Tutorial
Session 4b: Human Performance and Organizational Resilience

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Human Performance and Organizational Resilience--Introduction

Presenters

– Ron Farris
  • 8 yrs Nuclear Navy
  • 20+ yrs
    – ANLW—EBRII 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, Berkeley
  - 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 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**

- Preoccupation with Failure
- Reluctance to simplify interpretations
- Sensitivity to Operations
- Commitment to Resilience
- Deference to Expertise

**Mindfulness**

- Capability to Discover & Manage Unexpected Events

**Reliable Operations**

HRO, Managing the Unexpected
Mindfulness Contributes to High Reliability

Processes

1. Preoccupation with Failure
2. Reluctance to simplify interpretations
3. Sensitivity to Operations
4. Commitment to Resilience
5. Deference to Expertise

Pre---Anticipation and Prevention

Mindfulness

Capability to Discover & Manage Unexpected Events

Reliable Operations

Post---Resilience and Recovery

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

_HRO, Managing the Unexpected_
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
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 = Human Performance

Dr. James Reason
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?

- 80% Human Error
- 20% Equipment Failures

Human Errors

- 70% Latent Organization Weaknesses
- 30% Individual

Occurrences

Regular, Preventative & Corrective Maintenance Surveillances, Inspections & Audits

DOE, Center for Human Performance
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

DOE, Center for Human Performance
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
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.
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

DOE, Center for Human Performance
Breached or Flawed Defenses

What other “pieces of cheese” can you think of?

Reason, J. BMJ 2000;320:768-770
Anatomy of an Event

Vision, Beliefs, & Values

Mission Goals Policies Processes Procedures

Latent Failures

Flawed Defenses

Error Precursors

Active Error

Vision, Beliefs, & Values

DOE, Center for Human Performance
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.

Managing Maintenance Errors
James Reason
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
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

DOE, Center for 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.

Sydney Dekker, 2006
Organization Drift – So What?

Incremental Drift

Level of Danger

Danger level is always changing

Event

Standards/Expectations

Time

Sydney Dekker, 2006
Counteracting Organization Drift

- Incremental Drift
- Standards/Expectations
- Margin of safety much larger
- Observation & Feedback
- Reduce Danger by Addressing Latent Errors (i.e. self assessments etc.)

Level of Danger

Time

Ron Farris, 2008
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.

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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?

DOE, Center for Human Performance
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?”

DOE, Center for Human Performance
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

“Maybe we should try this…”
“Chill out… I know what I’m doing”
“We’ve always done it this way…”
“We have to get this done now…”
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

DOE, Center for Human Performance
## Sources of Latent Failures

<table>
<thead>
<tr>
<th>Processes (structure)</th>
<th>Values (relationships)</th>
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<tbody>
<tr>
<td>Work control</td>
<td>Priorities</td>
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<tr>
<td>Training</td>
<td>Measures &amp; controls</td>
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<td>Accountability policy</td>
<td>Critical incidents</td>
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<td>Reviews &amp; approvals</td>
<td>Coaching &amp; teamwork</td>
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<td>Equipment design</td>
<td>Rewards &amp; sanctions</td>
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<tr>
<td>Procedure development</td>
<td>Reinforcement</td>
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<tr>
<td>Staffing</td>
<td>Promotions &amp; terminations</td>
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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?

HRO, Managing the Unexpected
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.

HRO, Managing the Unexpected
Human Performance References

"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
## Contact Information

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<thead>
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