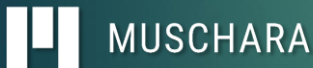


Risk-Based Thinking (RBT): A Fundamental First Principle

Tony Muschara, CPT



The Certified Performance Technologist (CPT) designation is awarded by the International Society for Performance Improvement (ISPI) to experienced practitioners in the field of organizational performance improvement whose work meets both the performance-based Standards of Performance Technology and application requirements.



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Event*

Harm to one or more assets (people, product, or property) due to an uncontrolled:

- ▶ *transfer of **Energy*** (various forms)
- ▶ *transport of **Mass*** (solids | liquids | gasses)
- ▶ *transmission of **Information*** (data, software, signals)

Safety: Asset's freedom from *unacceptable* risk of harm[#]

Resilience: The ability to succeed under *varying* conditions^β

* Adapted from Perrow, C. (1999), *Normal Accidents*, p.66.

Reason, J. (1997), *Managing the Risks of Organizational Accidents*, p.107.

β Hollnagel, E., et al. (Eds.) (2013), *Resilience Engineering In Practice*, p.277.



Video: Angel's Landing

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Key Points to Remember!!!

1. Top performers naturally practice **RBT**:
 - ▶ Anticipate
 - ▶ Monitor
 - ▶ Respond
 - ▶ Learn
2. Workers create safety by *adapting*, which is prompt **RBT** – preservation of defenses.
3. **RBT** is triggered by creation of *pathways*.
4. *Chronic uneasiness* is aware of:
 - ▶ Transfers of energy
 - ▶ Movements of mass
 - ▶ Transmissions of information
5. Technical *Expertise* is the bedrock for **RBT**.

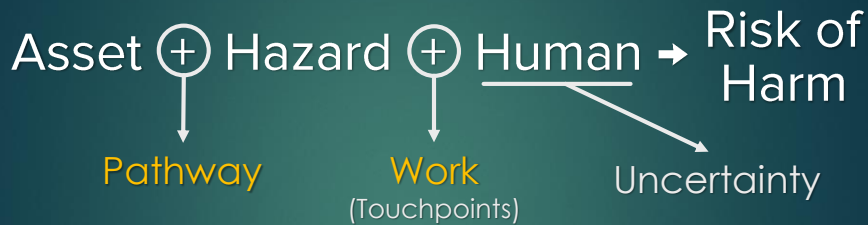
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Workplace Realities

- ▶ Market Place – competition, various demands, many implicit, pressures, and resource constraints, goal conflicts: faster, better, cheaper, & safer
- ▶ Residual Risks – intrinsic hazards, dynamic, human fallibility (3-4 errors per hour)
- ▶ Error traps – local factors that provoke error, uncertainty, complexity, surprises, etc.
- ▶ Overconfidence in the System: underspecified design, procedures, resources, training, etc.
- ▶ Land mines – hidden sources of energy, mass, and information that could cause harm to assets; configuration
- ▶ Defenses – missing, faulty, and sometimes bypassed

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Risk in Human Performance

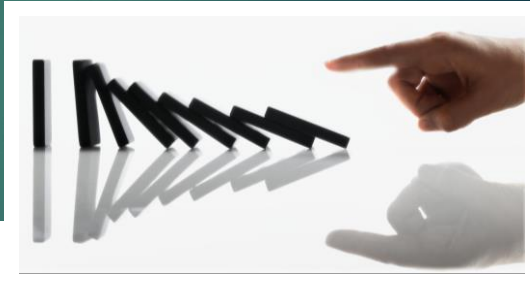


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TouchPoint

A human interaction with an object (asset) that changes the state of that object through work



Work ($f \cdot d$) involving:

- Transfers of **Energy**
- Movements of **Mass**
- Transmissions of **Information**

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Defenses: Protecting Assets (examples)

TouchPoints

Controls (guide behavior):

- ▶ Procedures
- ▶ Supervisions
- ▶ Signs, labels, and banners
- ▶ Alarms
- ▶ Expertise
- ▶ Good Operating Practices
- ▶ Hu Tools

Pathways

▶ Barriers (limit or impede):

- ▶ Lock Out/Tag Out (LOTO)
- ▶ Hard hat/Ear plugs/Gloves
- ▶ Passwords
- ▶ Machine guards
- ▶ Arc flash clothing

▶ Safeguards (mitigate):

- ▶ Sprinkler systems
- ▶ EMS
- ▶ Eye wash station

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Workers Create Safety*

- ▶ Adjustments: responses to incomplete or inaccurate plans, procedures, policies, design, etc. in order to protect key assets during work
- ▶ Expertise: bedrock of risk-based thinking; in-depth technical know-how tempered with experience; knowledge of assets' limitations
- ▶ Chronic uneasiness: mindfulness of fallibility, uncertainty, and potential sources of harm to assets in the workplace

* Reason, J. (2008), *The Human Contribution*, and Woods, D. et al. (2010), *Beyond Human Error*, 2nd ed., pp.10-11.

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Risk-Based Thinking*

Fundamental First Principle

- ▶ **A**nticipate – know what to expect
- ▶ **M**onitor – know what to pay attention to
- ▶ **R**espond – know what to do
- ▶ **L**earn – know:
 - ▶ what has happened (past)
 - ▶ what is happening (present)
 - ▶ what to change (future)



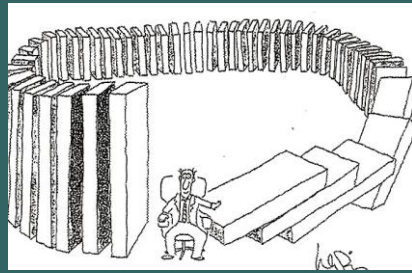
* Source: Hollnagel, et al., *Resilience Engineering*, (2006), p.350, and *Resilience Engineering Perspectives*, Vol. 2, (2009), pp.117-133.

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Anticipate

AMRL

- ▶ **Know what to expect:** assets / hazards
- ▶ Accomplishments: value additions (planned)
- ▶ Inherent risks:
 - ▶ Transfers of energy
 - ▶ Movements of mass
 - ▶ Transmissions of information
- ▶ What if...?



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Monitor

AMRL

- ▶ **Know what to pay attention to:** TouchPoints
- ▶ TouchPoints: human actions that change the state of an asset through work ($W=fxd$)
- ▶ Critical steps and Risk-Important Actions
- ▶ Critical parameters: safety and quality
- ▶ Situation awareness
- ▶ Operational oversight

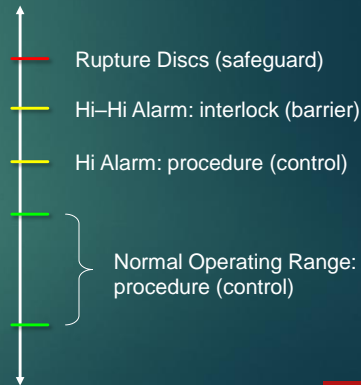


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Respond

AMRL

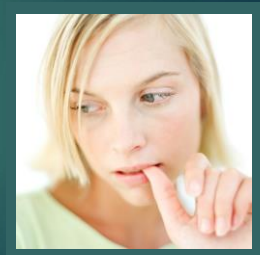
- ▶ **Know what to Do:** Positive Control
- ▶ Eliminate, Prevent, Catch, Detect, Mitigate
- ▶ Hu Tools
- ▶ Stop when unsure
- ▶ Conservative decision-making
- ▶ Pre-positioned resources, reserves
- ▶ Engineered safeguards



Learn

AMRL

- ▶ **Know what has happened** (past): operating experience and personal experience
- ▶ **Know what is happening** (present): situation awareness; relentless pursuit of truth; facts; thinking ahead
- ▶ **Know what to change** (future): system-level improvements, personal development, protection of assets for future tasks



Chronic Uneasiness*

A deep-rooted respect for the technology

Mindfulness
to protect assets
against *uncontrolled*:

- 1) Transfers of energy
- 2) Movements of mass
- 3) Transmissions of information



how you **perceive, feel, and think**
about **assets** and their hazards

A Preoccupation with Failure: Value Addition vs. Value Extraction

* Reason, J. (2008), *The Human Contribution*, p.274.



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Risk-Based Thinking* Fundamental First Principle

- ▶ **Anticipate** – know what to expect
- ▶ **Monitor** – know what to pay attention to
- ▶ **Respond** – know what to do
- ▶ **Learn** – know:
 - what has happened (past)
 - what is happening (present)
 - what to change (future)




* Source: Hollnagel, et al., *Resilience Engineering*, (2006), p.350, and *Resilience Engineering Perspectives*, Vol. 2, (2009), pp.117-133.

Building Blocks of HOP



 **Live Long and Prosper***



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* Popularized by actor Leonard Nimoy as the character Mr. Spock in the television show, *Star Trek*, but is actually an variation of a blessing by Jewish rabbis in worship services.

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