High Reliability: Putting Culture to Work

March 2013
Atlanta, Georgia
NERC’s “Improving Human Performance on the Grid”

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“The Best Damn Rescue in Texas”
What if we can’t wait 223 years?
Influencing Behaviors “at the Sharp End”

Influencing Behaviors “at the Sharp End”

Design of Structure

Design of Policy & Protocol

Design of Culture

Design of Work Processes

Design of Technology & Environment

Behaviors of Individuals & Groups

Outcomes

“Tribal wisdom” --- problems are 20% “individual” and 80% “system”

## Issues Are Individual *and* System

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<td>Environment, Systems, and Resources</td>
<td>26%</td>
<td>29%</td>
</tr>
<tr>
<td>Expectations &amp; Feedback</td>
<td>35%</td>
<td>26%</td>
</tr>
<tr>
<td>Rewards, Recognition, &amp; Consequences</td>
<td>14%</td>
<td>11%</td>
</tr>
<tr>
<td><strong>System Issues</strong></td>
<td><strong>75%</strong></td>
<td><strong>66%</strong></td>
</tr>
<tr>
<td>Capacity &amp; Selection</td>
<td>8%</td>
<td>1%</td>
</tr>
<tr>
<td>Skills &amp; Knowledge</td>
<td>11%</td>
<td>33%</td>
</tr>
<tr>
<td>Motivation &amp; Preferences</td>
<td>6%</td>
<td>0%</td>
</tr>
<tr>
<td><strong>People issues</strong></td>
<td><strong>25%</strong></td>
<td><strong>34%</strong></td>
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* USCG Performance Technology Center study of 118 performance analyses over 12 years and results compared / averaged via three separate evaluation systems – Tom Gilbert, Joe Harless, and Carl Binder.
Human Performance Improvement

Achievable Improvement Curve

Apparent increase due to better event / problem reporting and improved RCA

± 50% reduction in serious preventable events and a reduction in event severity in about 18 months

± 80% reduction in serious preventable events as a result full implementation

Potential increase due to complacency or reverting to old habits

Long-term improvement through sustained behaviors (± 50% every three years)
The challenge: Reduce TVA’s significant event rate to meet safety, performance, and cost goals.

Human Performance Improvement results FY04–FY 12 for the TVA non-nuclear fleet of 123 units (29 hydroelectric, 11 fossil fueled, 83 natural gas). Source: “TVA Focus on Results”, J. Patrick O’Neil, NERC HPI Conference 2012, Atlanta, GA.
All-Hands Understanding to Support Reliability

• The nature of human error
• The “anatomy” of an event (in context)
• Precursor events and near misses
• Achievable results (in context)
• The impact of culture on safety
• Skill-, Rule-, and Knowledge-based error
• Error prevention tools and strategies
• Off the job applicability to day-to-day life
More Rules or More Tools?
**“All-Hands” Behaviors to Support Reliability**

Error prevention strategies for use by every person “when indicated”

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<td><strong>Speak Up for Safety</strong></td>
<td>1. Speak Up using ARCC</td>
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<td>2. Pre-Task Briefings (esp. complex / infrequent)</td>
</tr>
<tr>
<td></td>
<td>3. Post-Task Review</td>
</tr>
<tr>
<td></td>
<td>4. Questioning Attitude (Stop and Resolve, Qualify / Validate / Verify)</td>
</tr>
<tr>
<td></td>
<td>5. Clarifying Questions</td>
</tr>
<tr>
<td><strong>Pay Attention to Detail</strong></td>
<td>1. Self-Checking using STAR</td>
</tr>
<tr>
<td></td>
<td>2. Protocol and Checklist Use</td>
</tr>
<tr>
<td><strong>Look Out for Each Other</strong></td>
<td>1. Peer Checking</td>
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<tr>
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<td>2. Peer Coaching using 5:1 Feedback</td>
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<td><strong>Communicate Effectively</strong></td>
<td>1. Three-Way Repeat Back / Read Back</td>
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<td></td>
<td>2. Handoffs using SBAR</td>
</tr>
<tr>
<td></td>
<td>3. Phonetic Clarification</td>
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<td>4. Numeric Clarification</td>
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Leader Understanding to Support Reliability

- Reliability science and the nature of human error
- The “anatomy” of an event
- The impact of culture on safety
- Culture embedding mechanisms
- Common barriers to communication
- The “drivers” of accountability
- Basics of RCA, ACA, and CCA
## The Science of Human Error

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<tr>
<th>Performance Mode</th>
<th>Error Type</th>
<th>Behavior Themes for Error Prevention</th>
<th>System Themes for Error Prevention</th>
</tr>
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<tbody>
<tr>
<td><strong>Skill-Based</strong></td>
<td>Slip (execution)</td>
<td>Self-checking</td>
<td>Automation, error proofing</td>
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<tr>
<td>“Autopilot” - Routine acts performed in familiar environments using learned skills.</td>
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<td></td>
<td></td>
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<tr>
<td>75% of errors, takes less than a second.</td>
<td>Lapse (forgetting)</td>
<td>Peer-checking</td>
<td>Checklists, visual cues</td>
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<td><strong>Rule-Based</strong></td>
<td>Fumble (motor skills)</td>
<td>Visualization</td>
<td>Automation, error proofing</td>
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<td>“Expert problem solving and decision making” - conscious choices based upon education or experience.</td>
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<td></td>
<td></td>
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<td>± 60% of errors, takes less than a second.</td>
<td>Wrong rule</td>
<td>Questioning attitude</td>
<td>Protocol, checklist</td>
</tr>
<tr>
<td><strong>Knowledge-Based</strong></td>
<td>Misapplication</td>
<td>Questioning attitude</td>
<td>Collegial teamwork</td>
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<td>“Figuring it out” -- Conscious choices where no rules exist or are unknown to the user.</td>
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<td>± 15% of errors, takes forever.</td>
<td>Non-compliance</td>
<td>Intelligent compliance with expectations</td>
<td>Process/protocol simplification, forcing functions</td>
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<td>**<strong>Decision-making</strong></td>
<td>Decision-making</td>
<td>Stop when unsure</td>
<td>Collegial teamwork</td>
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<td><strong>Problem solving</strong></td>
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Based on Jens Rasmussen’s “S/R/K Model” and James Reason’s “Generic Error Modeling System”
Defense in Depth

Adapted from James Reason’s “Swiss cheese” model of system failure.
Defense in Depth

Adapted from James Reason’s “Swiss cheese” model of system failure.

Event

Dependability

Engineered Safety Systems
Personal Protective Equipment
Interlocks / Forcing Functions
Policy & Procedures
Supervision
Training

Triggering Actions / Active Errors
Defenses promote an appropriate action or condition.

Defenses prevent / detect / correct / compensate for an inappropriate action or condition.

Adapted from James Reason's “Swiss cheese” model of system failure.
“No Interruption Zone”
Accountability System Effectiveness

- Instant Feedback & Constant Reinforcement
- Strong Reward Systems
- Strong Punishment Systems

Human Error Rate
## Culture Embedding Mechanisms

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<th>Primary Embedding Mechanisms</th>
<th>Secondary Articulation &amp; Reinforcement Mechanisms</th>
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<td>• What leaders pay attention to, operationalize, measure, and control on a regular basis</td>
<td>• Organizational design and structure</td>
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<td>• How leaders react to critical incidents and organizational crises</td>
<td>• Organizational systems and procedures</td>
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<tr>
<td>• Observed criteria by which leaders allocate scarce resources</td>
<td>• Organizational rites and rituals</td>
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<td>• Deliberate role modeling, teaching, and coaching</td>
<td>• Design of physical space, facades, and buildings</td>
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<td>• Observed criteria by which leaders allocate rewards and status</td>
<td>• Stories, legends, and myths about people and events</td>
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<td>• Observed criteria by which leaders recruit, select, promote, retire, and excommunicate organizational members</td>
<td>• Formal statements of organizational philosophy, values, and creed</td>
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From *Organizational Culture & Leadership*, by Edgar Schein
A Barrier to Communication

Geert Hofstede’s Power Distance

- Extent to which the less powerful expect and accept that power is distributed unequally
- Leads to the *perception* of authority as perceived by the subordinate

“Power distance has its place, but you don’t have to weaponize it.”

From Geert Hofstede’s “Cultural Dimensions” theory
The Drivers of Accountability

**Individual**
- Integrate into hiring criteria
- Integrate into performance appraisals

**Peers**
- Safety Success Stories
- Safety Coaches
- Peer checking & coaching
- Integrate into preceptor and mentoring programs

**Leaders**
- Integrate into vision / mission
- Align goals, metrics, incentives
- Rounding to observe and coach
- Find and fix system problems

**Optimal**
Root Cause Analysis / Common Cause Analysis
Identifying “insufficient or inappropriate actions” based upon available data

- Professional Groups
- Key Processes/Activities
- Human Error Types
- Error Precursors
- Individual failure mode
- System failure modes
- Barrier Analysis -- Generic & Process

Shift learning to lesser events and near misses to detect and correct root causes *before* they result in significant events.
Root Cause Mentality

• An insatiable desire to understand why things go wrong, why people do what they do, and how things got into their present state
• A reluctance to blame
• A desire to understand

“You don’t really understand the event until you know why the action made sense to the person at the time.”
It *is* what you say . . .

“You made a mistake and I’m here to investigate the event.”
It is what you say . . .

“You made a mistake and I’m here to investigate the event.”

vs.

“You experienced an error and I’m here to analyze the event and try to make sure it doesn’t happen to someone else.”
“Inappropriate Actions”

• Was there a deviation from an expected behavior?

• If so, write a brief description of each and every inappropriate action:
  
  Professional Group DID / DID NOT . . . .
  BECAUSE . . .
  AND . . . .

• Helps to surface skill / rule / knowledge
• Helps to surface latent system issues
• Walk each inappropriate action through your performance / culpability matrix
Root Cause Mentality -- Process Analysis

Adapted from James Reason’s “Swiss cheese” model of system failure.
Root Cause Mentality -- Barrier Analysis

Adapted from James Reason’s “Swiss cheese” model of system failure.
Leader Behaviors to Support Reliability

ALL of the “All Hands” error prevention strategies, PLUS . . .

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Daily Check-In

- High value, low impact
- Every day, ideally 24/7/365
- Led by a senior leader
- Mandatory attendance, every unit/division/department
- On your feet, maximum 15 minutes
- Focused, report by exception format:

  "No events, no concerns, no needs, end of report."

- Improved awareness of the status of front line ops
- More timely recognition and resolution of problems
- Aligns and focuses the leadership team around operational issues
## Leaders in the Field

<table>
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<tr>
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<th>Rounding To Influence</th>
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<tr>
<td><strong>Sensitivity to Operations Threshold</strong></td>
<td>Low - Moderate <em>How do your shoes feel?</em></td>
<td>Low - Moderate <em>Shine your shoes</em></td>
<td>Moderate <em>Take a few steps in their shoes</em></td>
<td>High <em>Walk a mile in their shoes</em></td>
</tr>
<tr>
<td><strong>Time</strong></td>
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<td>5 to 10 minutes</td>
<td>&gt; 30 minutes</td>
<td>Recurring, in-depth</td>
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<tr>
<td><strong>Theme</strong></td>
<td>General awareness</td>
<td>Specific focus</td>
<td>Blunt end to sharp end translation of expectations</td>
<td>Practical knowledge and experience of unit work</td>
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| **Purpose**   | • Identify problems that need to be fixed  
• Build relationships | • Influence a specific behavior expectation  
• Identify problems impacting a specific performance expectation | • *Empathy* for sharp end realities  
• Identify performance deviations and conditions impacting performance that need remediation | • *Sympathy* for sharp end realities  
• Identify performance deviations and conditions impacting performance that need remediation |
| **Implementing Detail** | Global questions | Targeted questions | Observation of behaviors and environment | Participation in work and work life |
| **Location**  | Work environment or other | Work environment or other | Work environment | Work environment           |
# Leaders in the Field

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Rounding to Influence

Four steps:
1. Establish reliability/safety as a core value
2. What it is / Why we do it
3. How we do it
4. Get commitment to use the tool or concept when appropriate
**Leader Behaviors to Support Reliability**

ALL of the “All Hands” error prevention strategies, *PLUS...*

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What's Next?

- Collegial Interactive Teams
- Strong Culture
- Error Prevention
- Critical Thinking
Leader Understanding – The elements of Collegial Interactive Teams

Situational Awareness
- Sensitivity to Operations
- Preoccupation with Failure

Communication
under Stress

Leadership
Deference to Expertise

Decision Making
Reluctance to Simplify

Reliable Performance
In High-Risk Situations

Assertiveness
under Stress

Adaptability
Commitment to Resilience

Resource Management
Task Allocation
Tools supporting CIT promote:

- **Thinking** – preventing misjudgment and decision-making errors
- **Thinking Together** – anticipating and managing the unexpected while preventing group-think
- **Resiliency** – recognizing the team is off the success path and getting back on a path

Most effective in training of natural work teams in simulation. Simulation – “An activity that mimics reality for education, research, and improving performance”
Behaviors to Support Collegial Interactive Teams

**Lead the Team**
- Take the Lead
- Assign Roles

**Maintain Situational Awareness**
- Call Outs
- Cross Monitor

**Communicate Clearly**
- 3-way Comms
- Call Outs

**Think Critically**
- Questioning Attitude (QVV, Stop & Resolve)
- Decision-Making (STEP)
Making Reliability a Reality -- Exercising Collegial Interactive Teams

- Fine-tune a critical process
- Tools for error prevention
- Tools for collegial interactive teams
- Tones to reduce power distance

Test using *in situ* simulation

*in situ*, Latin for “in position”, means to examine the phenomenon exactly in the place where it occurs.
Complimentary Strategies

Competing Priorities
- Competing priority #1
- Competing priority #2
- Competing priority #3
- Competing priority #4
- Competing priority #5
- Ad infinitum . . .
Complimentary Strategies

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Horizontal Interventions
- Behavior expectations for human error prevention
- High Reliability Principles and Accountability Systems
Complimentary Strategies

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Horizontal Interventions
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Reliability
“Performed as intended, consistently, over time”

All Hands Tools and Expectations
Leader Tools and Expectations
Consistency of Culture

Safety
Regulatory Compliance
Technical Excellence
Customer Satisfaction
Employee Satisfaction
Stakeholder Satisfaction
Financial Sustainability
Consistency of Culture

Reliability

Safety
Regulatory Compliance
Technical Excellence
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“Performed as intended, consistently, over time”
Achievable Improvement Curve

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- ±50% reduction in serious preventable events and a reduction in event severity
- ±80% reduction in serious preventable events as a result of full implementation
- Potential increase due to complacency or reverting to old habits
- Long-term improvement through sustained behaviors (±50% every three years)

Significant Events

Start of Reliability Culture Change

Time
TVA Human Performance Event Costs

The challenge: Reduce TVA’s significant event rate to meet safety, performance, and cost goals

Human Performance Improvement results FY04–FY 12 for the TVA non-nuclear fleet of 123 units (29 hydroelectric, 11 fossil fueled, 83 natural gas). Source: “TVA Focus on Results”, J. Patrick O’Neil, NERC HPI Conference 2012, Atlanta, GA.
“When you catch problems before they grow bigger, you have more possible solutions.” – Dr. Todd Conklin

“High reliability is not a program, it’s an operational framework that encompasses all programs – safety, operations, reliability, quality, maintenance, and support.” – Dr. Kathleen Sutcliffe
Questions?

James Morrison, CPT
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