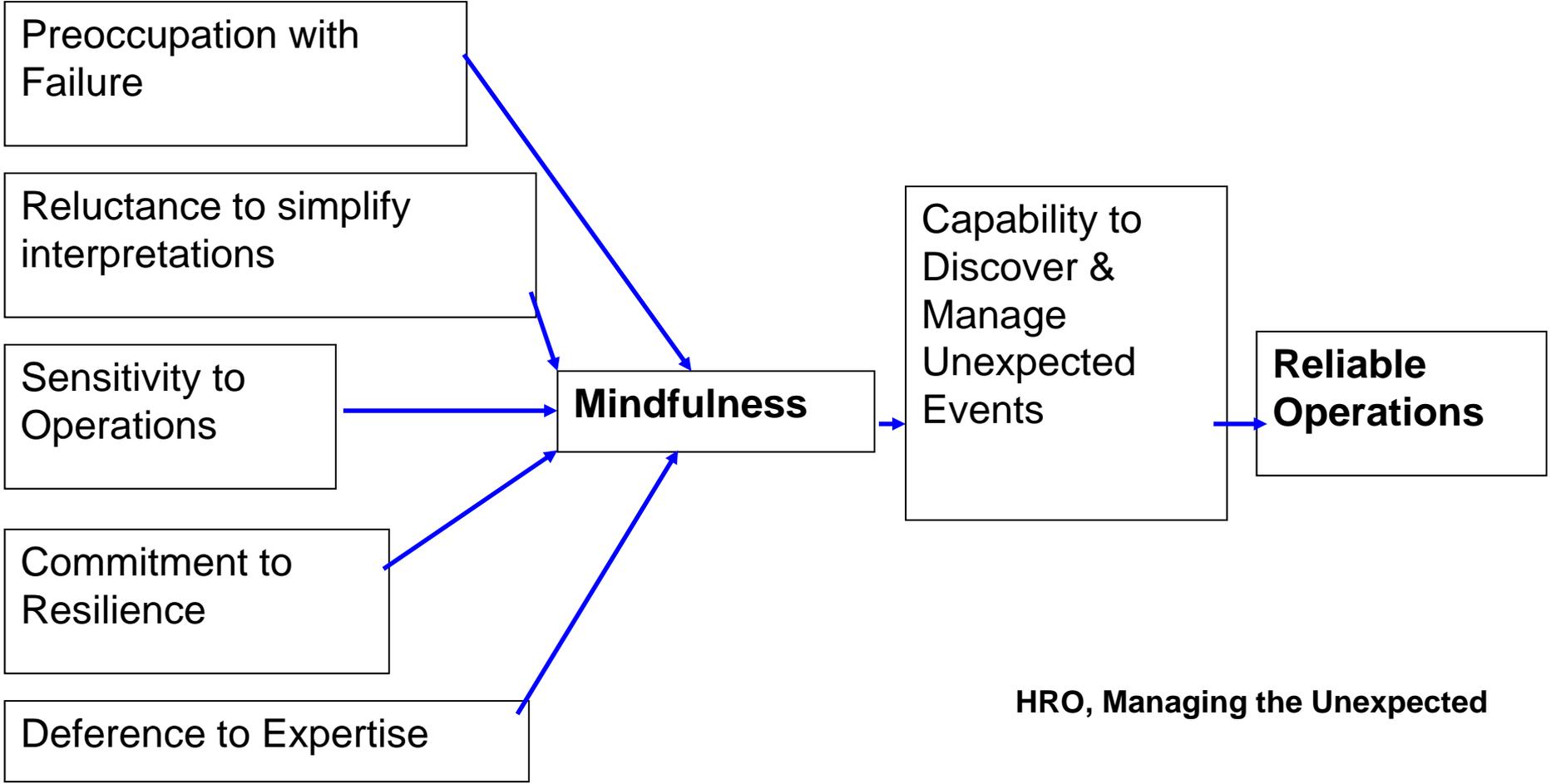
The past settles its accounts

“...the ability to deal with a crisis situation is largely dependent on the structures that have been developed before chaos arrives. *The event can in some ways be considered as an abrupt and brutal audit:* at a moment’s notice, everything that was left unprepared becomes a complex problem, and every weakness comes rushing to the forefront.”

Preventing Chaos in a Crisis, Lagadec, p. 54

Mindfulness Contributes to High Reliability

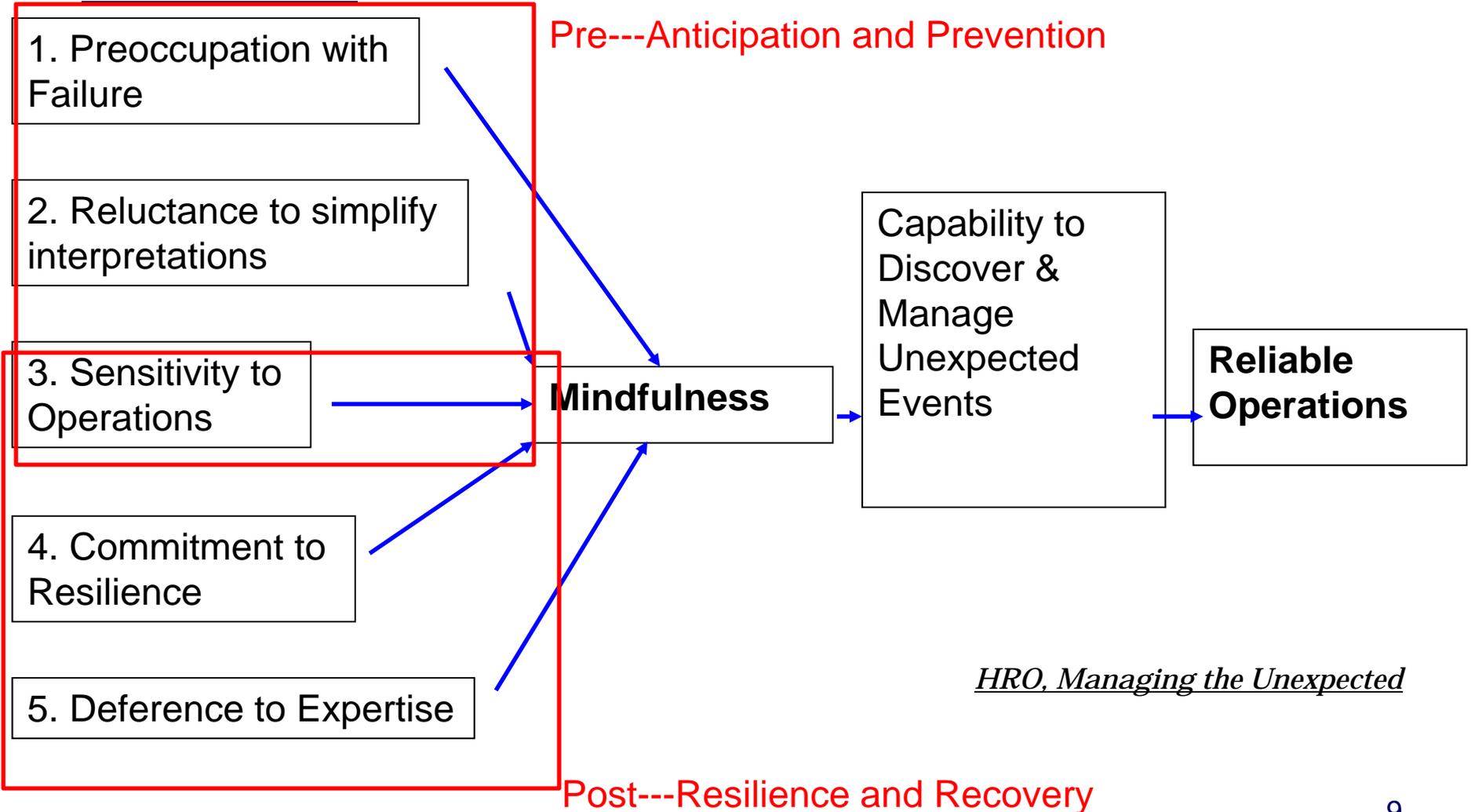
Processes



HRO, Managing the Unexpected

Mindfulness Contributes to High Reliability

Processes



HRO, Managing the Unexpected

1. Preoccupation with Failure

Thinking about our own team, can we honestly say:

- ❖ We regard near misses as a kind of failure that reveals potential danger rather than as evidence of our success and ability to avoid danger
- ❖ We treat near misses and errors as information about the health of our system and try to learn from them

2. Reluctance to Simplify

Thinking about our team, can we say:

- ❖ People around here take nothing for granted

- ❖ People are encouraged to express different points of view

3. Sensitivity to Operations

- ❖ During an average day, people come into enough contact with each other to build a clear picture of the situation.
- ❖ People are familiar with operations beyond one's own job.

4. Commitment to Resilience

- ❖ There is a concern with building people's competence and response repertoires.
- ❖ People have a number of informal contacts that they sometimes use to solve problems.

5. Deference to Expertise

- ❖ If something out of the ordinary happens, people know who has the expertise to respond.
- ❖ People in this organization value expertise and experience over hierarchical rank.

HRO Case Study

❖ Cerro Grande Fire

HRO

❖ Activity

- Quickie “Audit”

Human Performance Improvement

- ❖ Concepts and Principles
- ❖ Case Studies
- ❖ Activities

What is Human Performance?

It's a series of behaviors (B) executed to accomplish specific task objectives and results (R).

$B + R = \text{Human Performance}$

What is Human Performance Improvement?

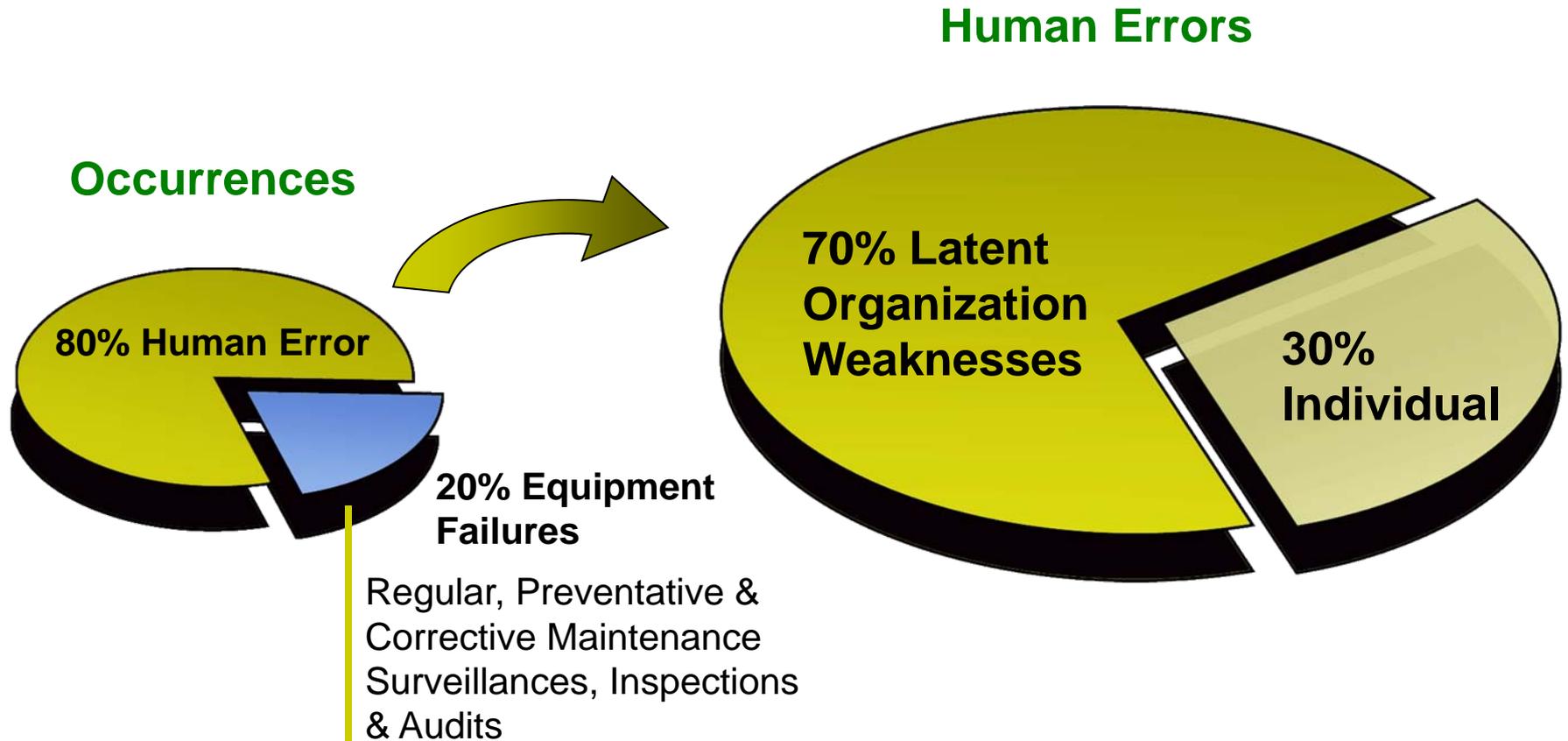
It IS supportive to...

- ❖ improve productivity
- ❖ improve efficiency
- ❖ improve safe work behaviors and practices
- ❖ being a positive value in how we work

It is NOT...

- ❖ a safety “program”
- ❖ an employee incentive program
- ❖ a way to earn an award
- ❖ a “grade” in your performance report
- ❖ a “flavor of the month”

Why a Human Performance Approach?



The 6 Principles of Human Performance:

1. Humans are fallible
2. Error is predictable
3. Organizations influence behavior
4. Behaviors are reinforced by the organization
5. Events are avoidable
6. To drift is human

Terms we will use in our discussion

1. Condoned Behavior
2. Willful Violation
3. Error
4. Error Precursors
5. Error-likely situations
6. Latent Errors
7. Flawed Defenses
8. Event-Accident



Condoned Behavior



- ❖ You get what you accept
- ❖ Look around and you will see what your organization condones or will accept in the actions of workers
- ❖ Actions that are allowed to continue may not be officially condoned, but if they continue, they will become condoned by acceptance as a normal occurrence

Willful Violation

Deliberate, intentional acts to evade a known policy or procedure requirement for personal advantage usually adopted for fun, comfort, expedience, or convenience



Condoned behavior or willful violation?



Errors

1. **Error** –The failure of planned actions to achieve their intended outcome. A deviation between what was actually done and what should have been done.
2. **Error (Provoking Factors) Precursors** – Preexisting conditions that increase human error rates (i.e. Time pressure, fatigue, lack of knowledge, distractions, habit patterns, change, etc.)
3. **Error-likely situations** – A work situation in which there is a greater opportunity for error due to specific precursors or actions



Types of human errors

Active Errors



Latent Errors



Latent Failures

Often management decisions create latent failures, which may remain hidden for a long time. These decisions are intentional and reasoned actions that end in unforeseen results.



James Reason

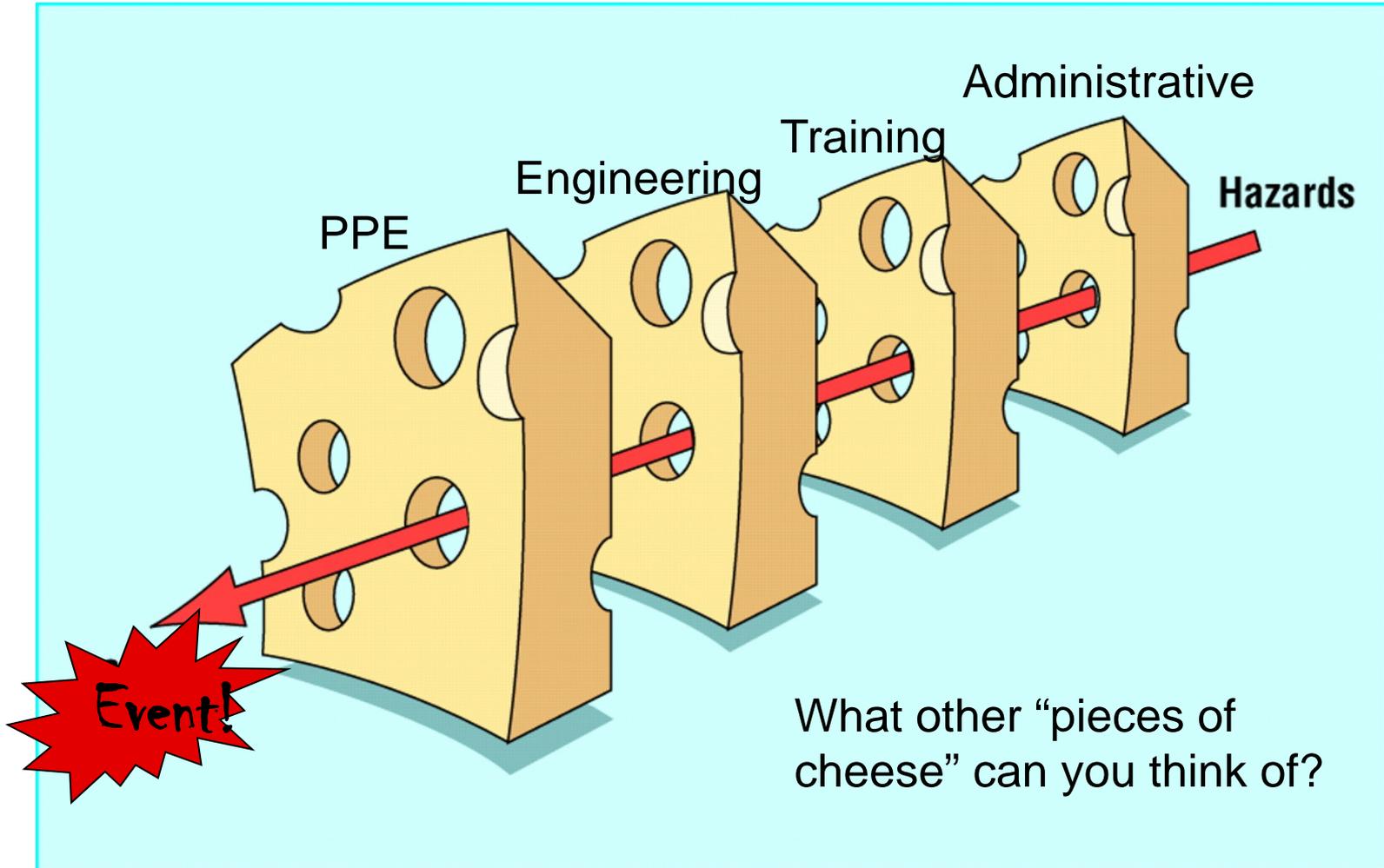
Flawed Defenses

Defects with administrative and/or physical defensive measures that, under the right circumstances may fail to:

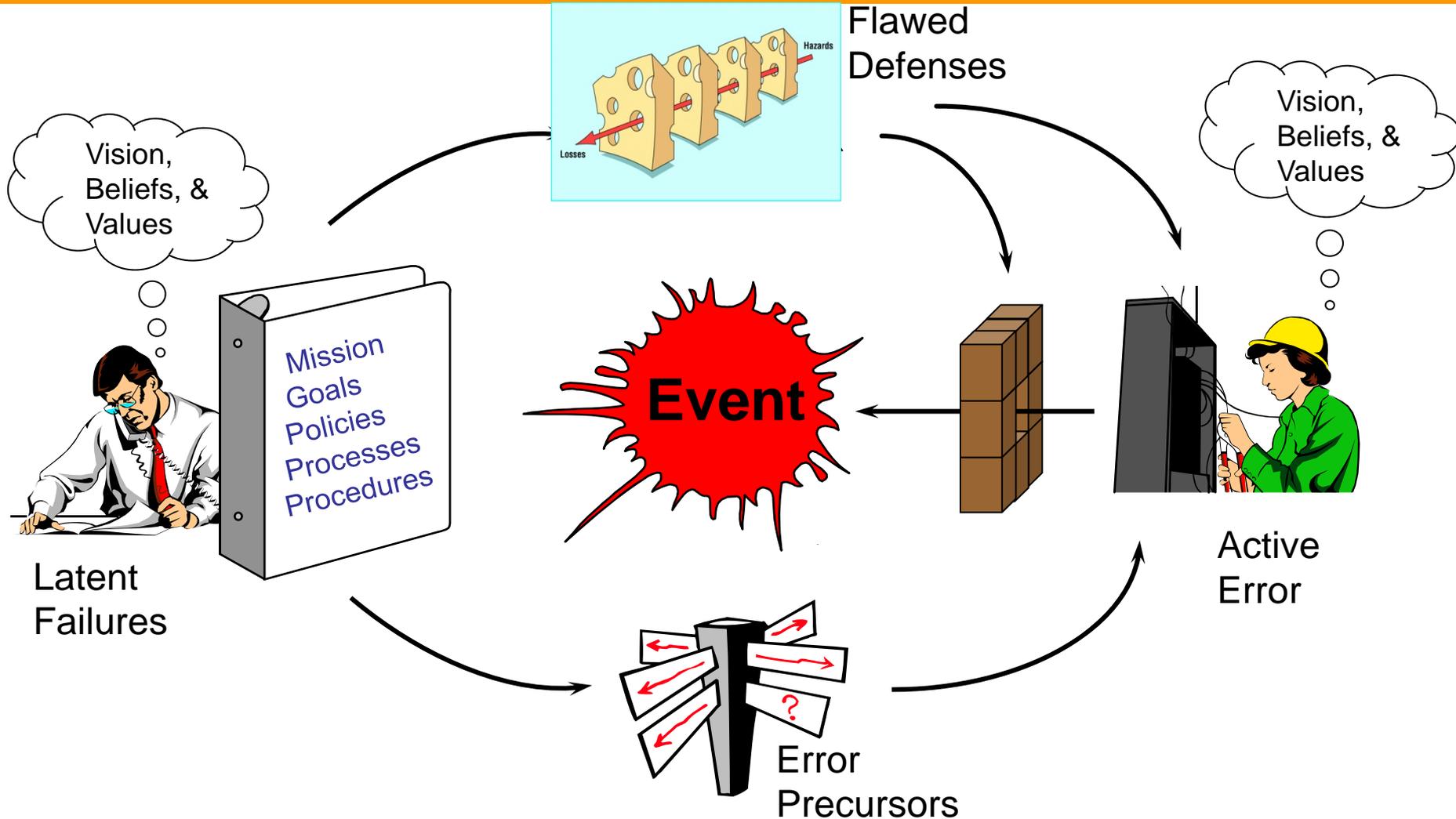
- ✓ Prevent an occurrence of active errors,
or
- ✓ Protect the facility/plant, equipment, or
people against hazards
or
- ✓ Mitigate the consequences of error



Breached or Flawed Defenses



Anatomy of an Event



1. Humans are fallible

- Under normal conditions, humans make an average of **5-7** errors per hour
- Under stressful/emergency/unusual conditions, humans make an average of **11-15** errors per hour

The root of human error... *the brain*

- **The brain has limited attention resources**

- We can concentrate on, at most, **2-3** things simultaneously



- **The brain has a limited working memory**

- Most people can reliably remember **3-4** items at a time (**5-7** upper limit)

2. Error is Predictable

Error (Provoking Factors) Precursors

- Team Beliefs
- Poor Communication
- Memory Lapses
- Errors in Habit
- Mistaken Assumptions
- Inexperience

- Shift Turnover
- Time Pressure
- Hazard Awareness
- Documentation
- Unsuitable Tools
- Etc.

3. Organizations influence behavior

- Accidents are rarely preceded by bizarre behavior
- People act within the framework of cultural norms
- Behaviors are reinforced and rewarded according to the organization's cultural norms



Principles of Human Performance

4. Behaviors are reinforced by.....

- ✓ **Praise**
- ✓ **Awards**
- ✓ **Letters of recognition**



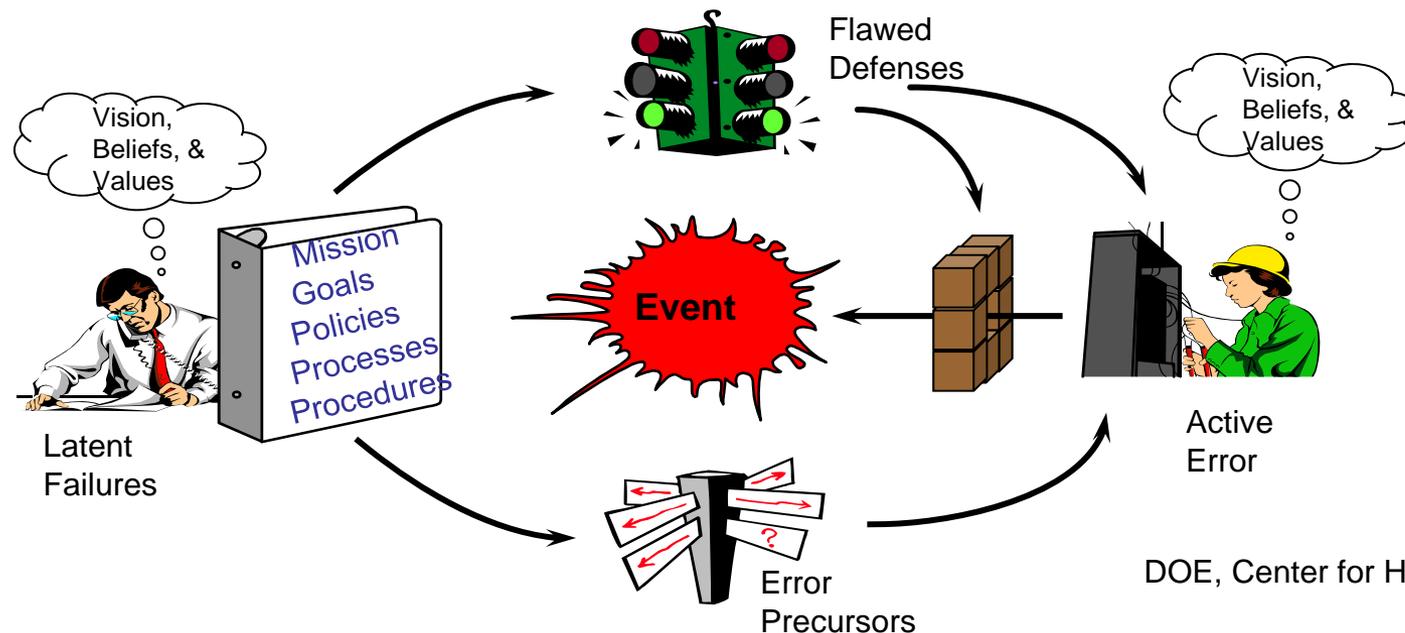
“Events are not so much the result of error-prone workers as they are the outcome of error-prone tasks and error-prone work environments, which are controlled by the Organization.”

James Reason, Managing the Risks of Organizational Accidents

Principles of Human Performance

5. Events are avoidable with strong defenses, mitigation of errors precursors, addressing latent (errors) failures and by mitigation of human error with error reduction tools.

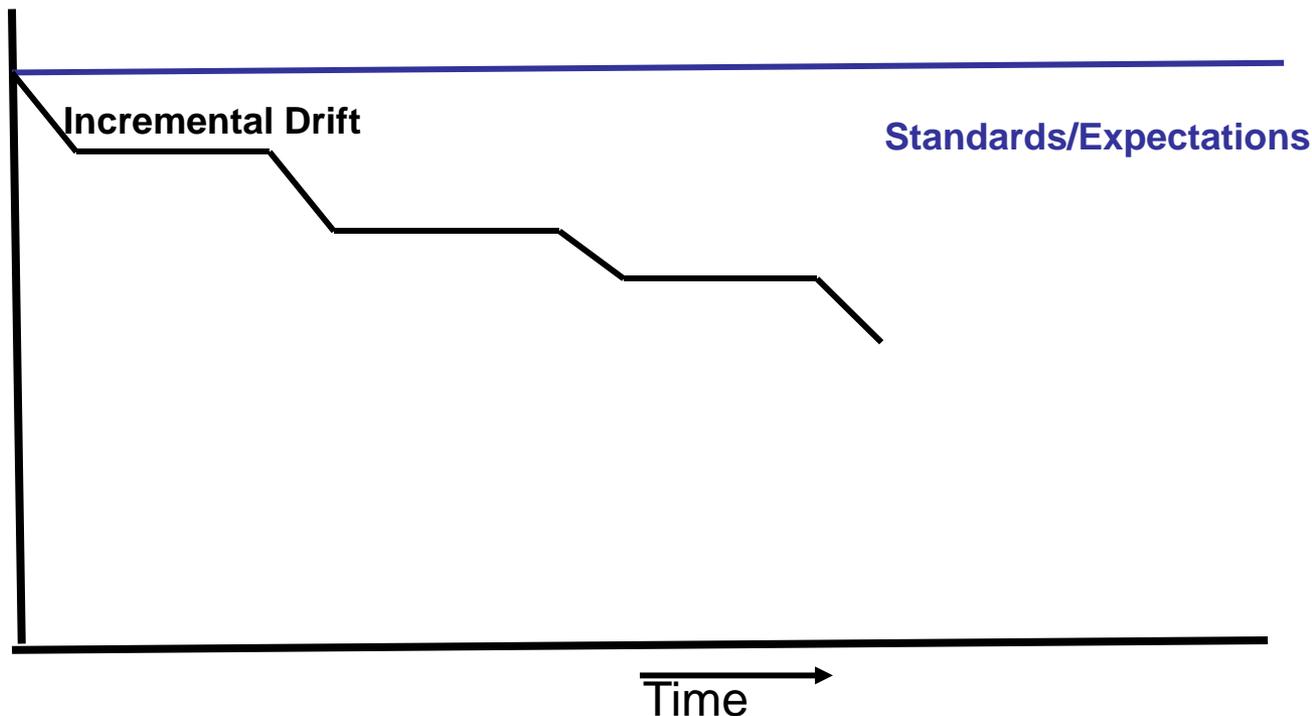
Anatomy of an Event



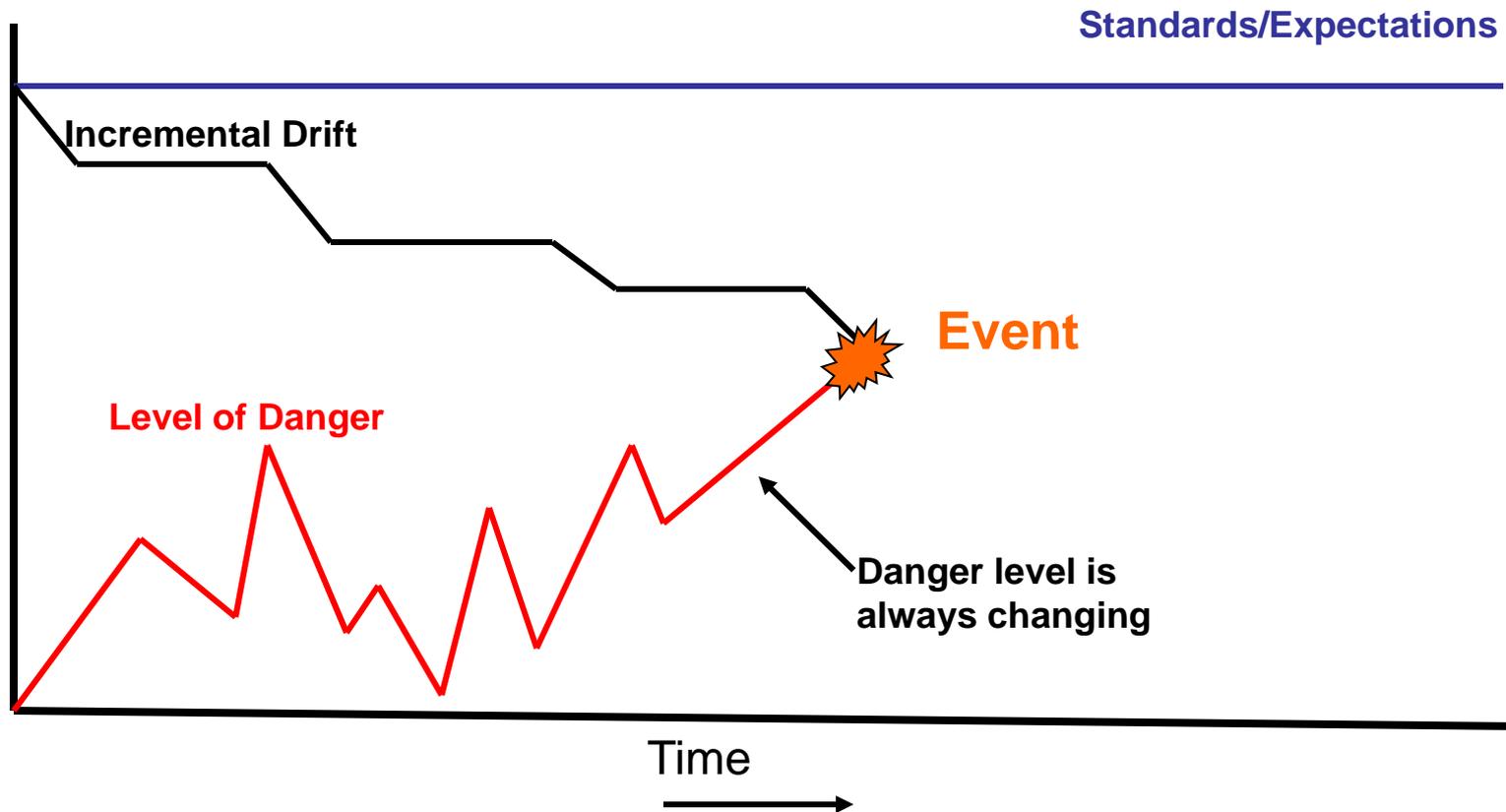
Principles of Human Performance

6. To Drift is Human.

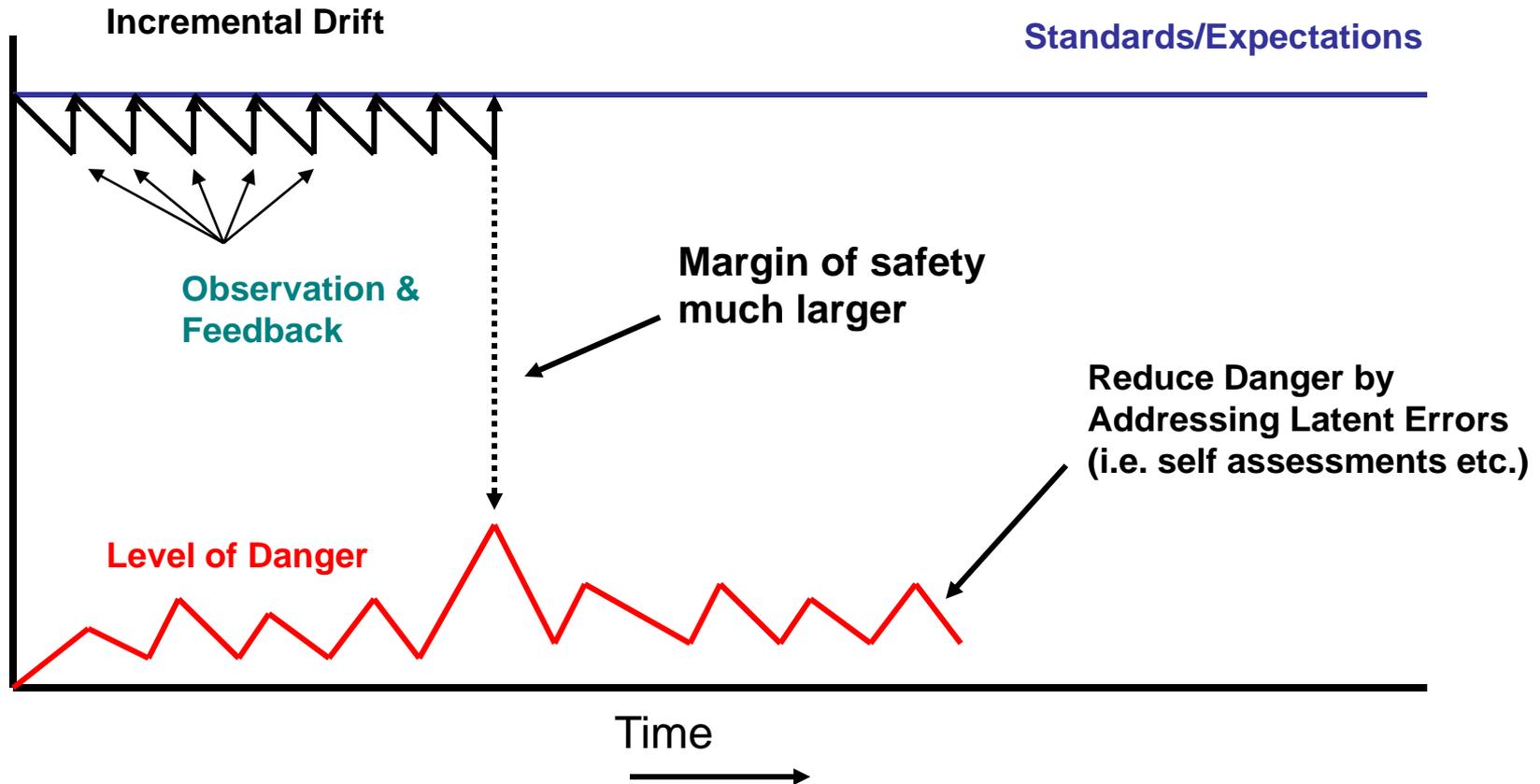
Drift – the slow, incremental departure from initial written guidance on how to operate a system. Departures from routine become routine.



Organization Drift – So What?



Counteracting Organization Drift



Critical Step

Definition: A Critical Step shall have any or all of the following criteria to consider a step or series of steps critical.

A procedure step, series of steps, or action(s) that:

- if done improperly will cause irreversible harm to people or
- if done improperly will cause irreversible harm to equipment or
- could significantly impact facility operations or
- could harm the environment.

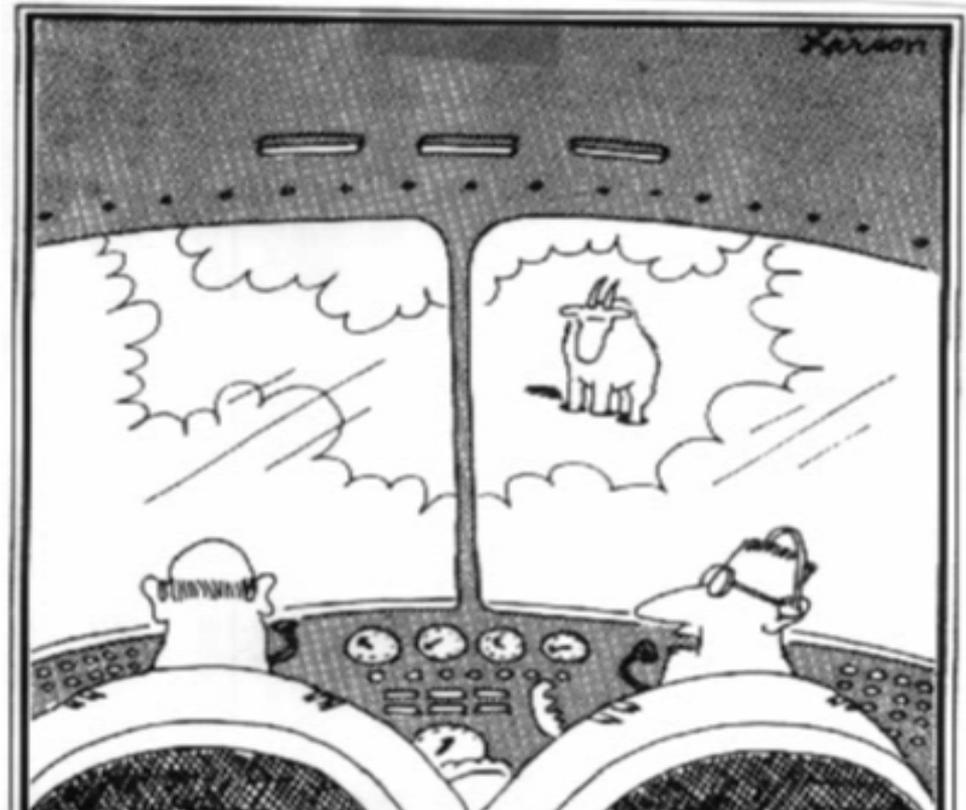
Basic Briefing Elements- 5 Questions

For all briefings performed in preparation for activities at the INL, the following questions, as a minimum, are answered to address the context of the activity hazards and associated mitigations:

1. Has this activity been previously performed?
2. What are the critical steps or phases of this activity?
3. How can we make a mistake at a *critical step*?
4. What could go wrong with the facility, the environment, the equipment, or personnel?
5. What barriers or defenses are needed or are in place?

What is situational awareness?

*Situational Awareness:
The accuracy of a
person's current
knowledge and
understanding of the
task and working
conditions, compared
to actual conditions at
that time.*



**“Say... What’s a mountain goat
doing way up here in a cloud
bank?”**

Sa... what do I do about it? Tools to maximize Sa

When performing work:

- ❖ Designate a “big-picture” person
- ❖ Designate a “Challenger” to challenge assumptions and decisions
- ❖ Discuss the small, incremental changes for this task (scope creep)
- ❖ Monitor changing work-site conditions
- ❖ Beware of hazardous attitudes
- ❖ Beware of assumptions—listen for “danger words” – Stop and collaborate

“We have to get this done now...”

“Chill out... I know what I’m doing”

“Maybe we should try this...”

“We’ve always done it this way...”

Basic Strategy of HPI

- 1. Strengthen and manage your defenses (use defense in-depth)**
- 2. Use error reduction tools to mitigate for human error**
- 3. Maximize situational awareness to assist in decision making**
- 4. Using these three basic strategies can and will prevent events**

Sources of Latent Failures

Processes (structure)

- **Work control**
- **Training**
- **Accountability policy**
- **Reviews & approvals**
- **Equipment design**
- **Procedure development**
- **Staffing**

Values (relationships)

- **Priorities**
- **Measures & controls**
- **Critical incidents**
- **Coaching & teamwork**
- **Rewards & sanctions**
- **Reinforcement**
- **Promotions & terminations**

Tools for Finding Latent Failures

1. Dry Runs
2. Mockups
3. Self-Assessment
4. Benchmarking
5. Post-job Critique
6. Trending
7. Surveys and Questionnaires
8. Field Observations

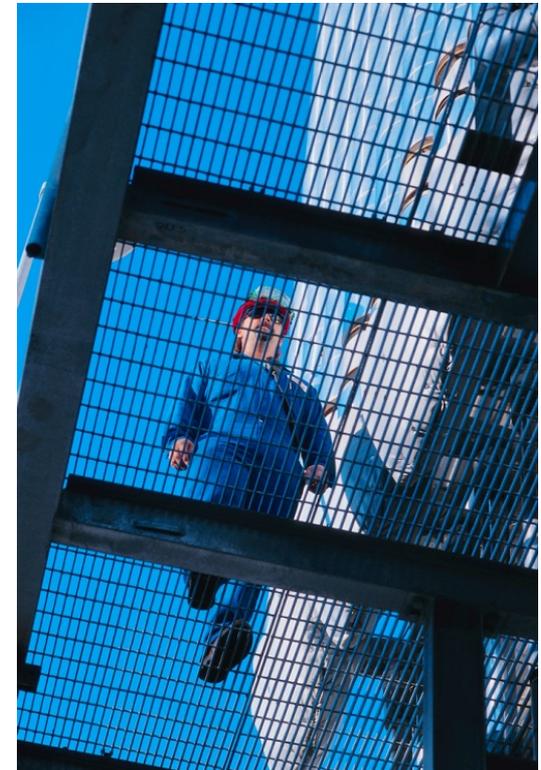
Error-prevention Tools at the job site

1. **Self-checking**
2. **Peer-checking**
3. **Concurrent verification**
4. **Independent verification**
5. **Three-way communication & Phonetic Alphabet**
6. **Stop and Collaborate**
7. **Situational awareness (Sa) (See list of tools for Sa)**



Error-prevention Tools at the job site

8. Place-keeping (marking steps)
9. Briefings (Pre, Post, & Job Site Huddle)
10. Problem-solving
11. Procedure use & adherence
12. Questioning attitude
13. Devils Advocate



Someone Sees It Coming

With every problem, someone somewhere sees it coming. But those people tend to be low rank, invisible, unauthorized, reluctant to speak up, and may not even know they know something that is consequential.

So the question is how do find out what they know?

Starting Small

- ❖ Trouble starts small and is signaled by weak signals that are easy to miss, especially when expectations are strong and mindfulness is weak.
- ❖ Small moments of inattention and misperception can escalate swiftly into unmanageable trouble.

"The Field Guide to Human Error Investigations"; Dekker, Sidney

"Ten Questions About Human Error"; Dekker, Sidney

"Human Error"; Reason, James

"Managing the Risks of Organizational Accidents"; Reason, James

"Managing Maintenance Error"; Reason, James & Hobbs, Alan

"Bringing Out the Best in People"; Daniels, Aubrey

"Managing the Unexpected"; Weick, Karl & Sutcliffe, Kathleen

"Resilience Engineering"; Hollnagel, Erik; Woods, David; Leveson, Nancy

"The Psychology of Safety"; Geller, E. Scott

Review & Reflect



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