SAND2010-8920P

MANAGING HUMAN PERFORMANCE

(HPI200)

Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy's National Nuclear Security Administration under Contract DE-AC04-94AL85000

Introduction

- Instructors
- Training Facility
  - Restrooms / Exits
  - Lunch Break
  - Phones / Pagers
- Course Logistics
  - 7:30 – 5:00
- Participants

Instructors

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Course Goals

1. To **promote** awareness of how the organization, leadership/management, and individual fallibility impact overall human and facility performance.
2. To **familiarize** Sandia managers with tools, practices, and behaviors that help to align organizational processes and values … to optimize worker performance.

Course Objectives

Participants will be able to….

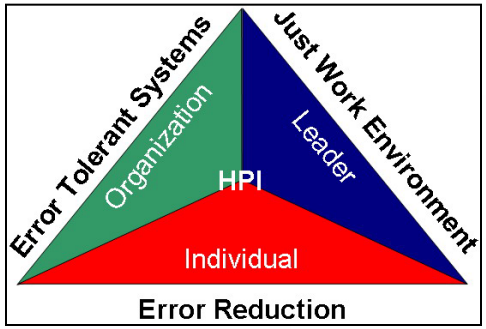
1. **Improve** individual, leadership, and organizational performance using a coherent, strategic approach.
2. **Understand** how implementation of human performance principles improves productivity, reliability, efficiency, and quality.
3. **Implement** techniques that help to identify and eliminate flawed defenses and latent organizational weaknesses.
4. **Discuss** “culture of mindfulness” and how to achieve it.

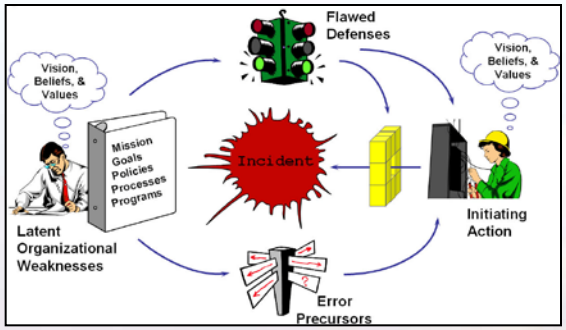
Course Outline

- **Introduction**
- Lesson 1: **Human Performance Basics**
- Lesson 2: **The Role of the Individual in Human Performance**
- Lesson 3: **Managing Defenses**
- Lesson 4: **The Role of the Organization in Human Performance**
- Lesson 5: **The Role of the Leader in Managing Human Performance**
- Lesson 6: **Creating a Culture of Mindfulness**
- Lesson 7: **Human Performance in Event Investigations**
- **Conclusion**

LESSON 1
Human Performance Basics

$$P = B + R$$





$$R_e + M_d \rightarrow UO$$

Lesson 1 Objectives

Participants will be able to….

1. **Identify** the goal and principles of human performance.
2. **Identify** the primary factors that lead to unwanted outcomes (events).

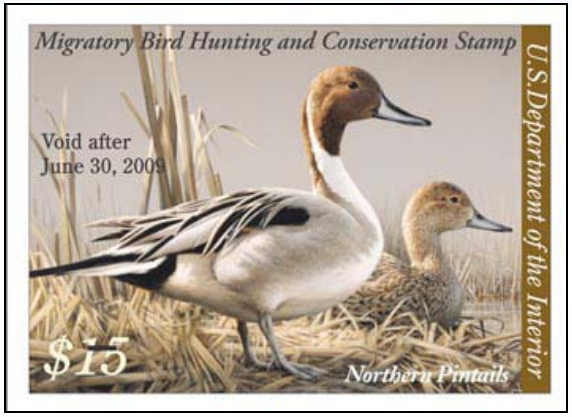
Human Fallibility

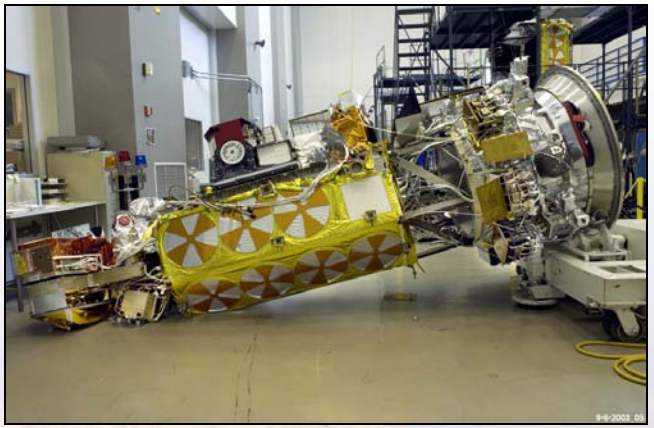
"… human fallibility is like gravity, weather, and terrain, just another foreseeable hazard. Error is pervasive … What is not pervasive are well-developed skills to detect and contain these errors at their early stages."

- ***Weick and Sutcliffe***

Leading with Resilience in the Face of the Unexpected

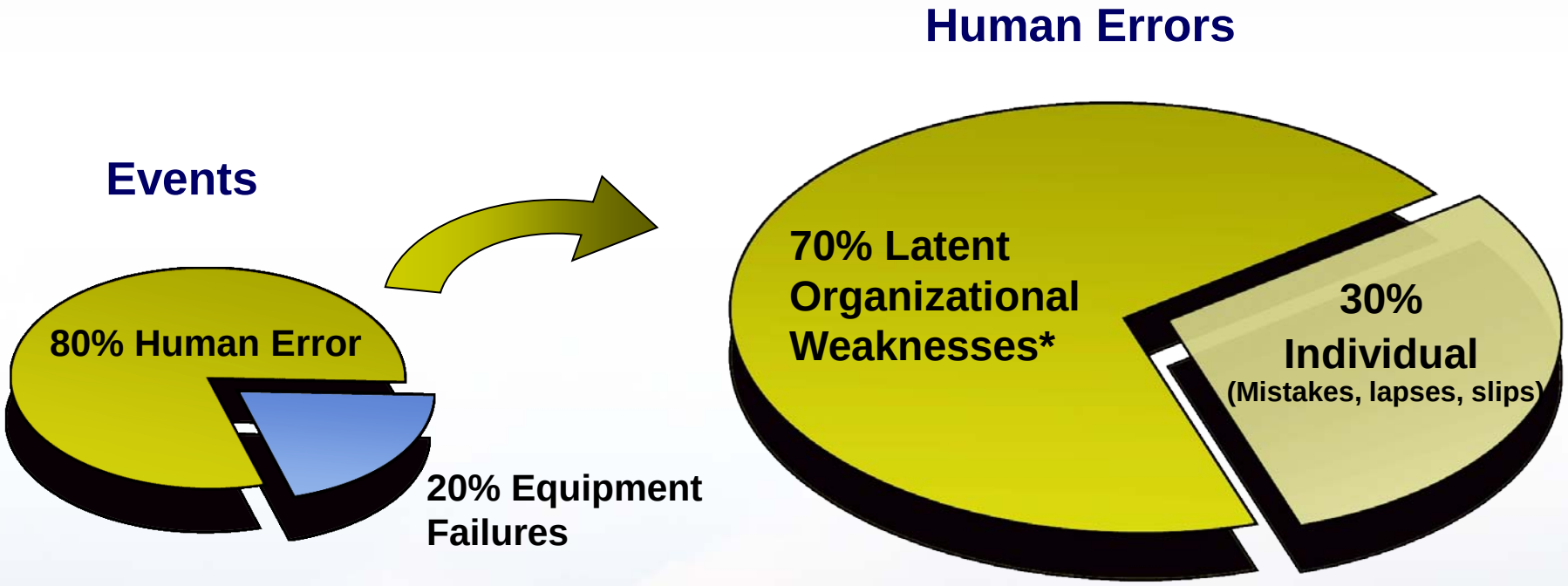
To Err is Human





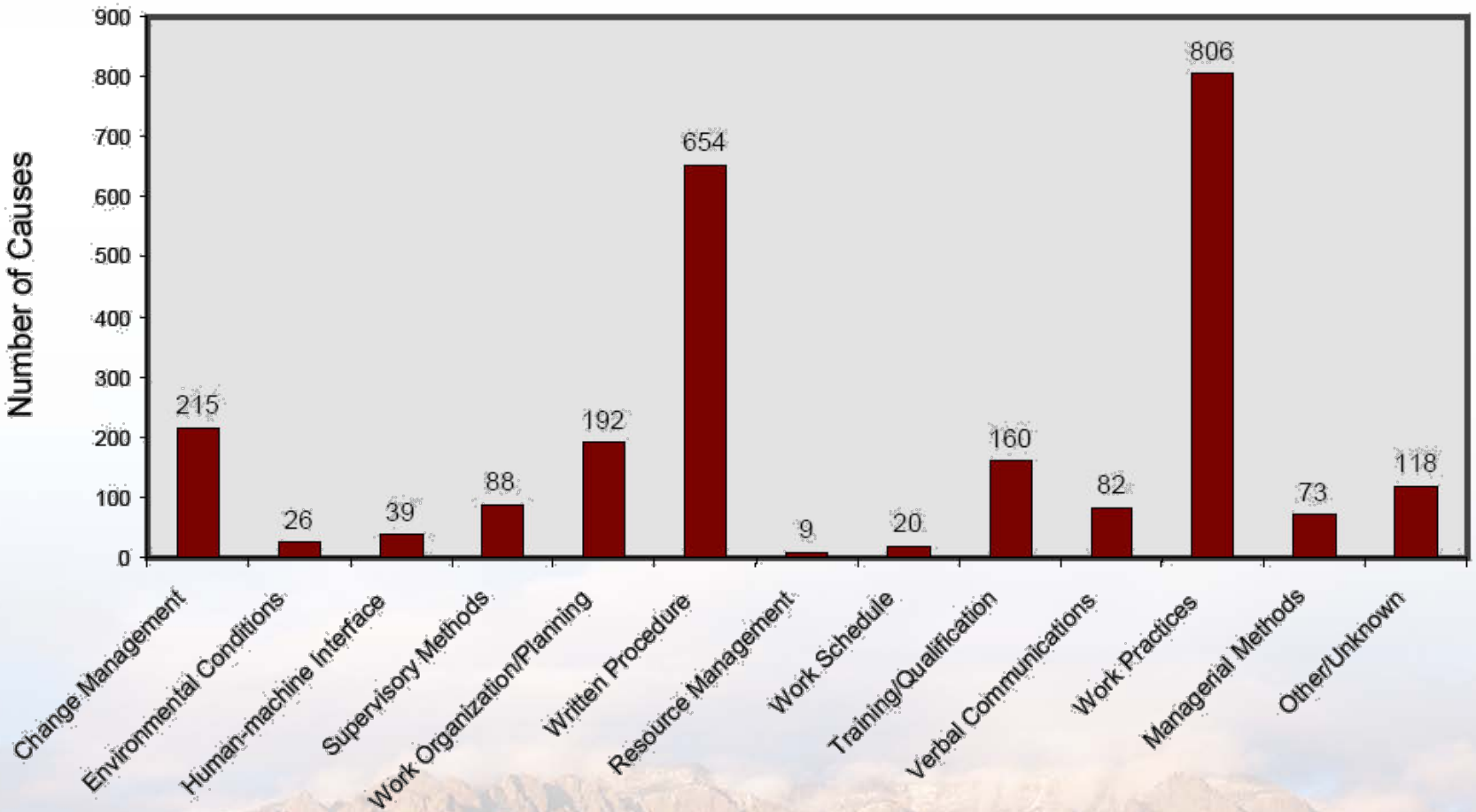
To Drift is Human

Causes of Events



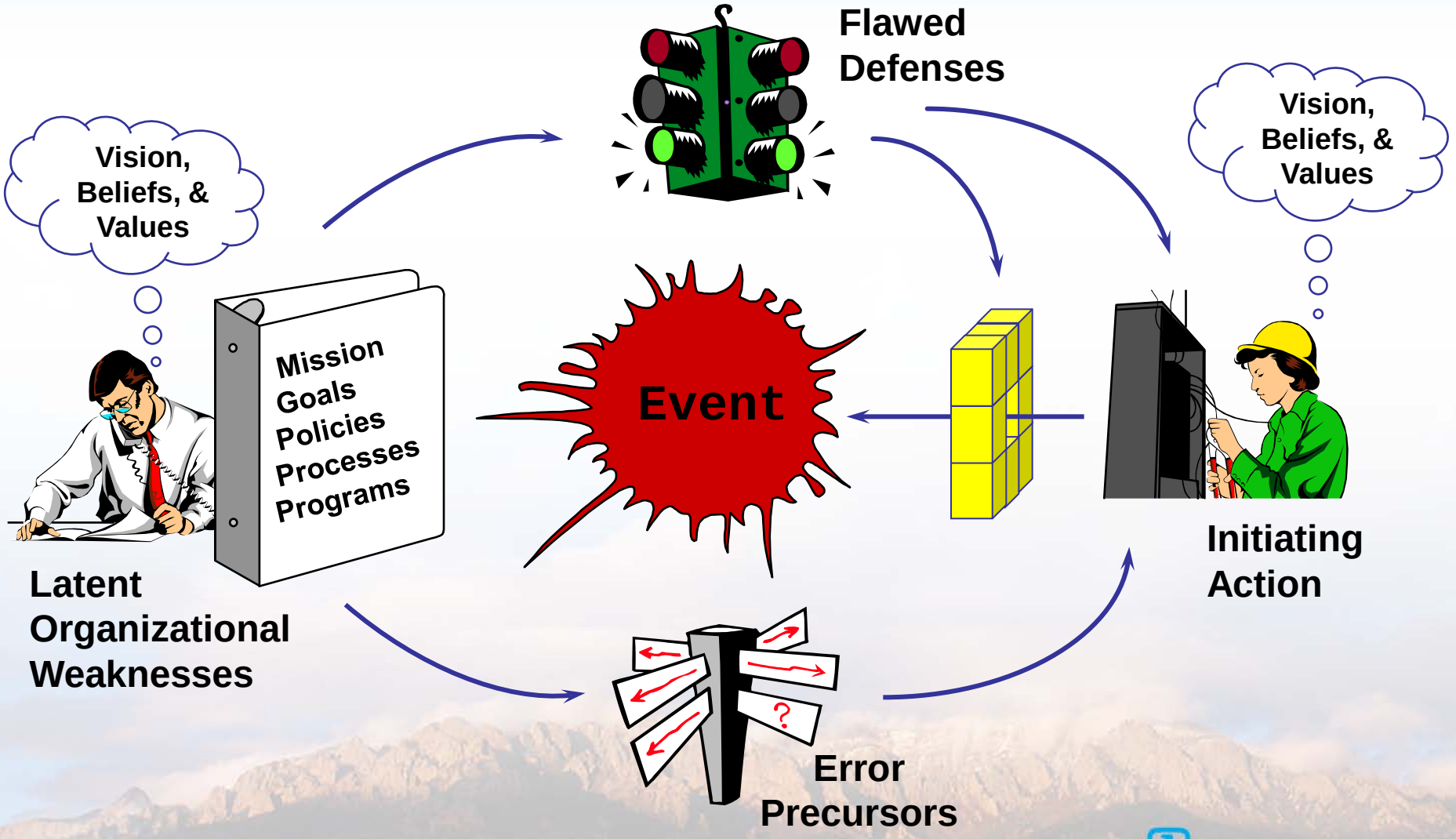
* Latent Organizational Weakness = Hidden deficiencies in management control process or values

Origins of Events



Source: INPO, Event Database, March 2000. For all events during 1998 and 1999.

Anatomy of an Event



"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."

- Patrick Lagadec and Jocelyn M. Phelps
Preventing Chaos in a Crisis: Strategies for Prevention, Control and Damage Limitation

Significance of an Event

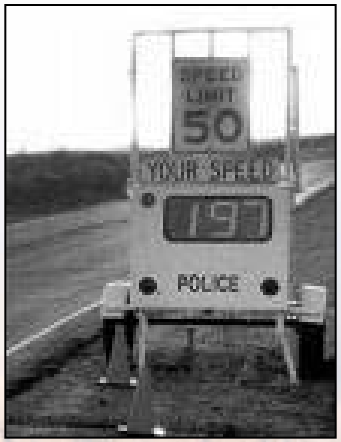
The significance (or severity) of an event depends upon the consequences suffered, and not on the error that initiates it. The error that triggers a serious accident … and the error that is one of hundreds with no consequences … can be the same error.

What is an Error?

An action that unintentionally departs from an expected behavior.

What is a Violation?

Intentional acts to deviate ***from a policy or procedure for personal advantage, usually adopted for fun, comfort, expedience, or convenience.***



Two Kinds of Error

Active Error →

Immediate consequences.
Know “who did it.”

← ***Latent Error***

Latent consequences. Do not know “who did it.”

Facts About Human Error

- Thrives in every industry
- Major contributor to events
- Costly, adverse to safety and hinders productivity
- Greatest cause of human error is **weaknesses in the organization**, not lack of skill or knowledge
- Error rates can never be reduced to zero
- Consequences of errors can be eliminated

Human Fallibility

"The single greatest impediment to error prevention in the medical industry is that we punish people for making mistakes."

- Dr. Lucian Leape,
Professor, Harvard School of Public Health
Testimony before Congress on Health Care Quality Improvement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WHEN GOOD PETS
GO BAD

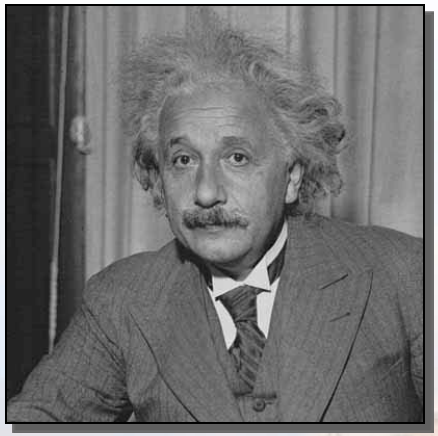
Discussion of Kenny Video

- What is your impression of Kenny?
- What error(s) did Kenny make?
- What condition(s) provoked the accident?
- What could be said about defenses?
- What error(s) did the organization make?
- Are there any Kennys in your organization?

New Approach Needed

"The significant problems we face can not be solved at the same level of thinking we were at when we created them."

- Albert Einstein

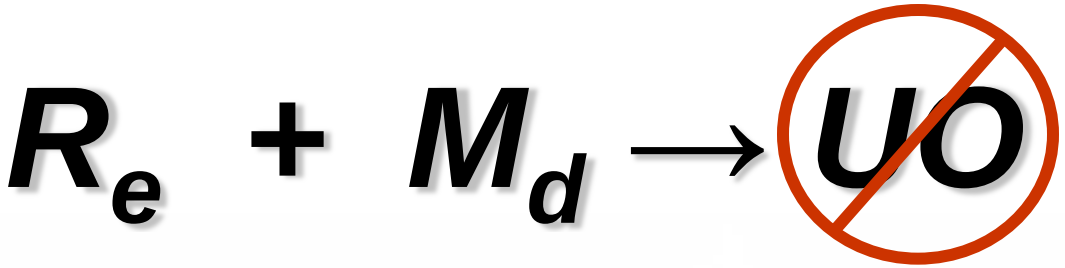


MISSION SUCCESS

$$P = B + R$$

Performance = Behavior + Results

Goal of Human Performance Improvement



Reducing Error + Managing Defenses → Zero Events
(Unwanted Outcomes)

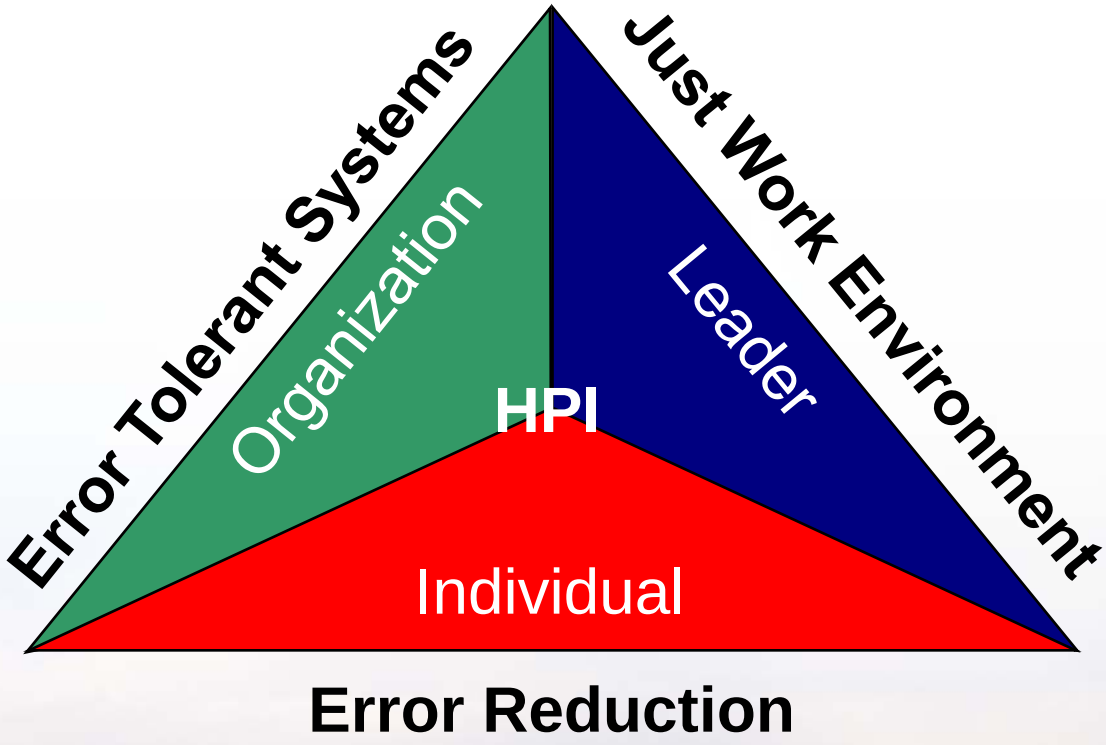
Anticipate & Prevent Active Error at the Job-site

Confirm Integrity of Defenses and Identify/Eliminate Latent Organizational Weaknesses

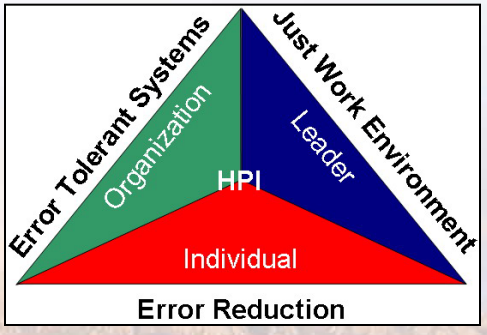
Principles of Human Performance

1. People are fallible - even the best people make mistakes.
2. Error likely situations are predictable, manageable, and preventable.
3. Individual behavior is influenced by organizational processes and values.
4. People achieve high levels of performance largely because of the encouragement and reinforcement received from leaders, peers, and subordinates.
5. Events can be avoided through an understanding of the reasons mistakes occur and the application of the lessons learned from past events (or errors).

Three-Tiered Approach



LESSON 2
The Role of the Individual in Human Performance



Lesson 2 Objectives

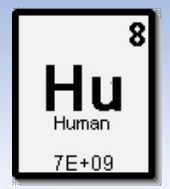
Participants will be able to….

1. **Understand** human fallibility.
2. **Describe** how to predict, manage, and prevent error-likely situations.

Human Performance Improvement Principle #1

People are fallible, and even the best make mistakes.

Common Traps of Human Nature



- Stress
- Mental Strain Avoidance
- Inaccurate Mental Models
- Limited Working Memory
- Limited Attention Resources
- Mind-Set

- Difficulty Seeing One's Own Error
- Limited Perspective
- Susceptibility to Emotional / Social Factors
- Motivated Toward Goal Accomplishment
- Fatigue

Fundamental Attribution Error

Tendency to over estimate the internal and underestimate the external factors when explaining behavior of others

<u>Two Opposing Perspectives</u>:

1. When I do well it is because I am talented and good. When I do bad it is because of bad luck.
2. When you do well it is because of luck. When you do poorly, it is because you are bad and unskilled with no talent.

At-Risk Attitudes

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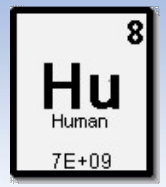
- **Risk Perception**: *Guided by the heart, not by the head.*
- **Pride**: "*Don't insult my intelligence*."
- **Heroic**: "*I'll get it done, by hook or by crook*."
- **Invulnerability**: "*That can't happen to me*."
- **Fatalistic**: "*What's the use?*" or "*Que será será*"
- **Bald Tire**: "*I've gone 60K miles without a flat yet*."
- **Summit Fever**: "*We're almost done*."
- **Pollyanna**: "*Nothing bad will happen*."

At-Risk Behaviors



At-Risk Behaviors: behavioral choices that increase risk where risk is not recognized, or is mistakenly believed to be justified.

Driving a Car:

- …
- …
- …
- …
- …

In the Workplace:

- …
- …
- …
- …
- …

Human Performance Improvement Principle #2

Error-likely situations are predictable, manageable, and preventable.

Error-Likely Situation

An error about to happen:

- Typically exists when task-related factors exceed the capabilities of the individual (a mismatch)

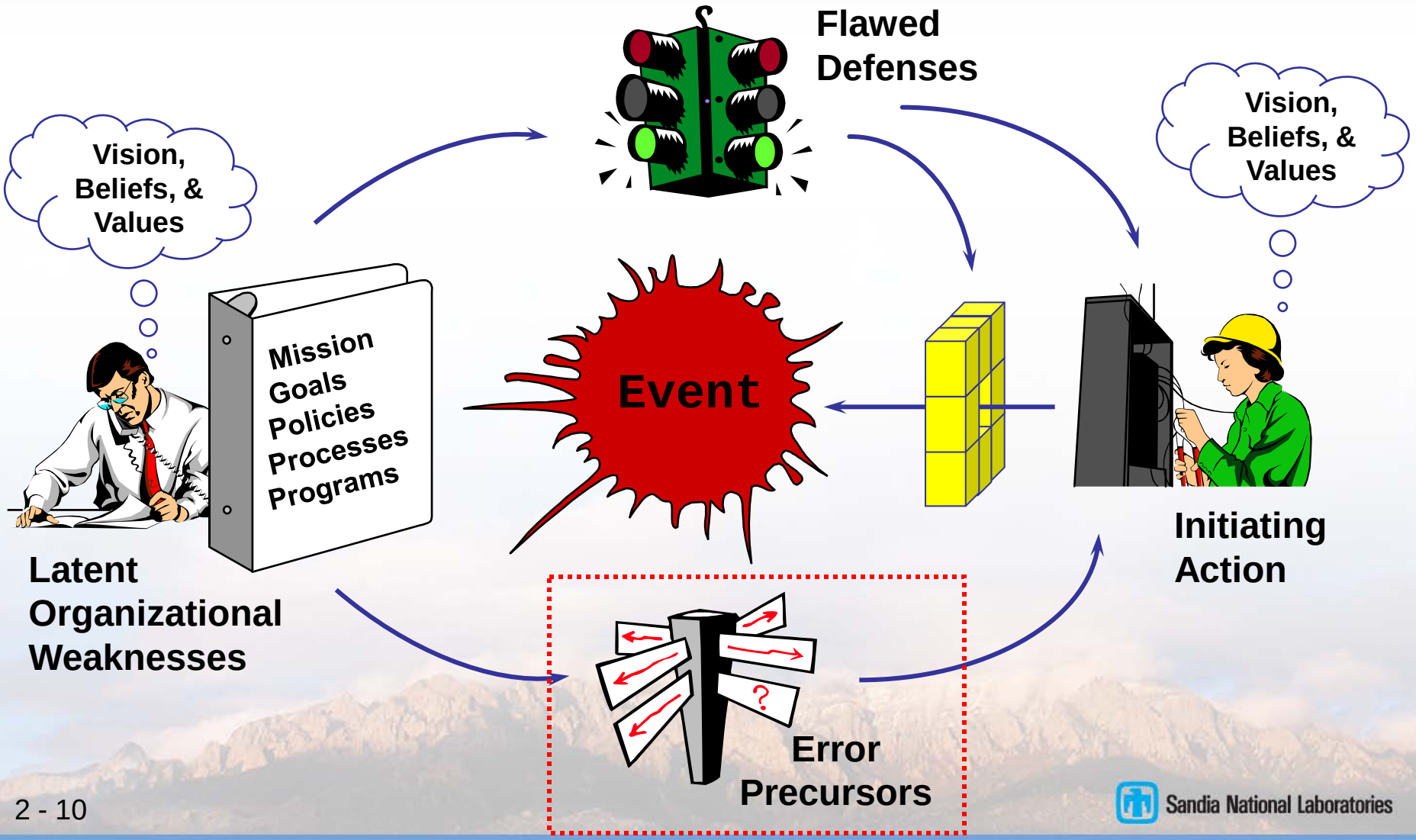
Error – likely Situation (also called "*Error Traps*")

Unintentional deviation from preferred behavior

Jobsite conditions

Degree of mismatch due to error precursors

Anatomy of an Event

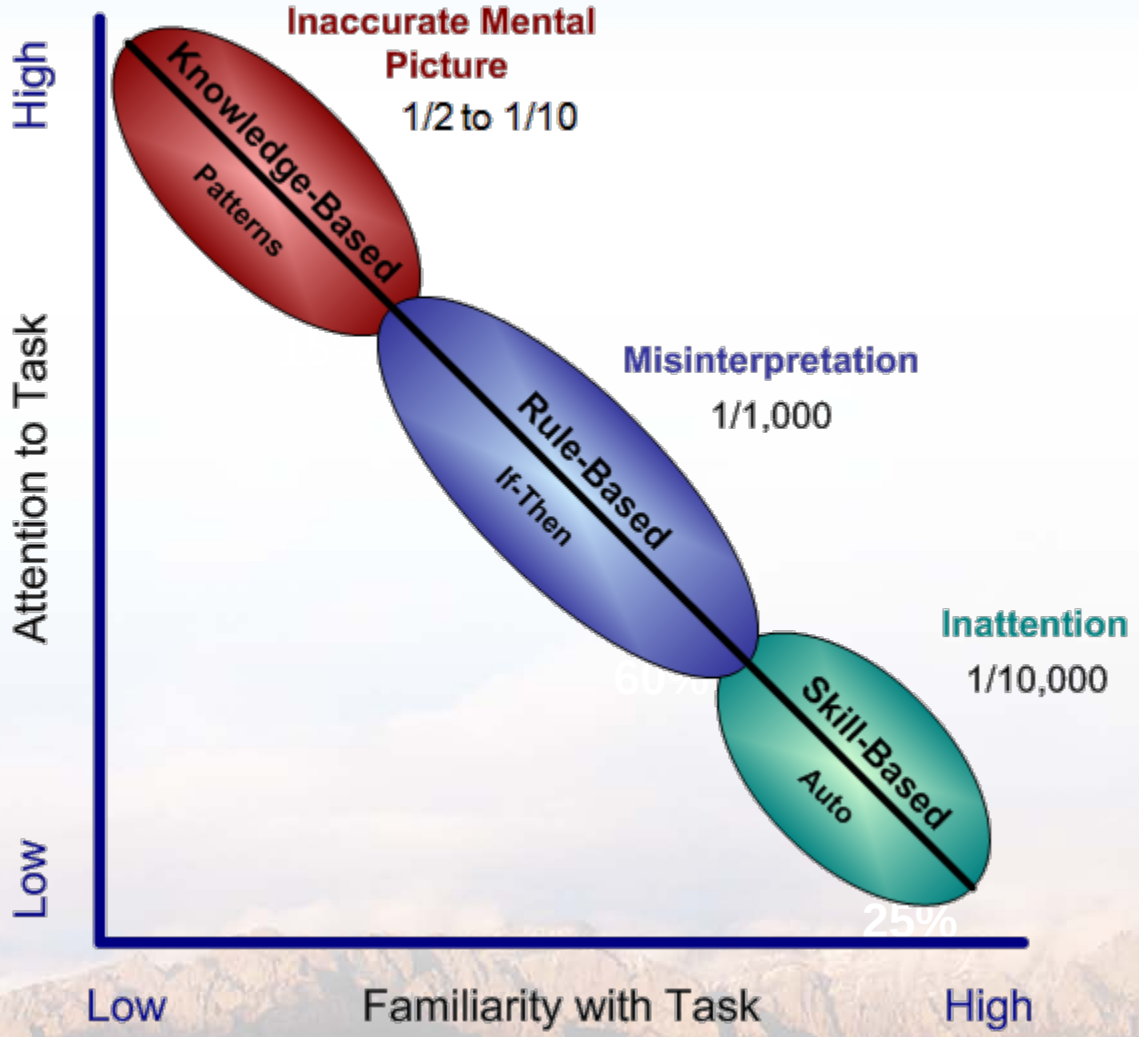


Common Error Precursors

(Conditions that Provoke Error)

Task Demands	Individual Capabilities
❑ Time pressure (in a hurry)	❑ Unfamiliarity with task/first time
❑ High workload (large memory requirements)	❑ Lack of knowledge (faulty mental model)
❑ Simultaneous, multiple actions	❑ New techniques not used before
❑ Repetitive actions/monotony	❑ Imprecise communication habits
❑ Irreversible actions	❑ Lack of proficiency/inexperience
❑ Interpretation requirements	❑ Indistinct problem-solving skills
❑ Unclear goals, roles, or responsibilities	❑ Unsafe attitudes
❑ Lack of or unclear standards	❑ Illness or fatigue; general poor health
Work Environment	**Human Nature**
❑ Distractions/interruptions	❑ Stress
❑ Changes/departure from routine	❑ Habit patterns
❑ Confusing displays or controls	❑ Assumptions
❑ Work-arounds/out of service instruments	❑ Complacency/overconfidence
❑ Hidden system/equipment response	❑ Mind-set (intentions)
❑ Unexpected conditions	❑ Inaccurate risk perception
❑ Lack of alternative indication	❑ Mental shortcuts or biases
❑ Personality conflict	❑ Limited short-term memory

Consider Performance Modes



Team Errors

- ***Halo Effect***: Blind trust in the competence of specific individuals
- ***Pilot / Co-pilot***: Subordinate reluctant to challenge opinions, decisions, or actions of senior person
- ***Free Riding***: One takes the lead while others tag along without actively scrutinizing the work.

Team Errors (Cont.)

- ***Groupthink***: Reluctance to share contradictory information for the sake of maintaining harmony
- ***Risky Shift***: Tendency to gamble with decisions more as a group than if each member was making the decision individually – accountability is diffused (also called "*herd mentality*")

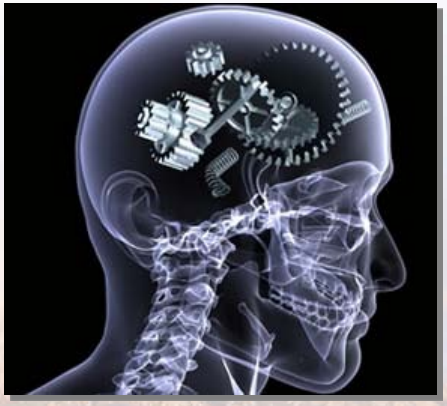
It takes a team error to have an event.

Fundamental Human Performance Tools

- Task Preview
- Job-Site Review
- Questioning Attitude
- Stop (& collaborate) when unsure

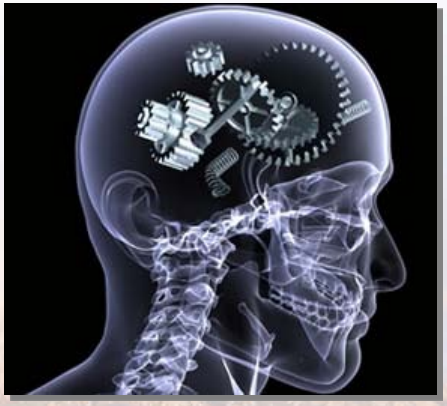
SITUATIONAL AWARENESS

- Self-Checking
- Procedure Use and Adherence
- Effective Communication



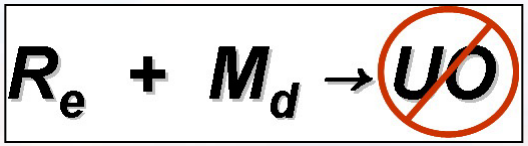
Conditional Human Performance Tools

- Pre-job Briefing
- Peer-Checking
- Concurrent Verification
- Independent Verification
- Flagging
- Placekeeping
- Turnover
- Post-job Review

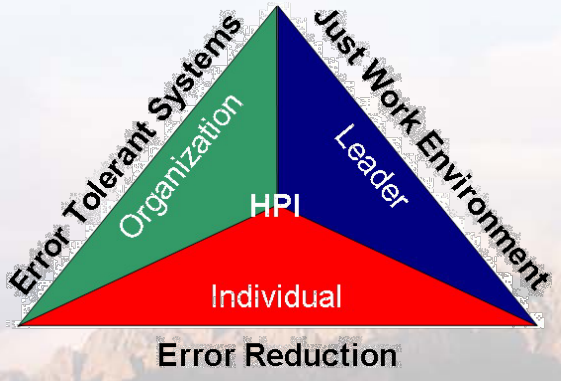


What Individuals can do……

- Understand error-provoking factors and human fallibility & vulnerabilities
- Anticipate error-likely situations
- Apply human performance tools & techniques
- Improve personal capabilities



LESSON 3
Managing Defenses

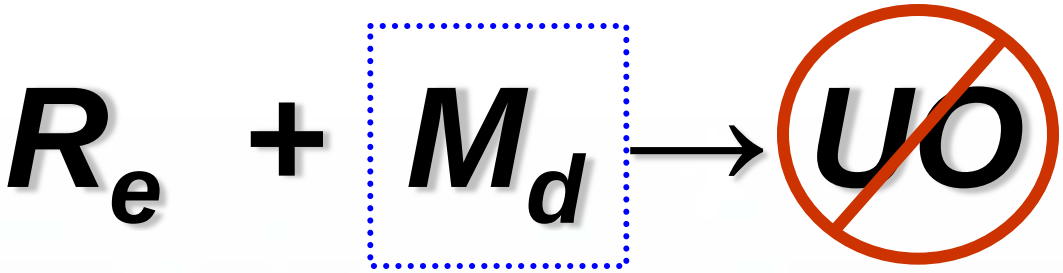


Lesson 3 Objectives

Participants will be able to….

1. **Describe** the functions of defenses.
2. **Discuss** defense-in-depth and the dependability of various defenses.

Goal of Human Performance Improvement



Reducing Error + Managing Defenses → Zero Events
(Unwanted Outcomes)

Anticipate & Prevent Active Error at the Job-site

Confirm Integrity of Defenses and Identify/Eliminate Latent Organizational Weaknesses

Functions of Defenses

- ***Create Awareness*** and ***Understanding*** of hazards
- Give clear ***Guidance*** on how to operate
- ***Detect*** & ***Warn*** of imminent danger
- ***Protect*** against error / harm and potential losses
- ***Restore*** facility to a safe condition
- ***Contain/Mitigate*** the effects of errors and hazards
- Provide the means of ***Escape*** and ***Rescue*** should containment fail

Categories of Defenses

- **Engineered** Controls
- **Administrative** Controls
- **Cultural** Controls
- **Oversight** Controls

Engineered Controls

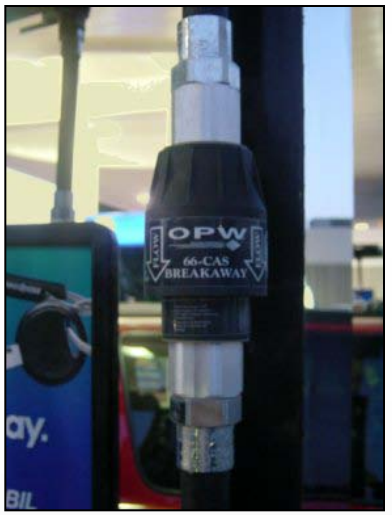
Design for System Reliability … knowing that systems will never be perfect.

Examples:

- Human factors design to reduce the rate of error.
- Use barriers to prevent failure.
- Provide for recovery – to capture failures before they become critical.
- Redundancy to limit the effects of failure.
- *Mistake-Proofing*.

Engineered Controls (Cont.)

Mistake-Proofing: Use of process or design features to prevent errors or the negative impact of errors.



- Reduces complexity, ambiguity, vagueness, and uncertainty
- Simplification - *by removing unnecessary process steps* - helps to reduce error

Engineered Controls (Cont.)

Design for Human Reliability … knowing humans will never be perfect.

Examples:

- Information
- Equipment/tools
- Design/configuration
- Job/Task Qualifications/Skills
- Perception of Risk
- Individual Factors
- Organizational Environment

Administrative Controls

Policies/procedures intended to inform people about what, when, and how to perform.

Examples:

- Work Planning & Control process
- Administrative procedures
- Training program
- Posting and Labeling
- Budget process

Cultural Controls

Practices that teach people how to perceive, think, feel, and behave regarding Corporate mission, processes, activities, priorities, values, etc.

Examples:

- Management expectations, actions, and reactions
- Recognition practices
- Critique process

Oversight Controls

Practices to observe work, identify issues, initiate remedial action(s), and verify effectiveness of actions taken.

Examples:

- Self-Assessment Program
- Internal Audit Process
- Independent Review Program
- Key Performance Indicators
- Corrective Action Program

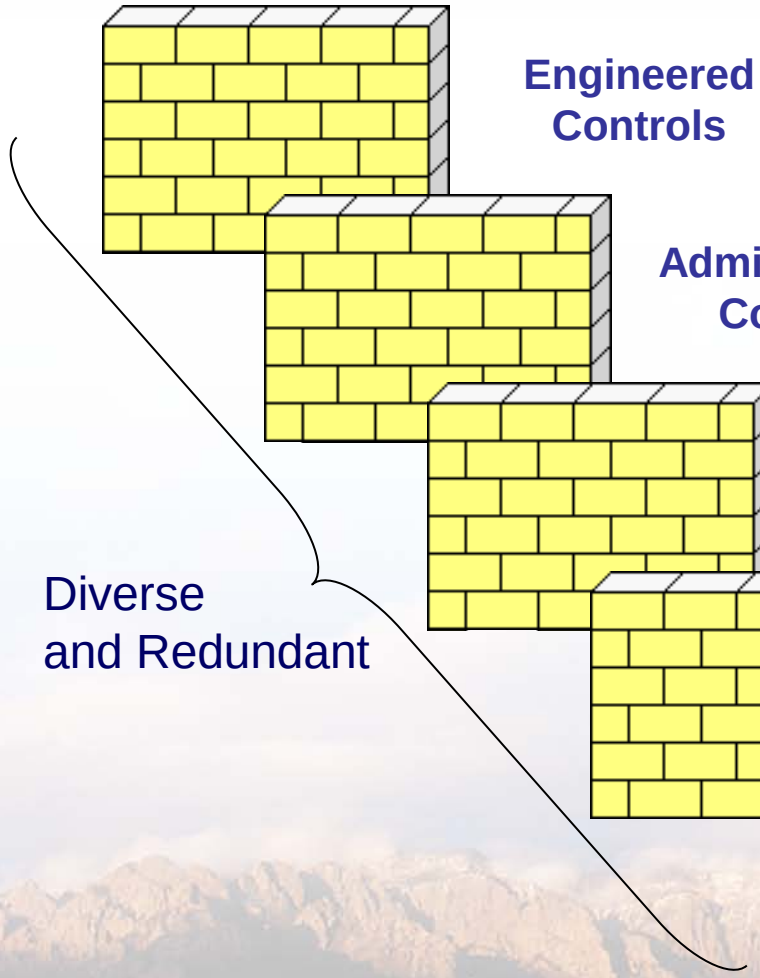
Defenses-in-Depth

"… assume that mistakes will happen, and have in place procedures {e.g., barriers, practices, etc.} that will catch and correct them before they snowball."

- Vincent Czaplyski,
Boeing 727 Check Airman

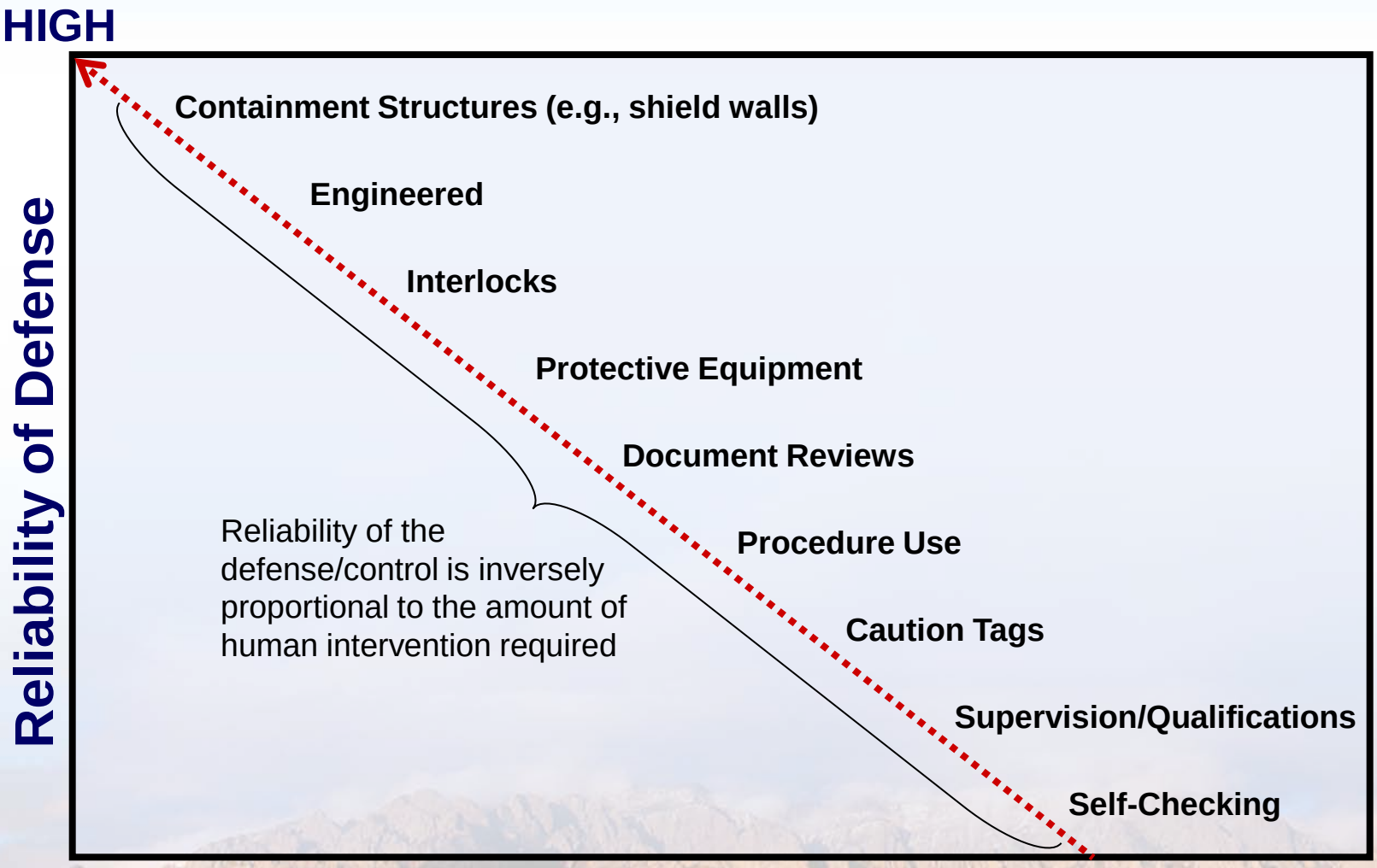
Defenses-In-Depth

Active Error



The Ideal

Dependability of Defenses



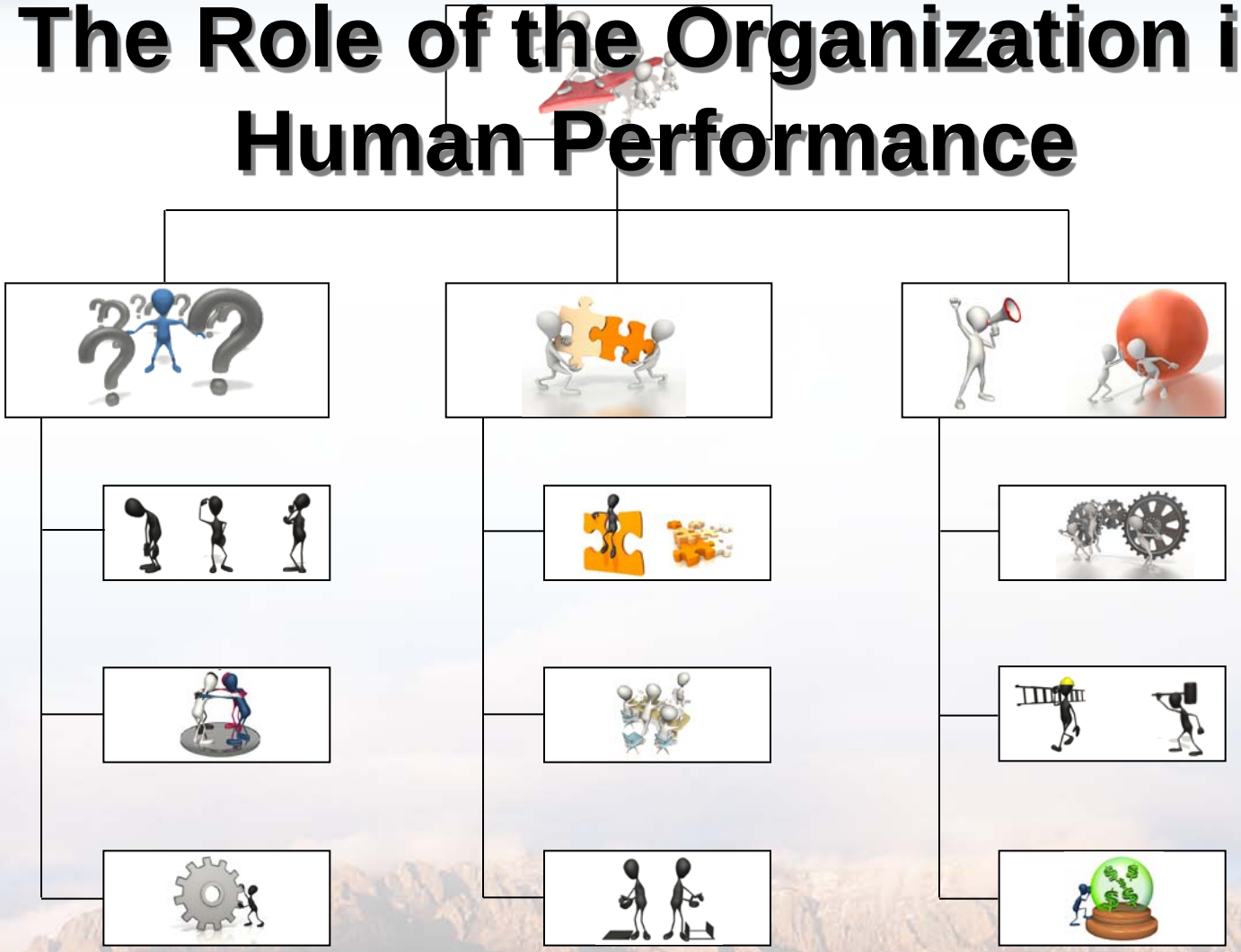
Dependability of Defenses (Cont.)

WARNING: Defense-in-depth can be a two-edged sword.

- Redundant defenses improve safety margins but also increase complexity.
- Flaws, traps, flawed defenses, and safety hazards can become more difficult to detect.
  - Latent conditions allowed to persist

Weakness in defenses may not be detected and repaired … because the people involved often forget to be afraid.

LESSON 4
The Role of the Organization in Human Performance



Lesson 4 Objectives

Participants will be able to….

1. **Understand** how individual behavior is influenced by organizational processes and values.
2. **Identify** sources of latent organizational weaknesses.
3. **Discuss** competing priorities and behaviors that are common in organizations.
4. **Discuss** the value of error tolerant systems.

Human Performance and the Organization

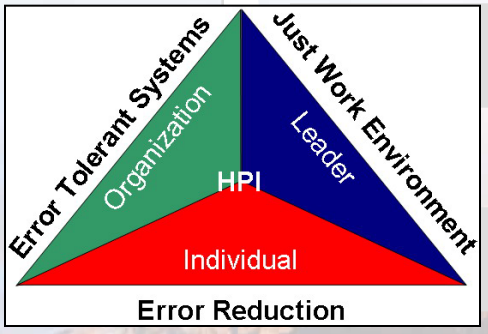
"Events are not so much the result of error-prone workers as they are the outcome of error-prone tasks and error-prone work environments, which are controlled by the organization."

- ***James Reason***

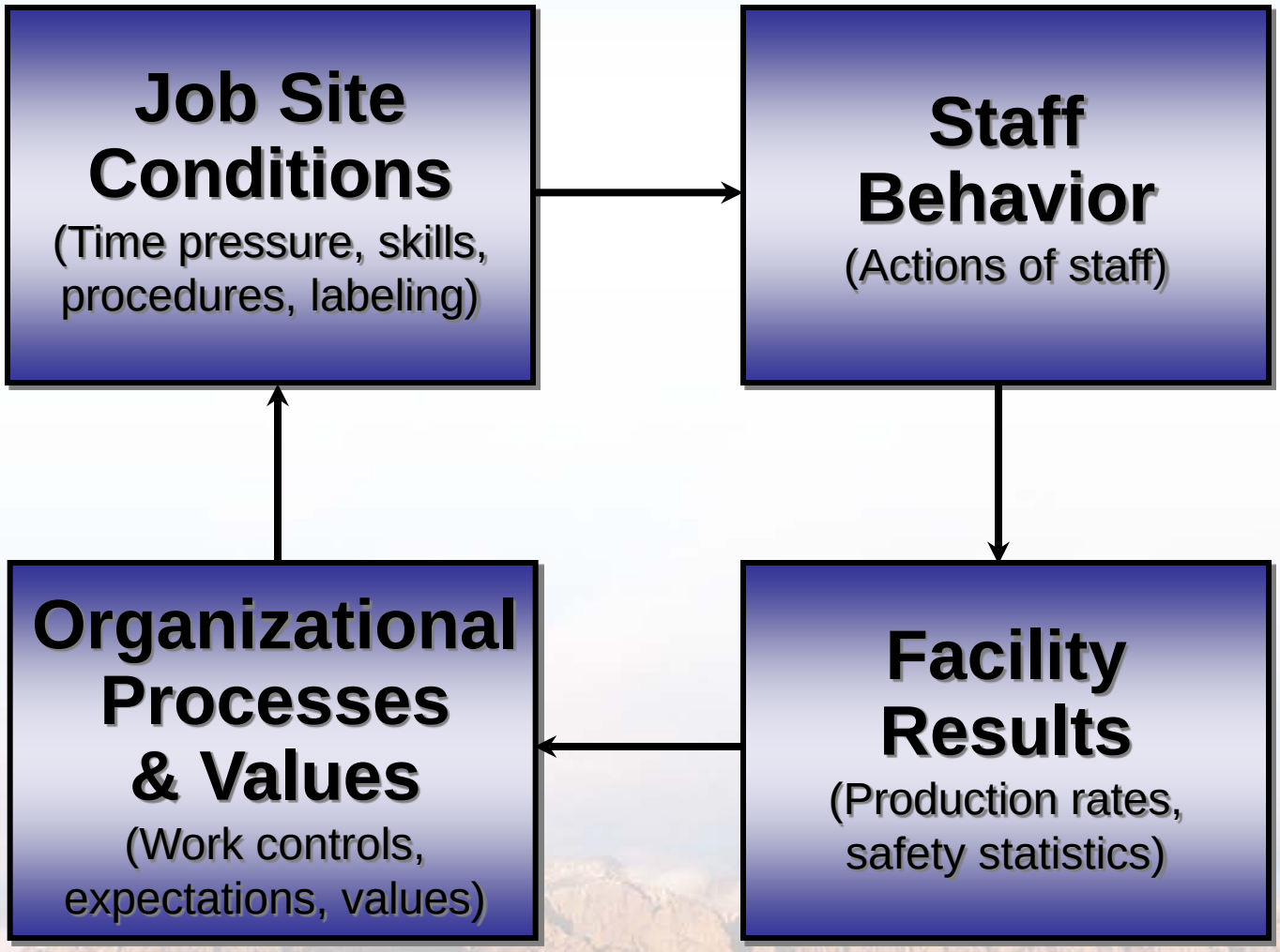
Managing the Risks of Organizational Accidents

Who is the Organization?

A group of individuals (managers, supervisors, staff) with a shared purpose (mission) and means (processes) to efficiently apply resources toward the safe and reliable (values) design, construction, operation, and maintenance of the physical facility.



Organizational Performance Model

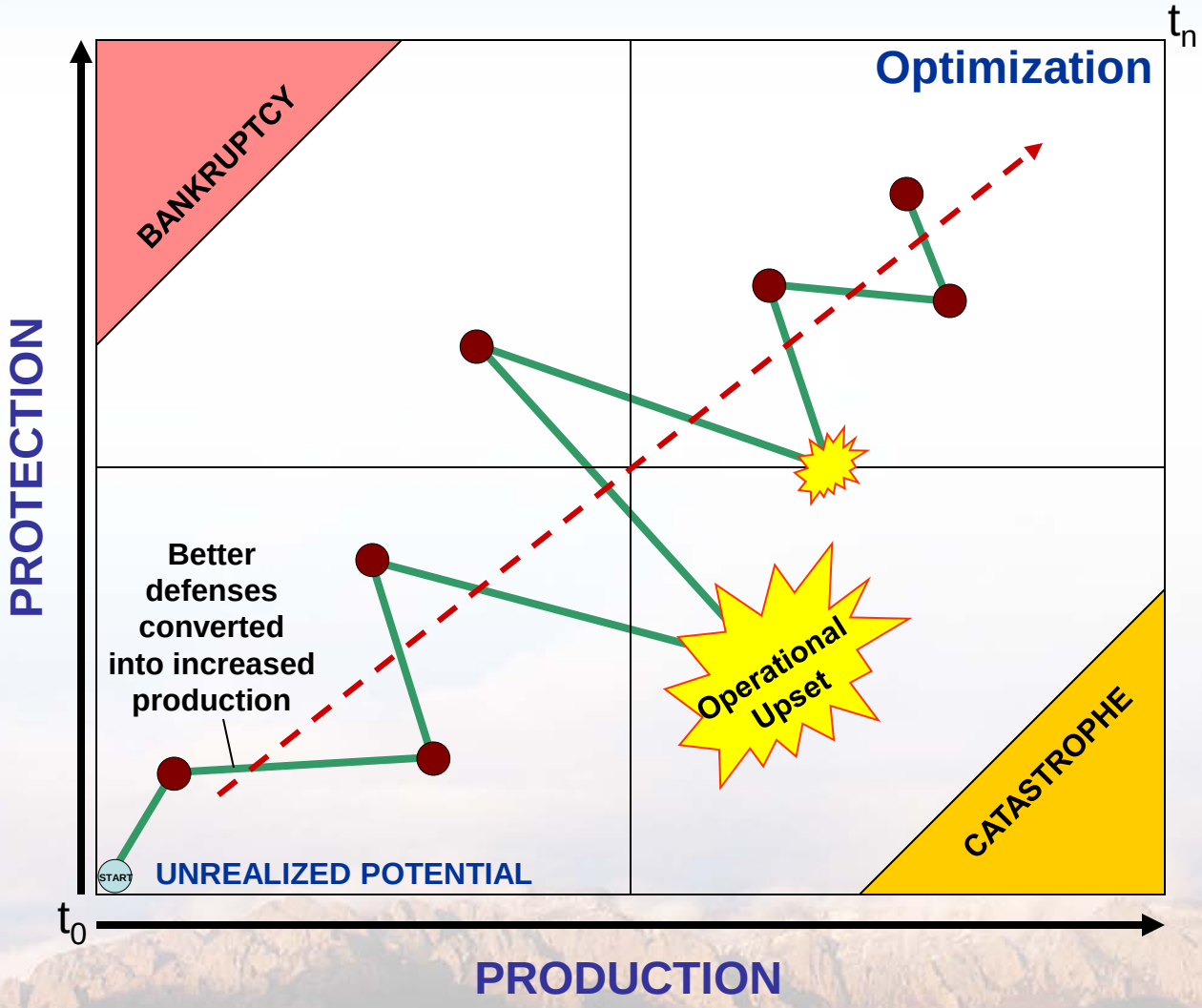


Human Performance and the Organization

"No matter how efficiently {plant} equipment functions; how good the training, supervision, and procedures are; and how well the best worker, engineer, or manager perform his or her duties, people cannot perform better than the organization supporting them."

- ***Maurino, Reason, Johnston, and Lee,***
  Beyond Aviation Human Factors, 1995.

Polarity Management



Production vs. Prevention

Production Behaviors:

- accomplish the facility's mission
- achieve desired results
- process driven
- easy to measure
- frequently reinforcing
- provide natural feedback
- perceived as mandatory
- involve the mind (logic)
- require mgmt. practices

Protection Behaviors:

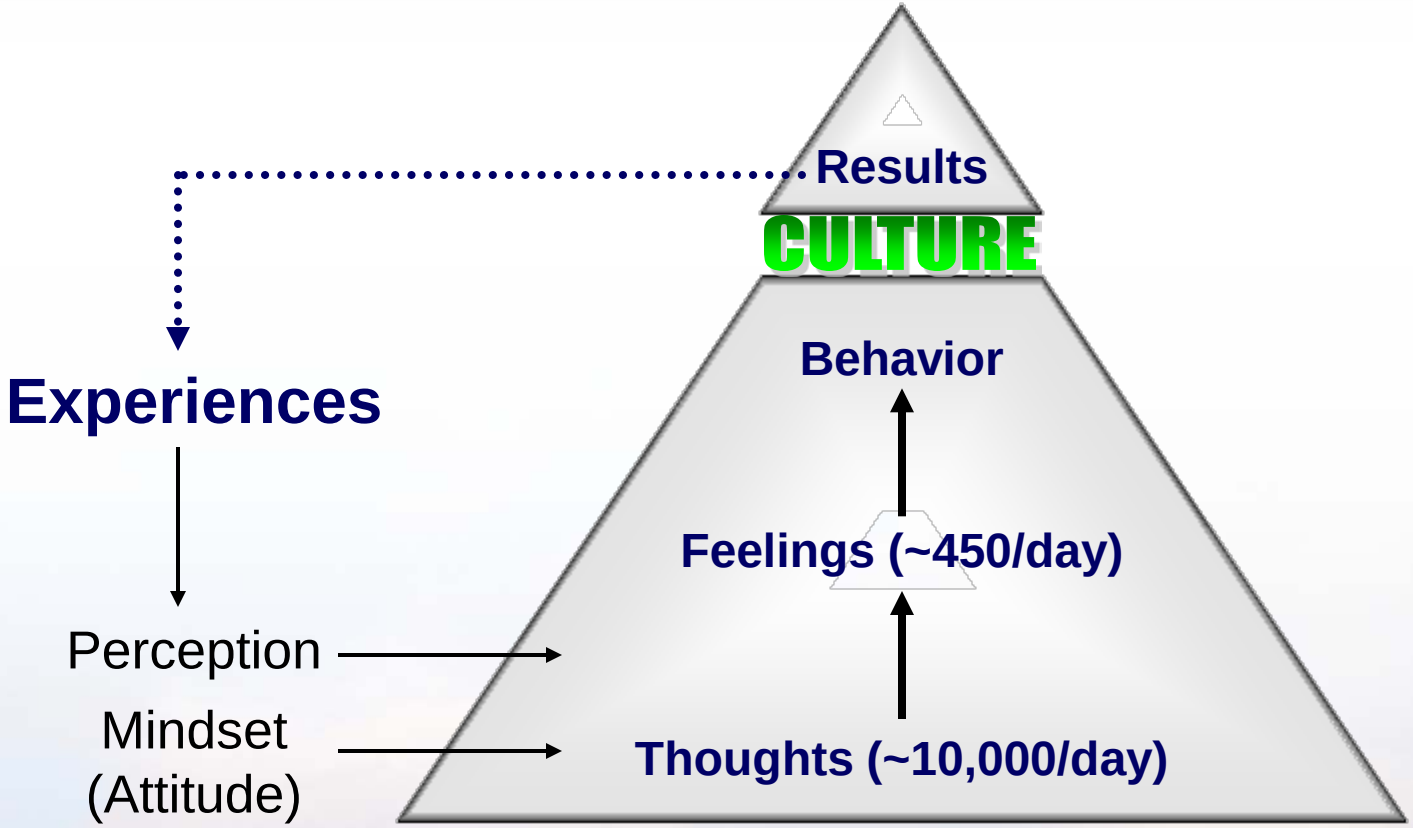
- avoid challenges to the mission
- protect desired results
- values driven
- hard to measure
- perceived as burdensome
- provide little or no feedback
- perceived as optional
- involve the heart (emotion)
- require leadership practices

Together, production and prevention behaviors are necessary for long-term success.

Human Performance Improvement Principle #3

Individual behavior is influenced by organizational processes and values.

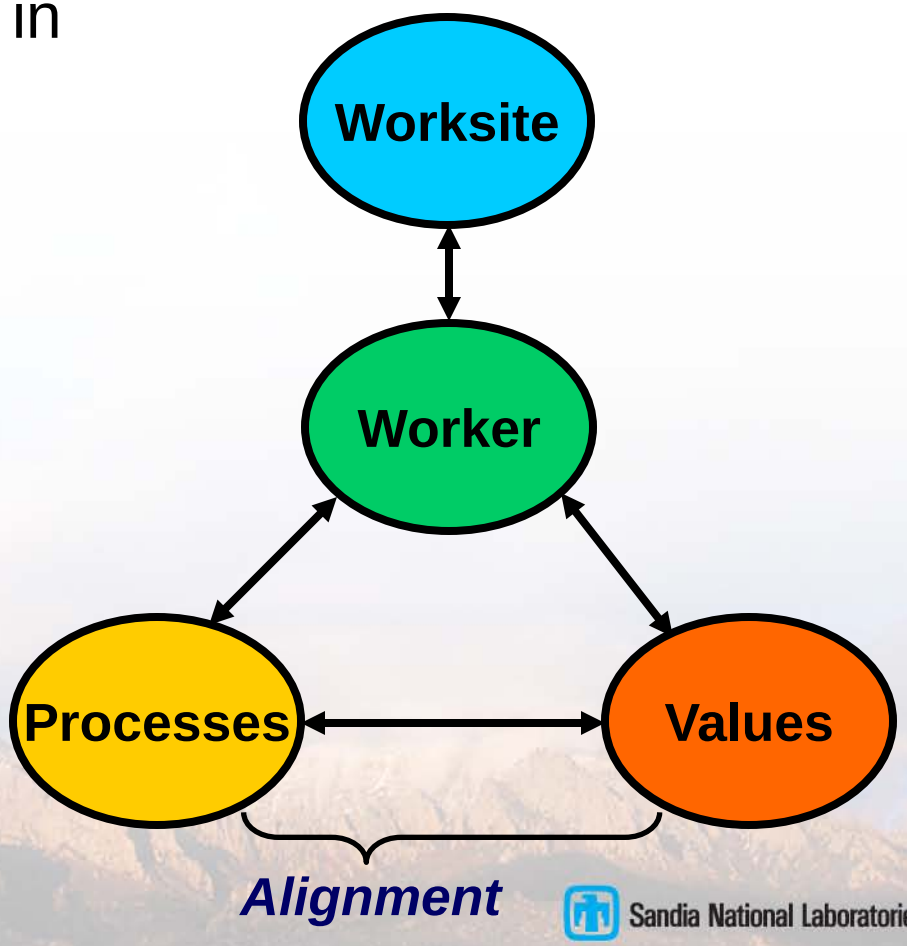
Individual Performance Model



Processes and Values

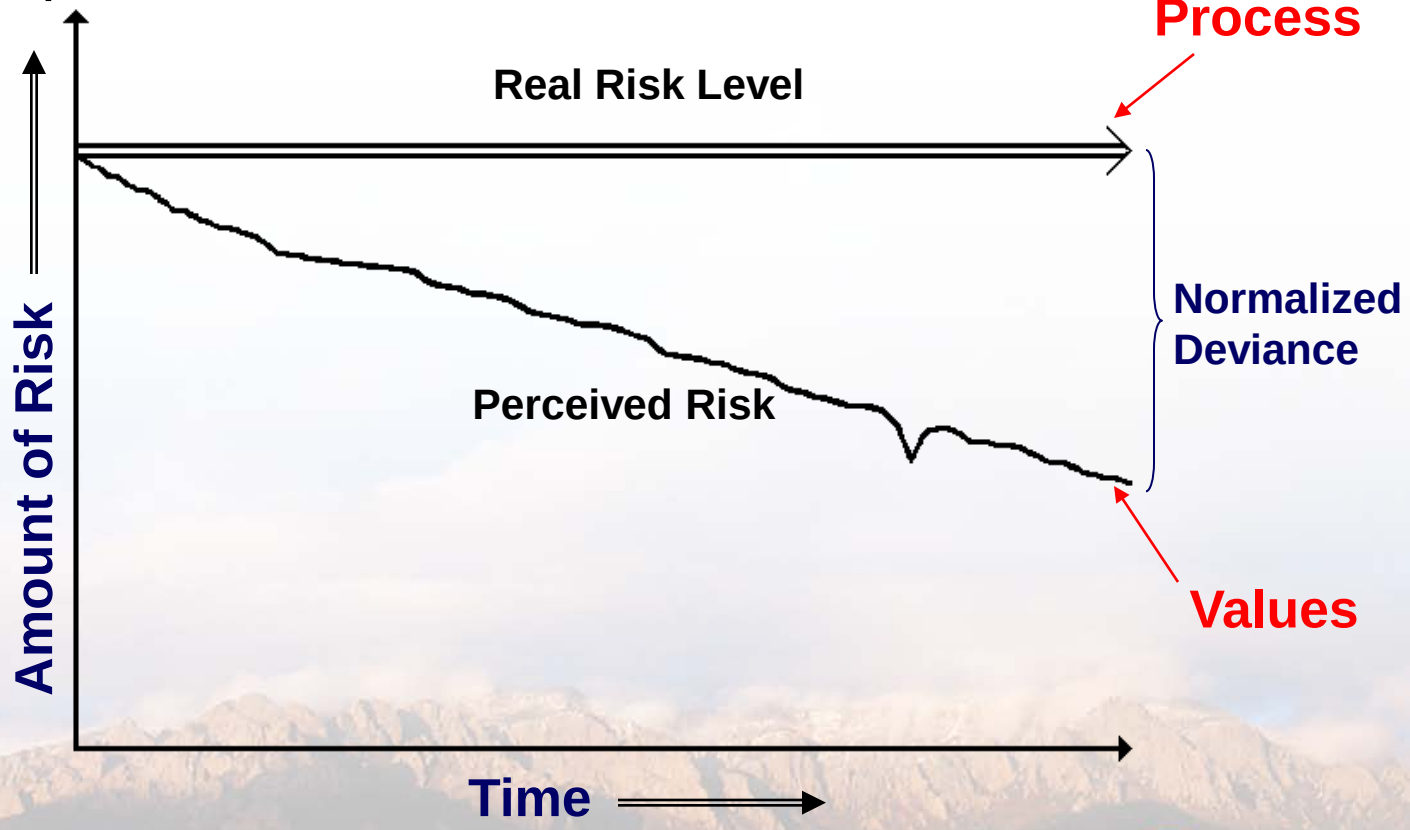
Processes – Tangible structures established to direct the behavior of individuals in a predictable, repeatable fashion as they perform various tasks.

Values – Central principles held in high esteem around which decisions are made and actions occur.



Normalized Deviance

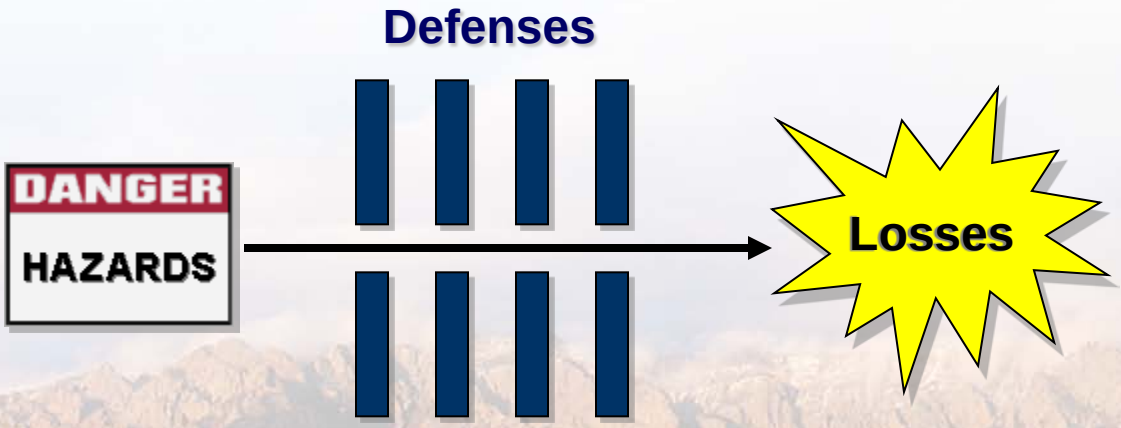
Focusing on one moment in time, you see negligence with respect to an old standard or norm.



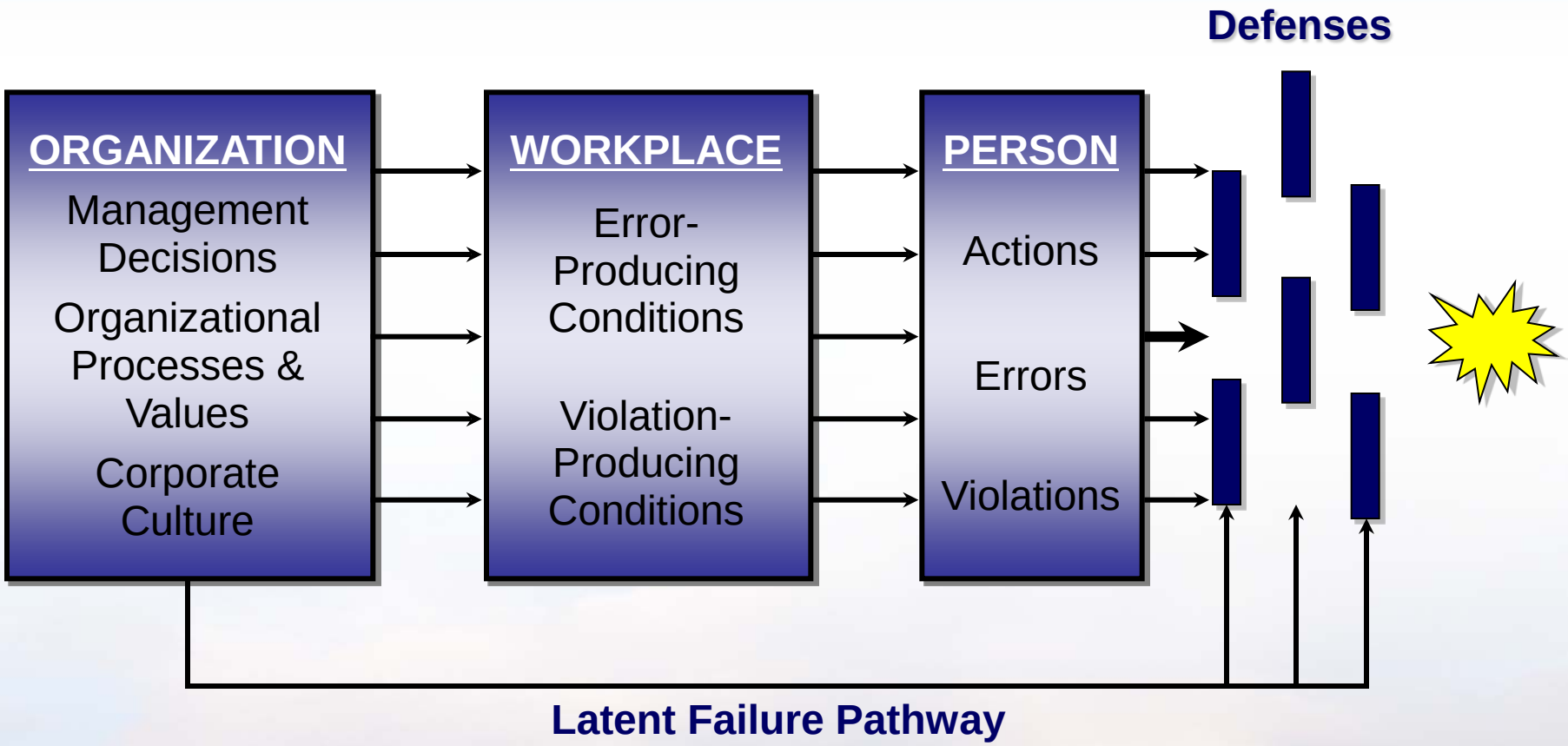
(NASA VIDEO)

Commonalities of Organizational Accidents

- Latent conditions are always present in complex systems
- Errors or human failures are not the principal causes
- Breakdowns in checking and reviewing defenses
- People “forget” to be afraid



Organizational Accident Model



Multiple causes - involving many people

Latent Organizational Weaknesses / Conditions

Undetected deficiencies in processes or values, or equipment flaws that create workplace conditions that provoke error ("error precursors") or degrade the integrity of defenses ("flawed defenses").

Sources of Latent Organizational Weaknesses

Processes (structure)

- ❑ Work Control
- ❑ Procedure Development
- ❑ Reviews & Approvals
- ❑ Engineering & Design
- ❑ Training
- ❑ Accountability Policy
- ❑ Resource Allocation

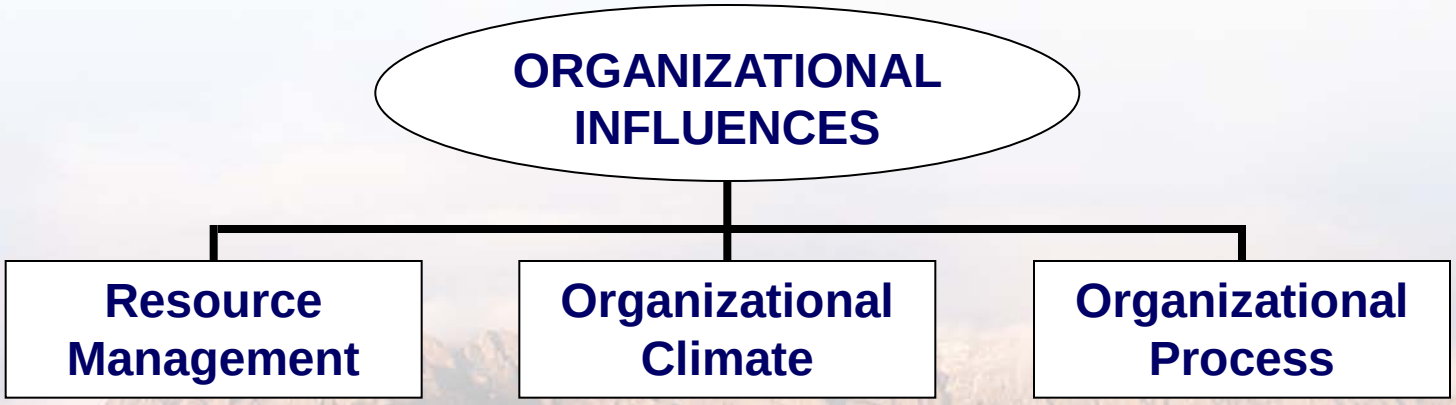
Values (relationships)

- ❑ Priorities
- ❑ Communication
- ❑ Coaching & Teamwork
- ❑ Measures & Controls
- ❑ Attitudes & Norms
- ❑ Assumptions
- ❑ Rewards & Sanctions

Sources of Latent Organizational Weaknesses (Cont.)

Fallible management decisions directly affect supervisory practices, as well as the conditions and actions of workers.

- Organizational errors often go unnoticed due to the lack of a clear framework from which to investigate them



Human Performance & the Organization - Revisited

"People make errors, which lead to accidents. Accidents lead to deaths. The standard solution is to blame the people involved. If we find out who made the errors and punish them, we solve the problem, right?

Wrong. The problem is seldom the fault of an individual; it is the fault of the system. Change the people without changing the system and the problems will continue."

- Don Norman
The Design of Everyday Things

Organizational Values
- Error Tolerance -

Error Tolerance:

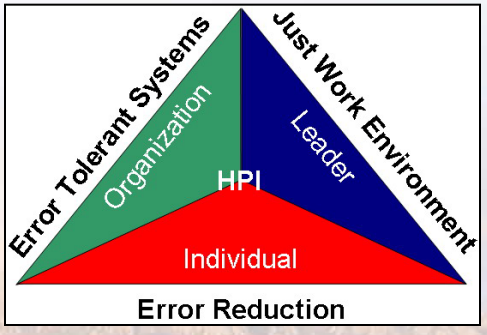
- Design processes, tasks, equipment, etc., such that the inevitable human error will not result in an event of consequence.

Error without consequence shows that our systems are error-tolerant and that they are working.

What Organizations can do….

- Foster a culture that values the prevention of errors and mishaps
- Preclude the development of error-likely situations
- Eliminate latent organizational weaknesses that provoke error
- Create a “Learning” environment that promotes continuous improvement
- Value error tolerance
- Report all errors and near misses
- Expect the unexpected, and have appropriate contingency plans in place

LESSON 5
The Role of the Leader in Managing Human Performance



Lesson 5 Objectives

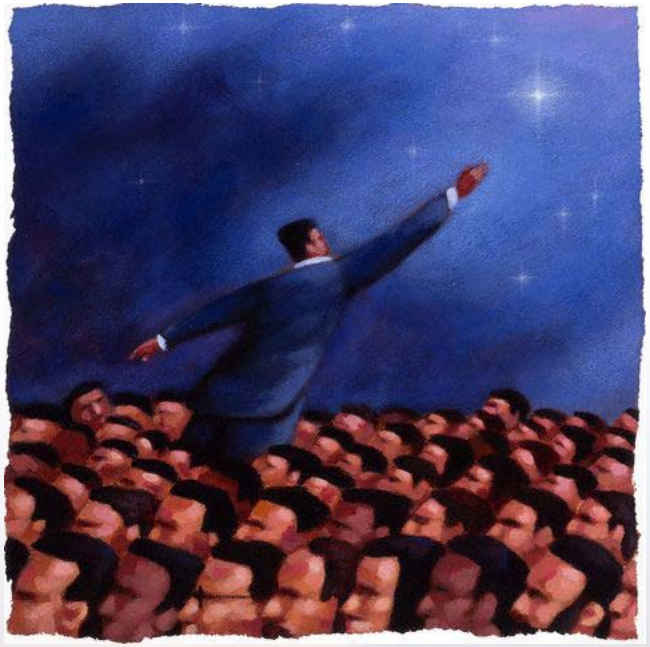
Participants will be able to….

1. **Describe** key leadership practices for managing human performance.
2. **Discuss** management error prevention tools.
3. **Discuss** the value of error prevention.
4. **Discuss** the importance of managing critical steps.

Leader Defined

Any individual who ***takes personal responsibility*** for their performance and the organization's performance.

- Attempts to *influence* the improvement of organizational processes and values.
- *Influences* others through relationships characterized by respect, honesty, and fairness.

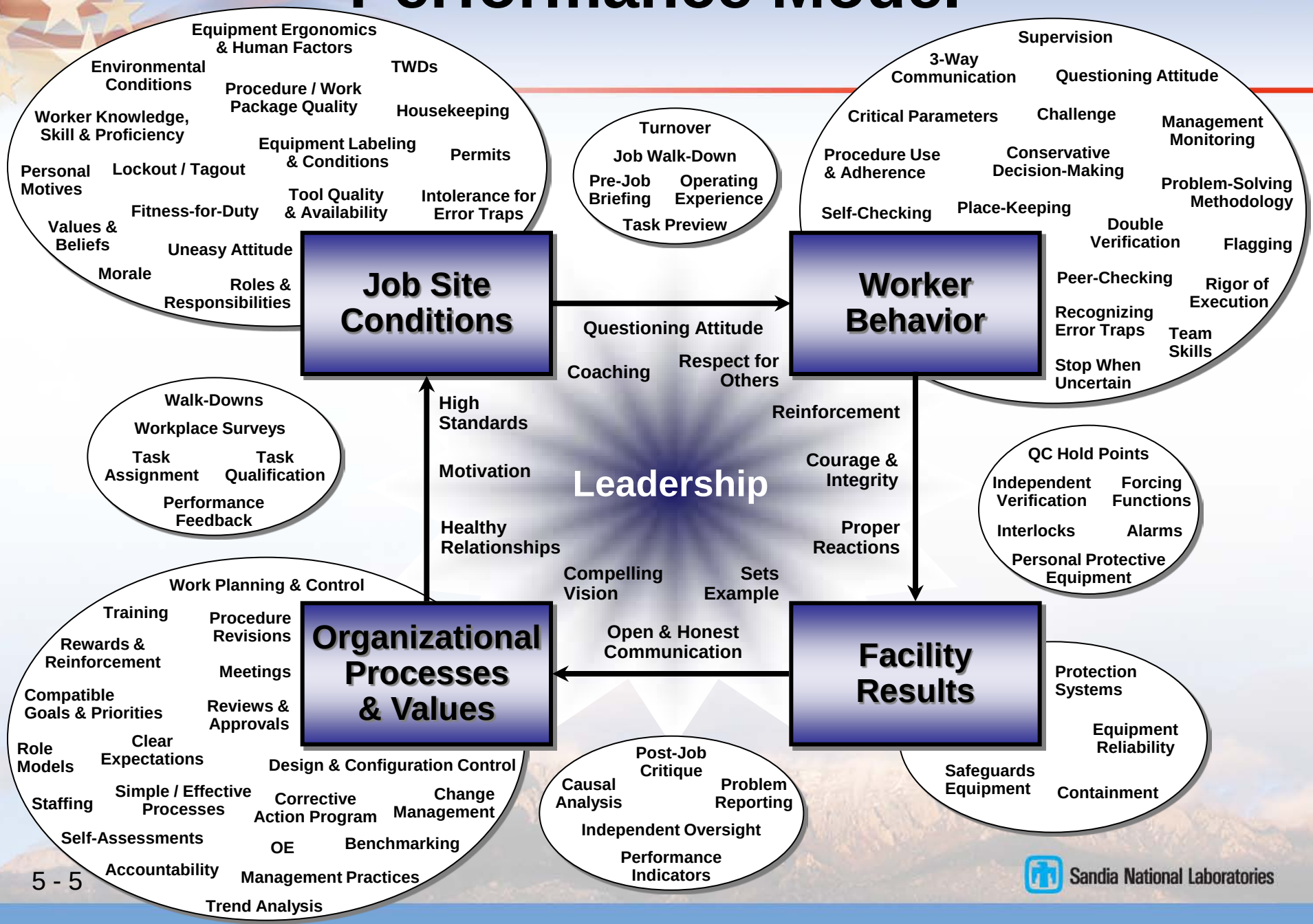


Importance of Leadership

Management activity most likely to move a facility or operation to the next level performance.

- Management systems & engineered controls alone not fully effective to ensure human performance.
- A culture must exist in which hazards, error-likely situations and flawed defenses are readily recognized, communicated, and resolved before work proceeds.
  - *Leaders set the tone.*

Performance Model



Key Leadership Practices

- Facilitate open communication
- Promote teamwork
- Reinforce desired behaviors
- Eliminate latent organizational weaknesses
- Value prevention of errors

Asking Questions….

"What I ask questions about sends clear signals to my audience about my priorities, values, and beliefs."

- Dr. Edgar Schein

Organizational Culture and Leadership

Facilitate Open Communication

The will to communicate at all levels of the organization is vital (and challenging).

Managers:

"Ask for what you need to hear, not for what you want to hear."

Subordinates:

"Tell your boss what they need to hear, not what you think they want to hear."

-- Roger Boisjoly –

Former Chief Engineer, Morton-Thiokol, Inc.

Facilitate Open Communication (Cont.)

"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."

- Weick & Sutcliffe
Managing the Unexpected

Promote Teamwork

Team skills are needed to identify and eliminate error-likely situations and to reinforce defenses.

- Humans have difficulty detecting their own errors, especially when working alone.

Promote Teamwork (Cont.)

Teamwork improves the ability of individual members to collectively prevent human performance problems.

- Important when a team or crew is confronted with an unfamiliar problem.
- Individual thinking/reasoning visible to the other team members.
- Dialogue allows assumptions to be challenged and errors to be detected.

Human Performance Improvement Principle #4

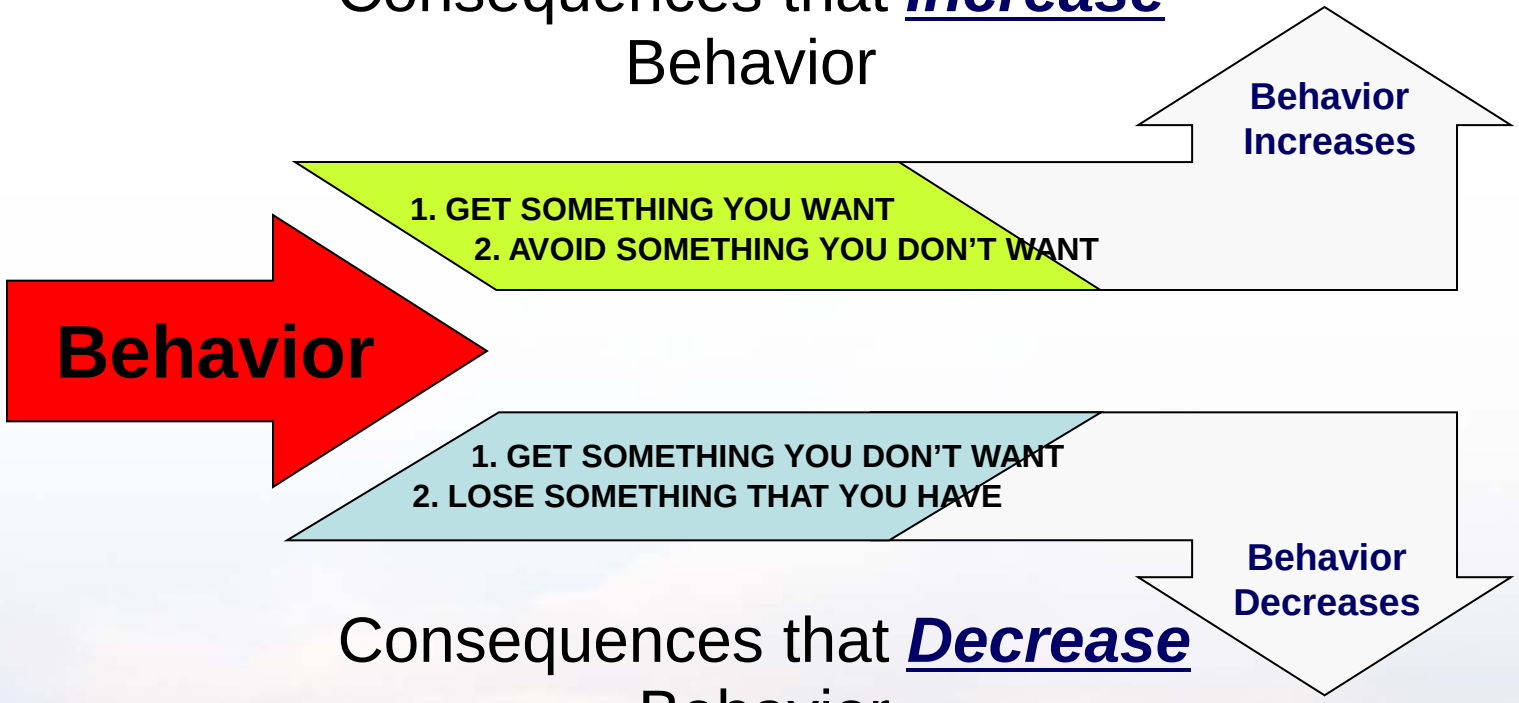
People achieve high levels of performance largely because of the encouragement and reinforcement received from leaders, peers and subordinates.

Reinforce Desired Behavior

- A direct cause and effect relationship exists between a manager's actions and an employee's behavior
- By controlling consequences, managers can take specific actions to reliably improve performance for the long-term
- Consequences, not directives or threats, reinforce behavior

Reinforce Desired Behavior (Cont.)

Consequences that ***Increase*** Behavior

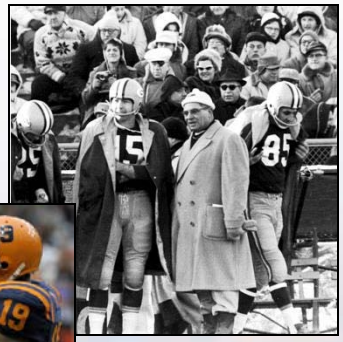


Consequences that ***Decrease*** Behavior

Which is more effective?

Reinforce Desired Behavior (Cont.)

- Provide effective leadership and motivation
- Establish/support culture and key values & beliefs of the organization (implied vs. explicit)
- Establish ***clear*** expectations
- Specify roles and precise behaviors important for task success
  - Solicit input from employees
- Reinforce desired behaviors (role model)
- Monitor and coach staff
- ***Stop*** inappropriate behavior immediately



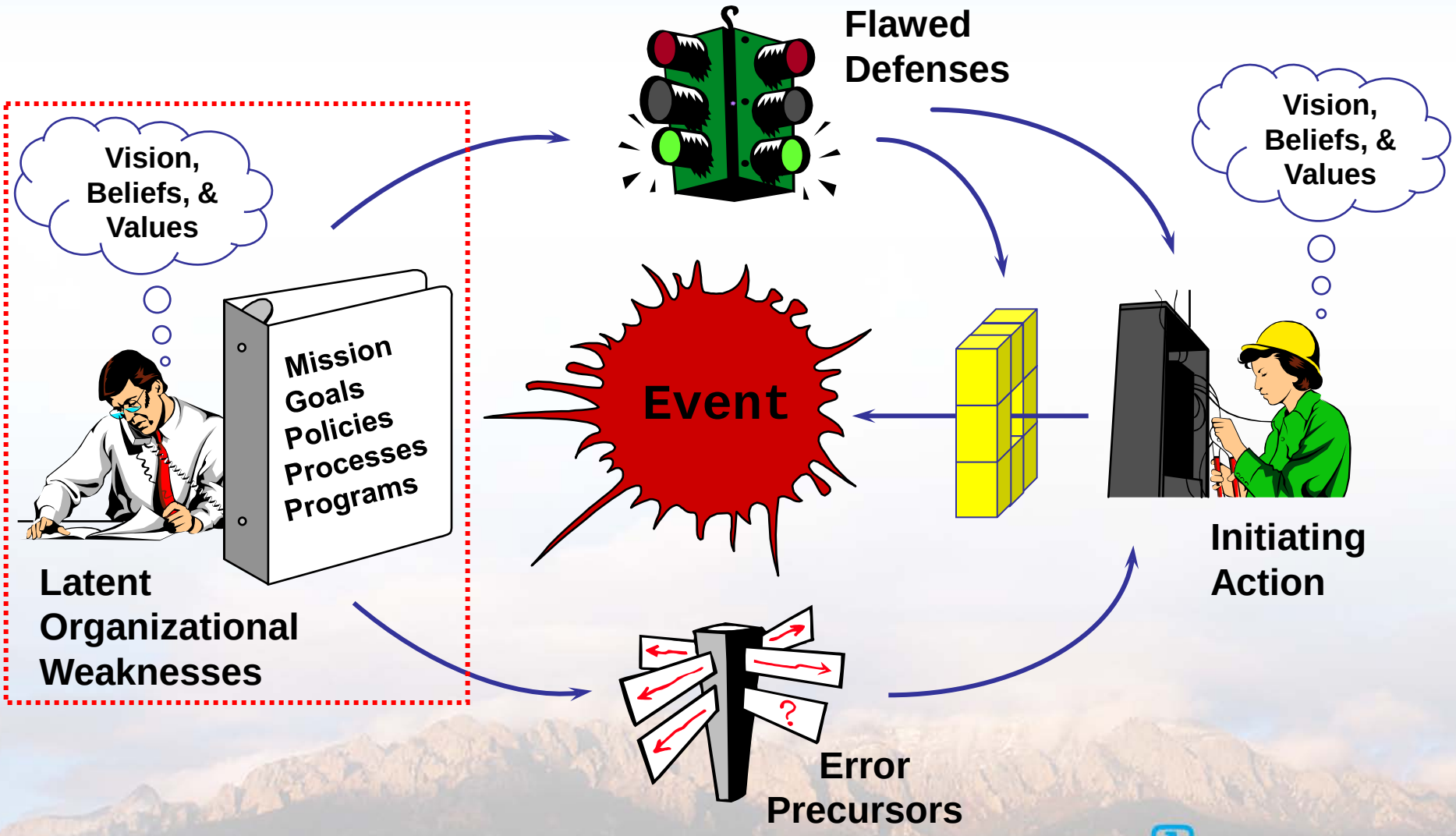
Coaching

- Helps unlock another person's potential to maximize his or her own performance … to self-learn
- Effective coaching helps people become aware of their need for change and to take personal responsibility for taking the appropriate measures to change

Essential Coaching Attributes

- Establish trust and Rapport
- Identify Goals
- Foster Motivation
- Coach by Example
- Change Your Role
- Guide, don’t tell
- Coach, don’t direct

Anatomy of an Event



Managing Human Performance Tools

- Benchmarking
- Observations (Mgmt. Surveillances)
- Self-Assessments
- Trending Key Performance Indicators
- Operating Experience
- Change Management
- Reporting Errors and Near Misses
- Employee Surveys & Questionnaires

Value Prevention of Errors

"If error-free performance (avoiding active errors) is not held up as an important value or is not expected for daily work, then people may adopt unsafe practices to get their work done, possibly placing themselves, others, or the facility at risk of an event."

Human Performance Reference Manual
INPO 06-003

Value Prevention of Errors

Understanding human fallibility encourages a proactive perspective toward work:

- It is easy to err, and a person may not even know it
- Workers should possess a keen - and healthy - sense of ***uneasiness*** toward any activity
  - prompts the mindset: "*expect success but anticipate failure*"
  - fosters ***intolerance for error traps / precursors***

Human Performance

"Workplaces and organizations are easier to manage than the minds of individual workers. You cannot change the human condition, but you can change the conditions under which people work."

- Dr. James Reason

Manage Critical Steps

Critical Step – a step that if omitted or performed incorrectly could result in an irrecoverable act.

- Flag critical steps in work control documents
- Discuss critical steps and defenses at pre-job briefings
- Consider eliminating non-critical steps when practical
- Employ Human Performance tools to ensure critical steps are performed as intended

Leader Practices

that influence values & beliefs

- What leaders pay attention to, measure, and control on a regular basis
- How leaders react to critical incidents and organizational crises
- How leaders allocate resources
- Deliberate role modeling, teaching, and ***COACHING***
- How leaders allocate rewards and status
- How leaders recruit, select, promote, and excommunicate

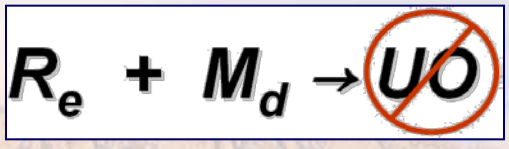
Source: Schein, Edgar H. *Organizational Culture and Leadership,* Josey-Bass, 2004, p246.

What Leaders can do....

- Understand error-provoking factors and human fallibility & vulnerabilities
- Identify error precursors and error-likely situations (for both individuals and teams)
- Identify and *manage Critical Steps* & processes
- Employ appropriate controls & defenses (engineered, administrative, cultural & oversight)
- Establish and monitor supervision, training, and procedures
- Clearly define roles, responsibilities, accountabilities, and authorities

What Leaders can do....

- Manage defenses
  - Periodically review & inspect all defenses to verify integrity and adequacy
    - *Effective vs. ineffective?*
    - *Used vs. bypassed?*
    - *Flawed, broken, or absent?*
  - Strengthen and/or replace defenses as necessary
- Perform periodic management surveillances (*effective* & *value-added*)
- Report all errors and near misses
- Establish a "*Just Work Environment*"



LESSON 6
Creating a Culture of Mindfulness

Lesson 6 Objectives

Participants will be able to….

1. **Describe** a culture of mindfulness.
2. **Discuss** the benefits of a reporting culture.
3. **Discuss** the benefits of a just culture.
4. **Discuss** the benefits of a flexible culture.
5. **Discuss** the benefits of a learning culture.
6. **Describe** a High Reliability Organization.

Elements of a Culture of Mindfulness

A culture that creates and sustains intelligent wariness. To be mindful is to "see more clearly, not to think harder and longer."

Consists of:

1. A **reporting** culture
2. A **learning** culture
3. A **flexible** culture
4. A **just** culture

A Reporting Culture

An organizational climate in which people are prepared to report their errors and near-misses, as well as their achievements and successes.

- Basis of reporting: Valid feedback on local and organizational factors promoting errors and incidents is far more important than assigning blame to individuals.

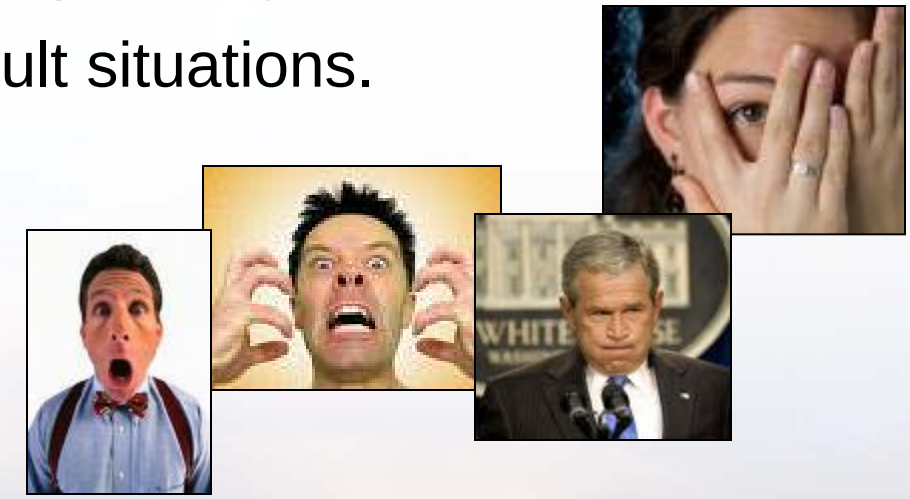
A Reporting Culture (Cont.)

- Success depends upon how the organization handles blame and punishment.
  - Manager/leader reactions directly influence employee willingness to report
- Challenges:
  - Frank confession is not a human strength
  - Disincentives are strong (extra work, fear of reprisal, skepticism, lack of trust)

A Reporting Culture (Cont.)

How to Achieve:

- Clearly communicate reporting expectations.
- Use lessons learned to explain significance.
- Carefully approach difficult situations.



*Reporting sets the stage for becoming a **Learning Culture**.*

A Learning Culture

Facilitates the learning of all its members and consciously transforms itself and its context

- Possess a strong desire to find and fix flaws
- Quickly learn from mistakes
- Aggressively respond to problems
- Appreciate the impact of their actions on others
- Foster inquiry and open dialogue

"Learning disabilities are tragic in children, but fatal in organizations."

Peter Senge, Organizational Theorist

A Flexible Culture

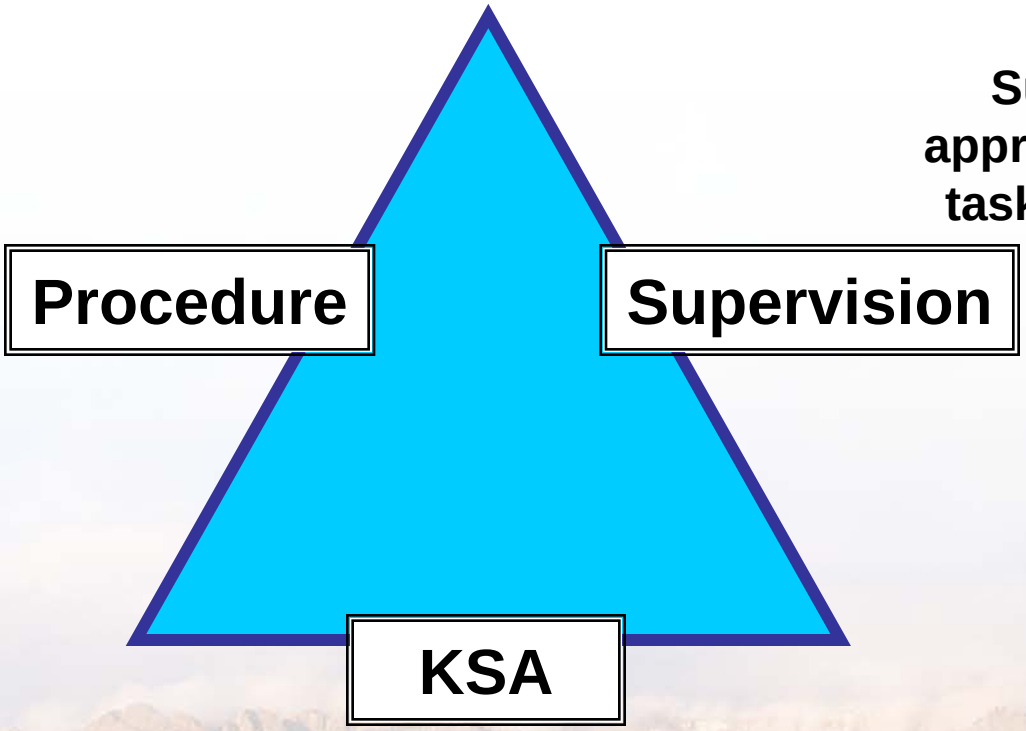
Characterized by the ability to reconfigure in the face of high tempo operations or certain hazards

- Characterized by a constant concern – an intelligent awareness
- Promoted by:
  - Face-to-face communication
  - Divergent work groups
  - A highly trained staff
  - A ***balanced work control system***

A Flexible Culture (Cont.)

A Balanced Work Control System:

Procedure with appropriate level of detail – consistent with importance, complexity, and risk



Supervision appropriate to the task and worker

Knowledge, skill, and ability of the worker

A Just Culture

Atmosphere of trust in which people are encouraged, even rewarded, for providing essential information – and in which they are also clear about where the line is drawn between acceptable and unacceptable behavior.

- It is unacceptable to punish all errors and unsafe acts regardless of origins and circumstances;
- It is equally unacceptable to give blanket immunity from sanctions to all actions that contribute to organizational accidents.

Use of tools like the ***Culpability Decision Tree*** helps in sorting through these two principles

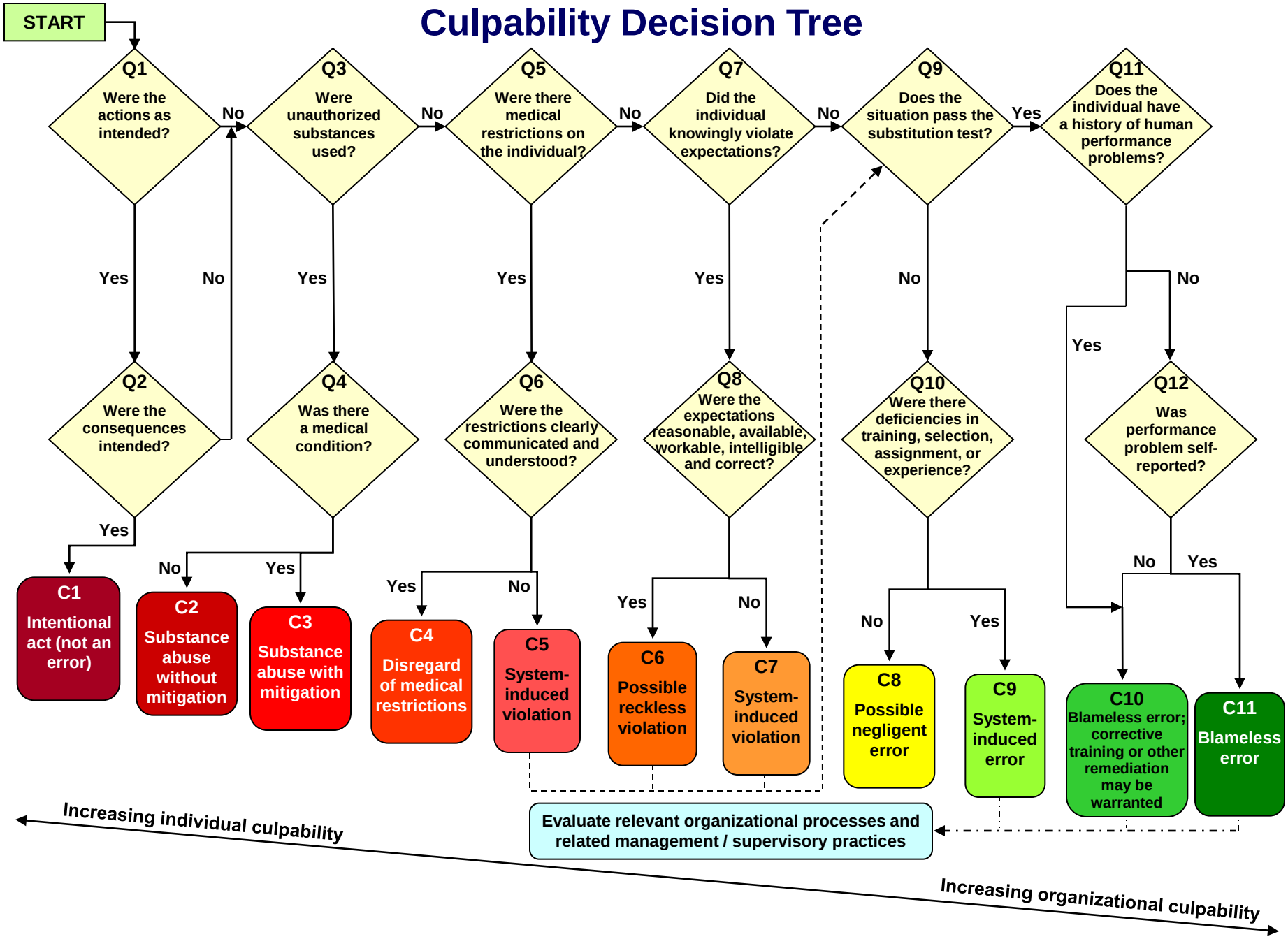
Accountability vs. Culpability

Accountability - accounting for your actions

- If you're truly accountable, you'll punish/blame yourself more than the organization does
- Needed at all levels; everyone plays a role

Culpability - worthy of blame … and punishment

- Should be related to a specific act of non-compliance
- Should ***NOT*** be related to any error.
- Should not punish organizationally-condoned violations unless you punish everyone


START
Culpability Decision Tree
Q1
Were the actions as intended?
Q2
Were the consequences intended?
Q3
Were unauthorized substances used?
Q4
Was there a medical condition?
Q5
Were there medical restrictions on the individual?
Q6
Were the restrictions clearly communicated and understood?
Q7
Did the individual knowingly violate expectations?
Q8
Were the expectations reasonable, available, workable, intelligible and correct?
Q9
Does the situation pass the substitution test?
Q10
Were there deficiencies in training, selection, assignment, or experience?
Q11
Does the individual have a history of human performance problems?
Q12
Was performance problem self-reported?
Yes
No
C1
Intentional act (not an error)
C2
Substance abuse without mitigation
C3
Substance abuse with mitigation
C4
Disregard of medical restrictions
C5
System-induced violation
C6
Possible reckless violation
C7
System-induced violation
C8
Possible negligent error
C9
System-induced error
C10
Blameless error; corrective training or other remediation may be warranted
C11
Blameless error
Evaluate relevant organizational processes and related management / supervisory practices
Increasing individual culpability
Increasing organizational culpability

A Just Culture (Cont.)

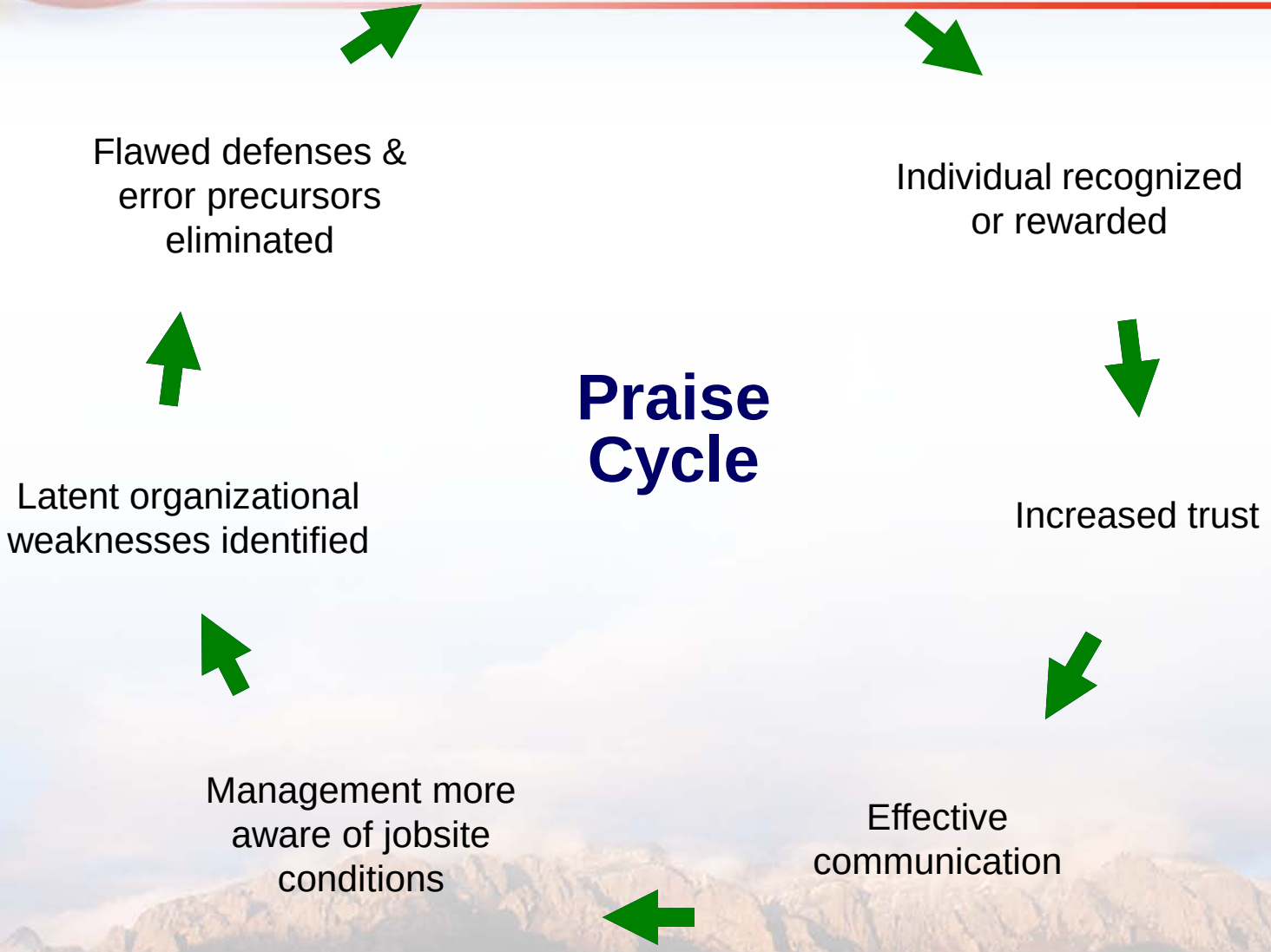
Attributes:

- Defines "***acceptable***" vs. "***unacceptable***" behavior in a consistent manner.
- Recognition of fairness related to the identification and resolution of human performance problems.
- Distinction between honest mistakes and intentional shortcuts, violations, etc. (with respect to discipline).
- Free-flow of facility information across all levels of an organization.
- High level of self-reporting.

Benefits of a Just Culture

- Promotes a reporting and learning culture & honest investigation of true organizational weaknesses
- Provides forward-looking accountability
- Builds Trust … what's said gets done by management
- Ensures respect for the individual
- Instills belief that discipline is fairly administered
- Maintains zero tolerance for harassment/retaliation
- Provides multiple avenues of communication
- Builds confidence in broader organizational cause investigations

Human "Success"



High Reliability Organizations

1. ***Expect the unexpected***
   - ***Healthy uneasiness with potential failure modes***
2. ***Take nothing for granted***
   - ***Questioning is encouraged, status quo is challenged***
3. ***Sensitivity to operations***
   - ***Routinely paying attention to what is going on***
4. ***Commitment to resilience***
   - ***Managing the unexpected when it does occur***
5. ***Maintain deference to expertise***
   - ***Experts are involved when problems arise***

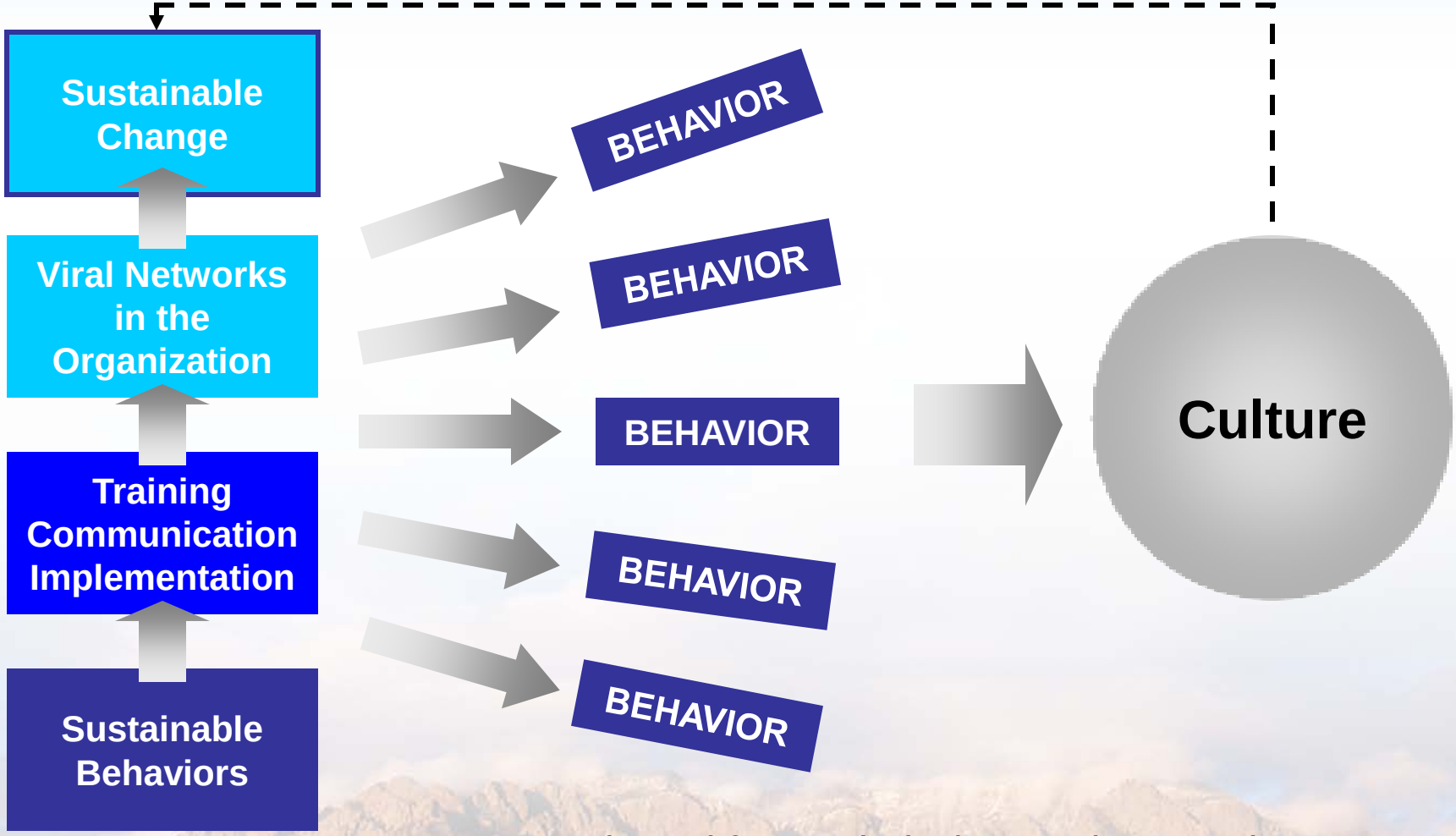
Adapted from “Managing the Unexpected,” by Karl Weick and Kathleen Sutcliffe

Managing Change….

"We trained hard… but it seemed that every time we were beginning to form up in teams we would be reorganized. I was to learn later on in life that we tend to meet any new situation by reorganizing, and a wonderful method it can be for creating the illusion of progress while producing confusion, inefficiency and demoralization."

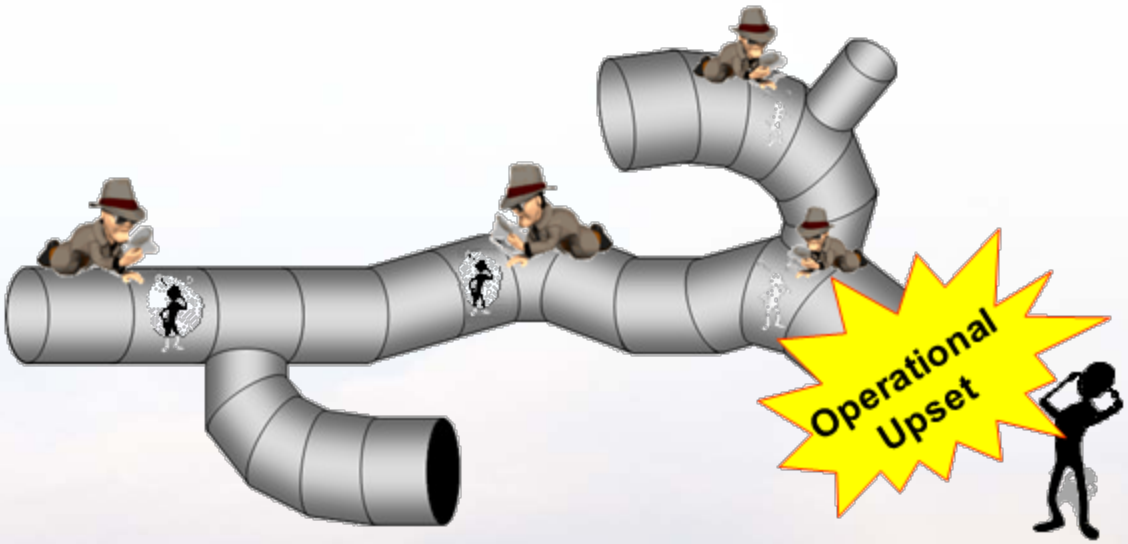
Caius Petronius
AD 65

Viral Change



Adapted from “Viral Change” by Leandro Herrero

LESSON 7
Human Performance in Event Investigations



Lesson 7 Objectives

Participants will be able to….

1. **Discuss** the impact of hindsight bias, micro-matching, cherry-picking, and other prejudices in event investigations.
2. **Describe** the Human Performance Improvement approach to event investigations.

Errors are....

"Errors are for the most part unintentional. It is very hard for management to control what people did not intend to do in the first place."

- Dr. James Reason

Human Error

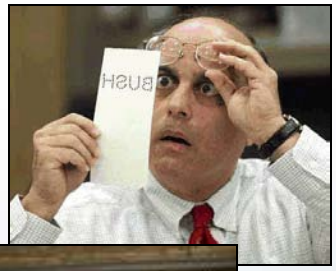
Common Approach to Event Investigations

- Events are caused by shortcomings in humans
  - Incompetence
  - Loss of situational awareness
  - Procedural violation
  - Poor management
  - Inadequate training and/or procedures

- Failures are introduced only through inherent unreliability of people
  - Investigate to find where people went wrong
  - "*Once we can rid ourselves of a few bad performers, everything will be fine. There is nothing wrong with the system.*"

Common Approach to Event Investigations (Cont.)

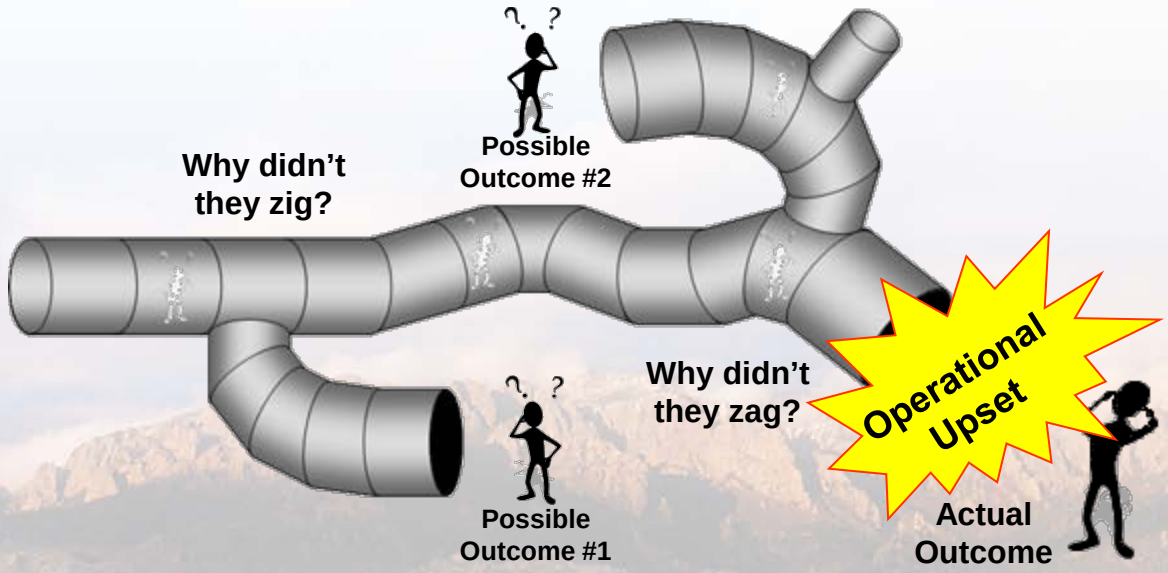
- Unreliable, erratic humans undermine defenses, rules, and regulations
- Explain failure by seeking failure
  - Inaccurate assessments
  - Wrong decisions
  - Bad judgments
  - People didn't care or try hard enough
- Evaluate the actions of people against requirements
- Stop looking when "*human error*" identified as the cause



Common Prejudices in Event Investigations

Hindsight Bias: Judge each critical step in light of the final outcome; reacting to after-the-fact "*knowns*"

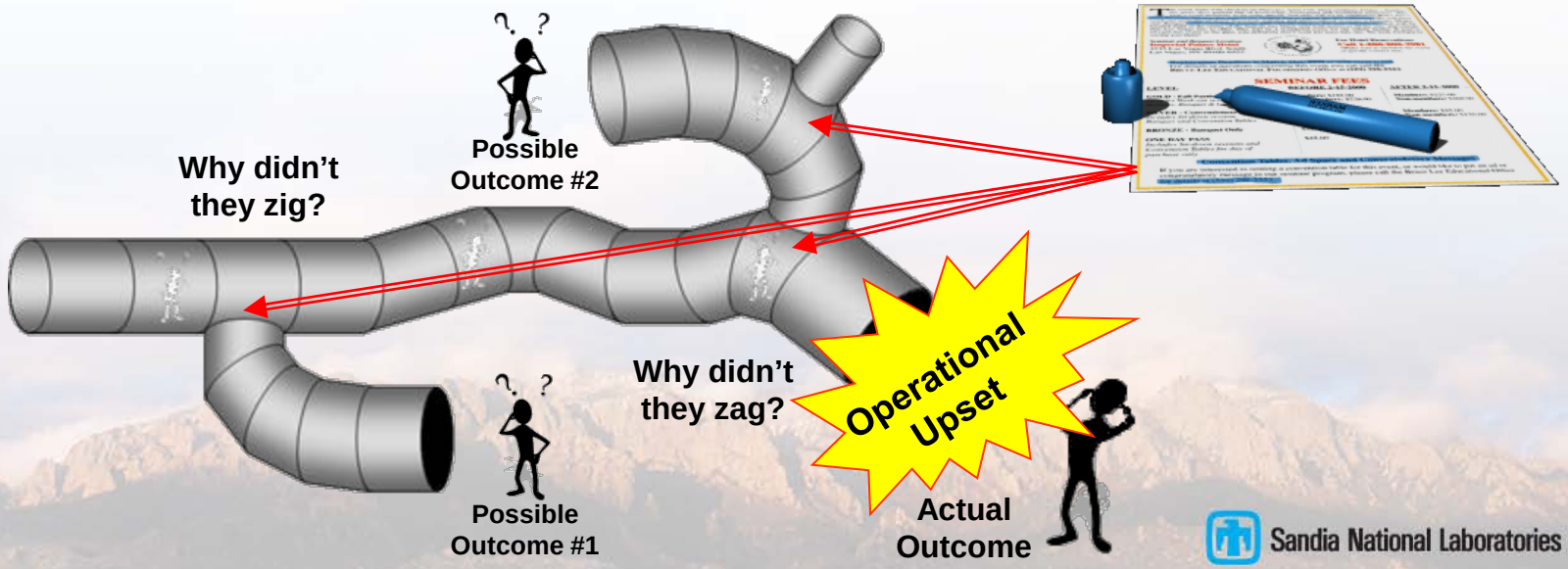
- Focuses on *failures*, *could haves*, *should haves*
- Predisposes the investigator to search for information that confirms the individual's apparent shortcomings



Common Prejudices in Event Investigations (Cont.)

Micro-Matching: Judgmental, easy approach that imposes specific details from procedures, data, and standards onto history

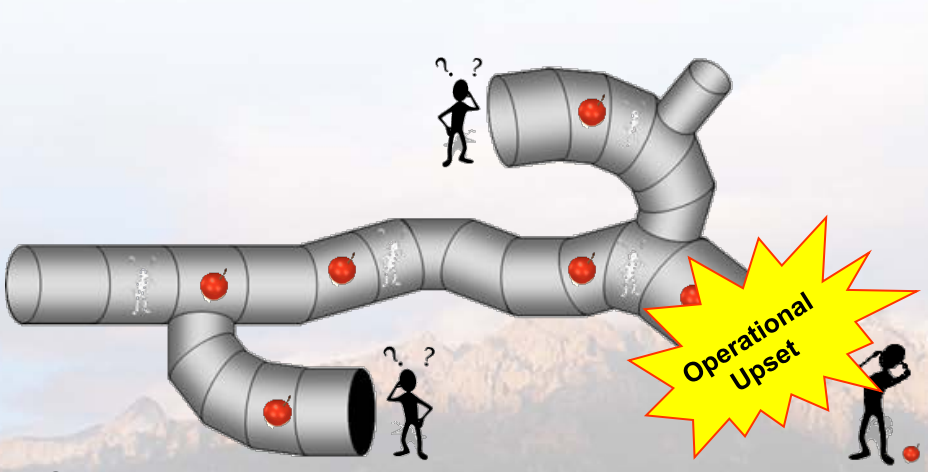
- Expose inconsistencies between rules and behavior
- Typically has little to do with what actually happened

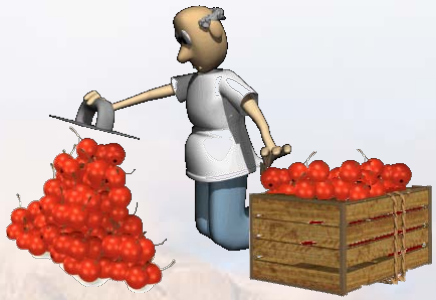


Common Prejudices in Event Investigations (Cont.)

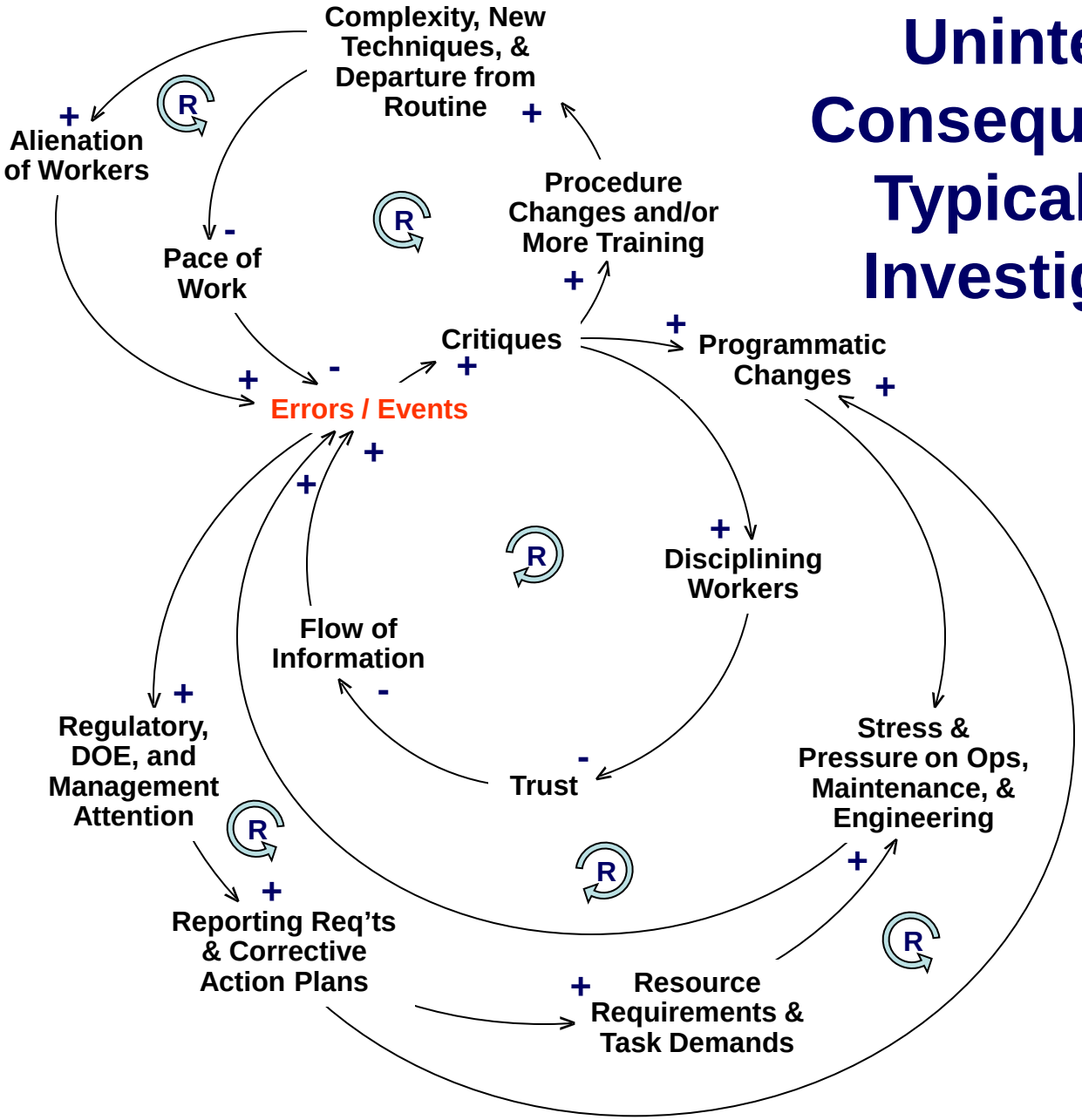
Cherry-Picking: Group fragments that seem to point to a common condition

- Select only pieces that support the "***a priori***" argument
- Each cherry meaningless outside the context
  - In reality, the pieces probably had nothing to do with each other





Unintended Consequences of Typical Event Investigations

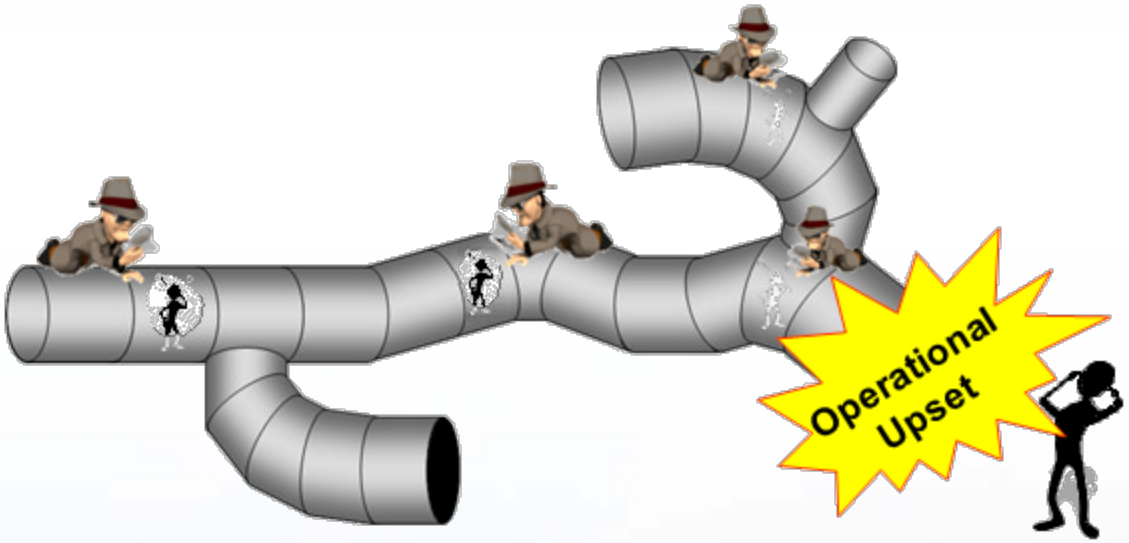


Human Error

"To explain failure, do not try to find where people went wrong. Instead, find how people's assessments and actions made sense at the time, given the circumstances that surrounded them."

- Sidney Dekker
The Field Guide to Human Error investigations

HPI Approach to Event Investigations



See the world from the point of view of people <u>inside</u> the situation – not from outside or hindsight

<u>CONTEXT</u>

Does not justify behavior – it explains it.

HPI Approach to Event Investigations (Cont.)

- Events (e.g., human error) are not random
- Human error is a ***symptom*** of trouble deeper within the system (or organization)
  - Mismatches between task demands and individual capabilities/limitations
  - Error-likely situations
  - Flawed defenses
  - Latent organizational weaknesses
  - Misalignment of processes and values
- Goal should be to prevent recurrence, *not simply to find people to punish*

HPI Approach to Event Investigations (Cont.)

- Human error should be the ***starting point*** of event investigations
- Evaluate the organization as the event unfolds - *from the perspective of the people involved in the event*
- Find how people's assessments, priorities, decisions, and actions made sense at the time

Events will continue as long as event investigations stop prematurely at the active human error. True causes (typically organizational weaknesses) will remain latent/hidden … and errors and events will persist.

Error Management

"Comprehensive error management can, and should, be directed at several different levels of the organization - - the individual and the team, the task, the workplace, and the organizational processes."

- Dr. James Reason
Managing the Risks of Organizational Accidents

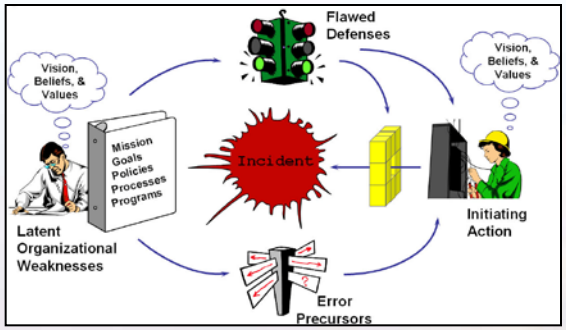
Human Performance Improvement Principle #5

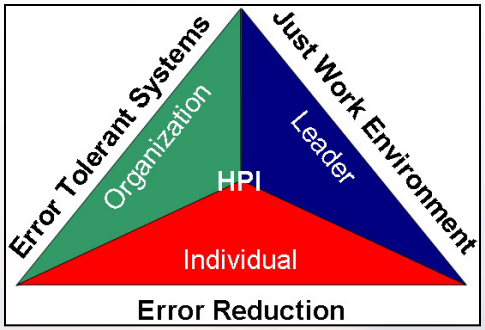
Events can be avoided through an understanding of the reasons mistakes occur and the application of the lessons learned from past events (or errors).

CONCLUSION

$$P = B + R$$

$$R_e + M_d \rightarrow \not{UO}$$





Course Goals

1. To **promote** awareness of how the organization, leadership/management, and individual fallibility impact overall human and facility performance.
2. To **familiarize** Sandia managers with tools, practices, and behaviors that help to align organizational processes and values … to optimize worker performance.

Course Objectives

Participants will be able to….

1. **Improve** individual, leadership, and organizational performance using a coherent, strategic approach.
2. **Understand** how implementation of human performance principles improves productivity, reliability, efficiency, and quality.
3. **Implement** techniques that help to identify and eliminate flawed defenses and latent organizational weaknesses.
4. **Discuss** “culture of mindfulness” and how to achieve it.

Performance Improvement

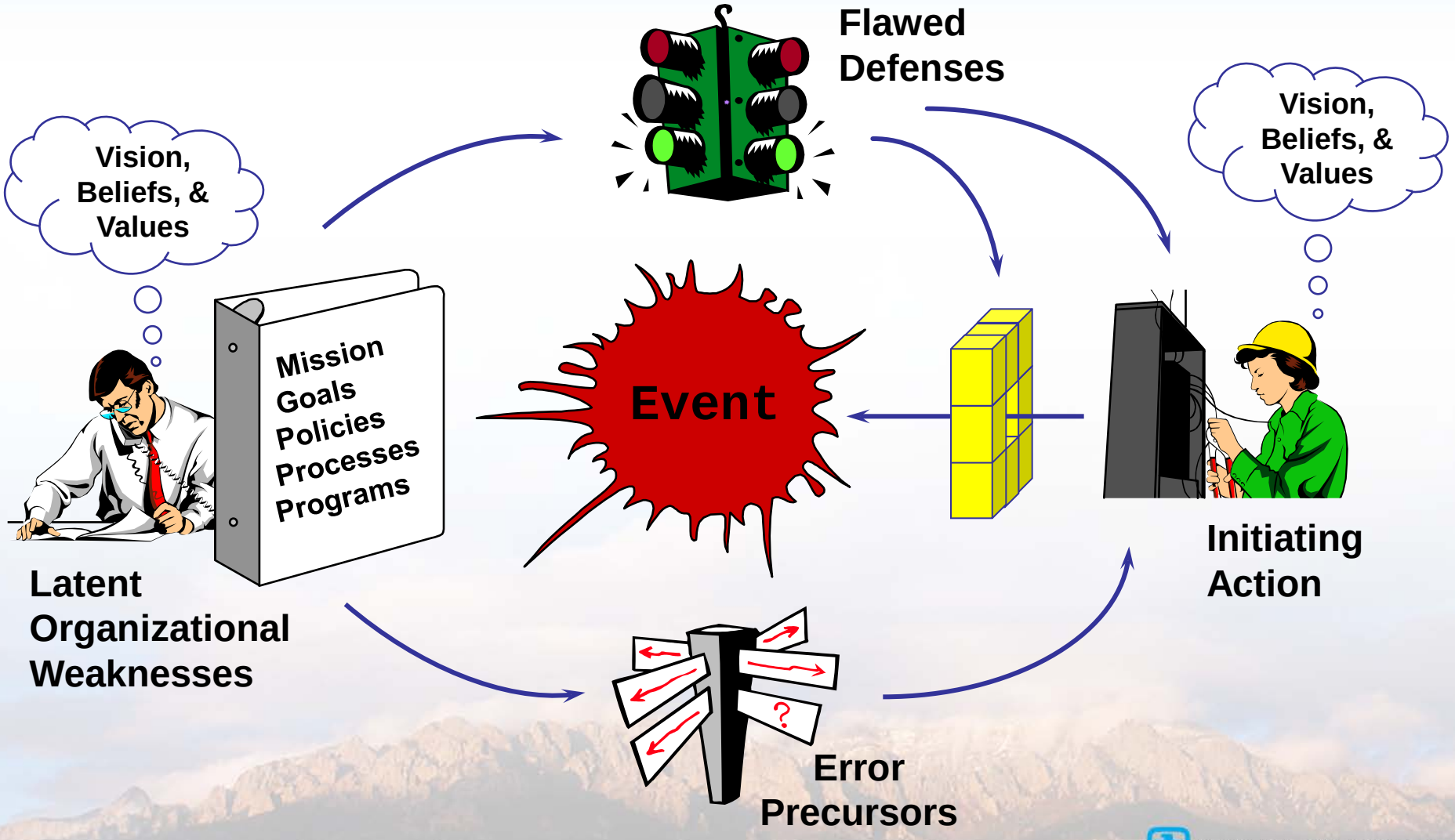
$$P = B + R$$

Performance = Behavior + Results

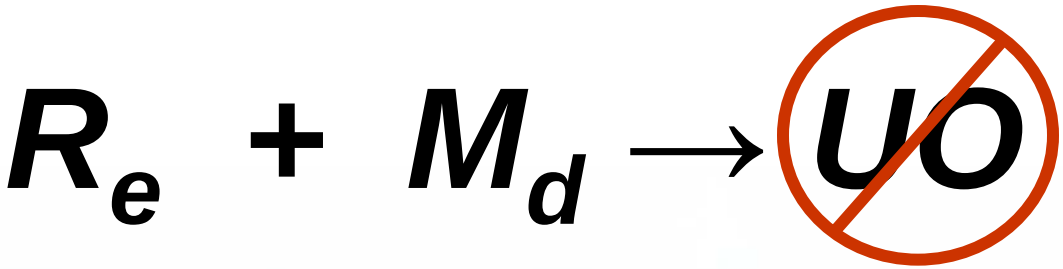
Principles of Human Performance

1. People are fallible - even the best people make mistakes.
2. Error likely situations are predictable, manageable, and preventable.
3. Individual behavior is influenced by organizational processes and values.
4. People achieve high levels of performance largely because of the encouragement and reinforcement received from leaders, peers, and subordinates.
5. Events can be avoided through an understanding of the reasons mistakes occur and the application of the lessons learned from past events (or errors).

Anatomy of an Event



Goal of Human Performance Improvement



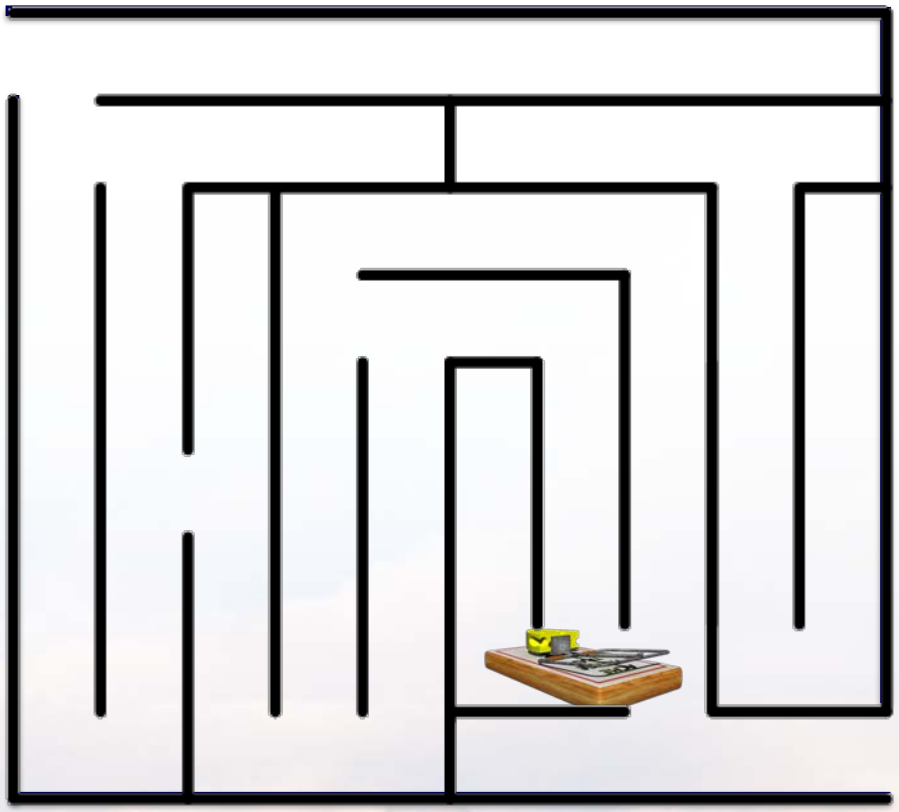
Reducing Error + Managing Defenses → Zero Events
(Unwanted Outcomes)

Anticipate & Prevent Active Error at the Job-site

Confirm Integrity of Defenses and Identify/Eliminate Latent Organizational Weaknesses

How to Improve Human Performance

Individual



Organization

Incentives to meet leader's expectations

HPI200 Course References

- *The Field Guide to Understanding Human Error*, Sidney Dekker
- *Managing the Unexpected*, Karl Weick & Kathleen Sutcliffe
- *Viral Change*, Leandro Herrero
- *Mindfulness,* Ellen Langer
- *Managing the Risks of Organizational Accidents*, James Reason
- *Organizational Culture and Leadership,* Edgar Schein
- *The Human Contribution,* James Reason
- *Human Performance Fundamentals – Course Reference*, Institute of Nuclear Power Operations (INPO)
- *Human Performance Improvement Handbook (Draft Standard)*, U.S. Dept. of Energy

HPI200 Course References (cont.)

- *The Human Contribution,* James Reason
- *Bringing Out the Best in People*, Aubrey Daniels
- *The Atomic Chef,* Steven Casey
- *Set Phasers on Stun*, Steven Casey
- *The Fifth Discipline,* Peter Senge
- *Crucial Conversations,* VitalSmarts™
- *Crucial Confrontations,* VitalSmarts™
- *Influencer,* VitalSmarts™
- *The Black Swan,* Nassim Nicholas Taleb
- *A Field Guide to Good Decisions*, Bennett and Gibson

NOTE: The Human Performance Improvement SharePoint website is located:

https://sharepoint.sandia.gov/sites/HumanPerformance/default.aspx