



Preventing Catastrophic Incidents

*Unlocking the Secrets of
Highly Reliable Organizations*

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Outline for Today's Discussion:



Overview of High Reliability Organizational Concepts



Major Incident Prevention: Organizations Skilled in Reliability

Anticipation, Questioning, Diligence, Resilience & Learning



Measuring Organizational Reliability



Linking Reliability to Safety & Operational Performance



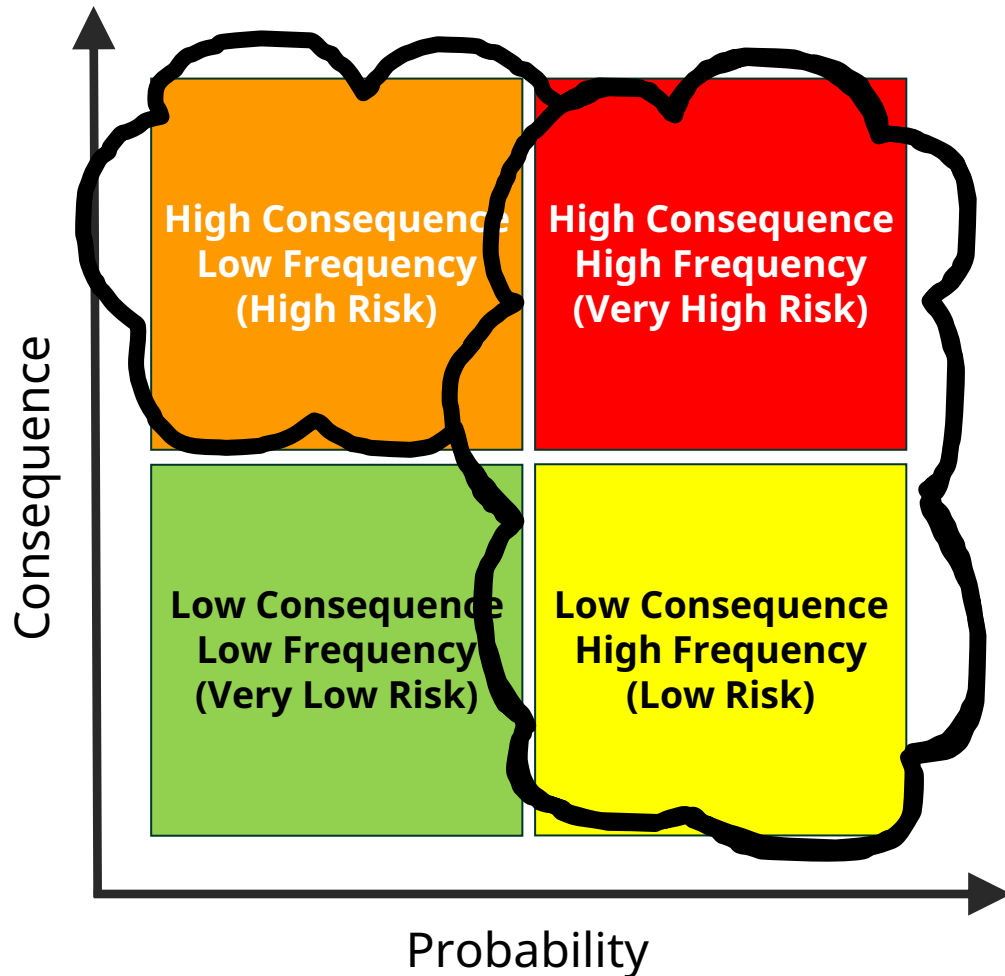
Summary & Call to Action



High Reliability Organizations (HRO)

Organizations that operate with **remarkable reliability** despite **inherent risks and complexities** associated with their Operations.

Framework For A High Reliability Organization (HRO)



- **Targeted activity plans based on risk**
 - Each Function has a unique set of risks
- **Anticipate points of failure & manage proper controls**
- **Catch small deviations early, and respond properly**
- **Operational discipline**
- **“In process” metrics to evaluate performance**

Adapted from Managing the Unexpected by K. Sutcliffe & K. Weick

The Five Disciplines of HROs



Anticipation



Questioning



Diligence

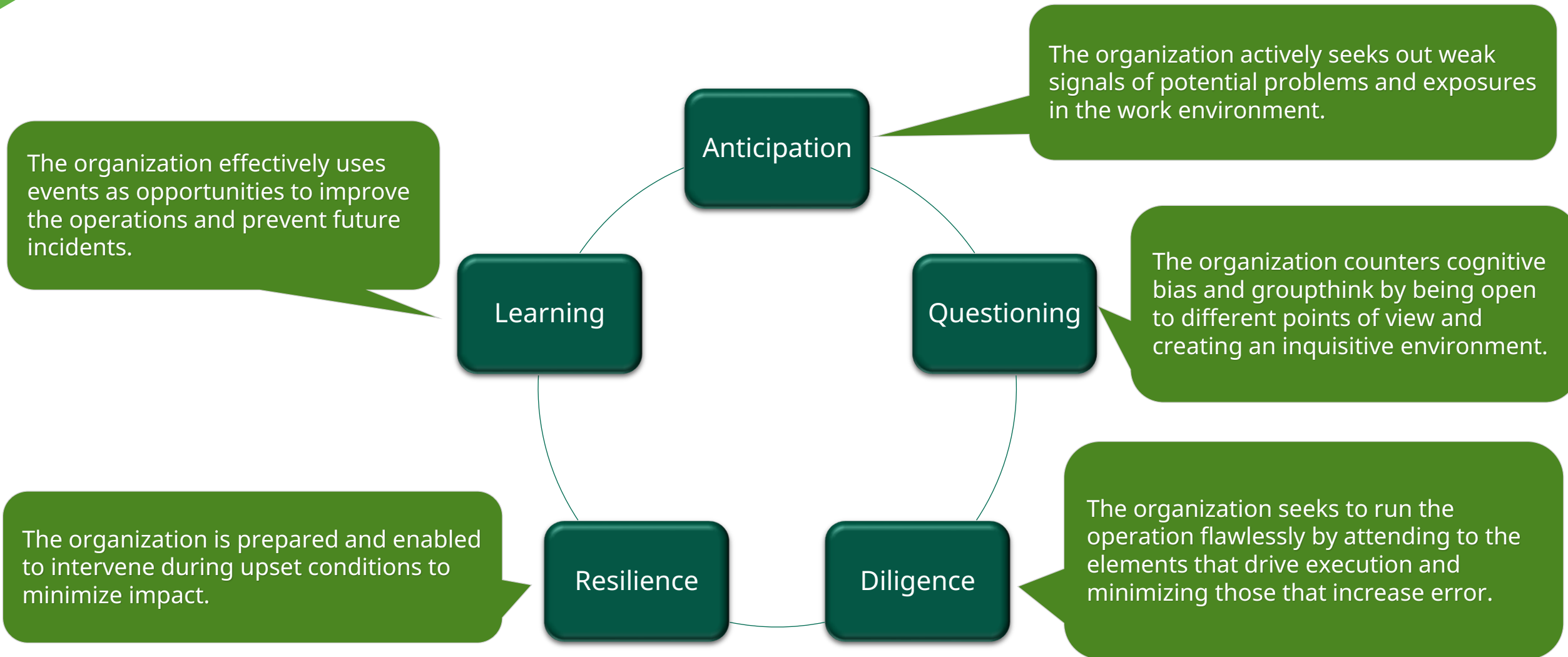


Resilience

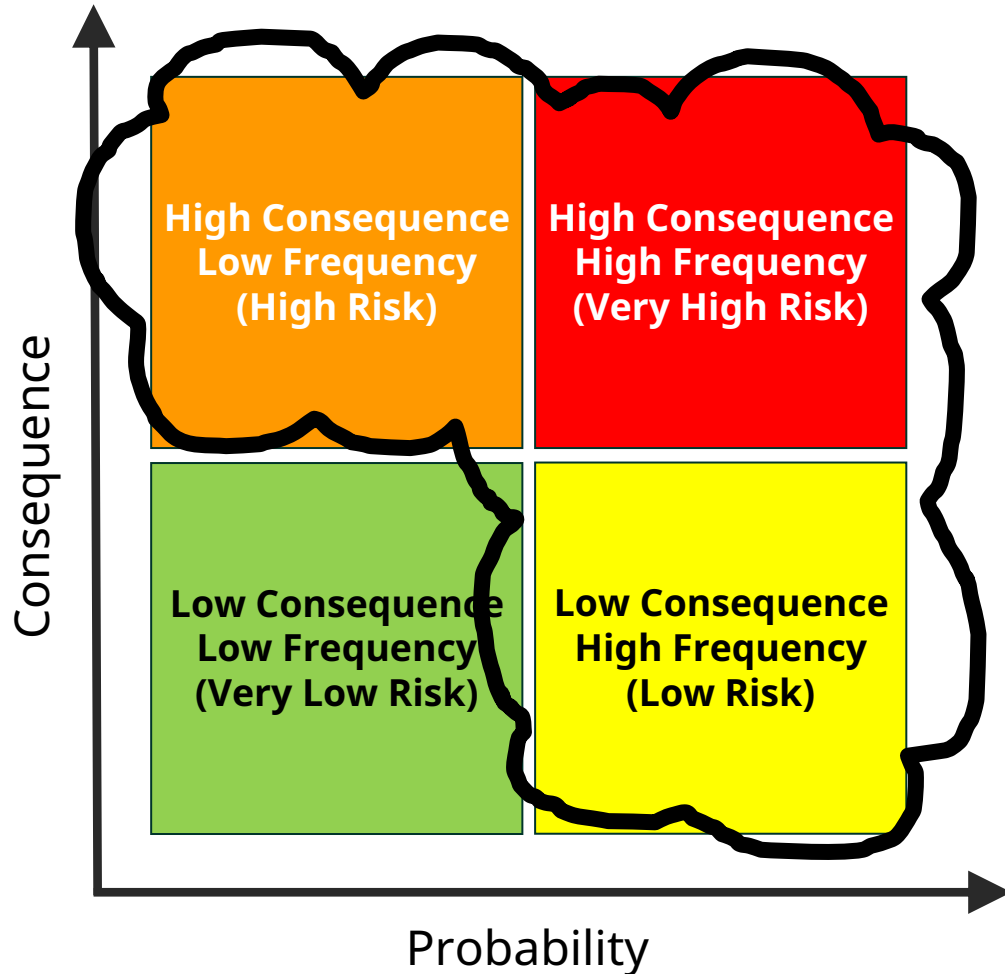


Learning

The Five Disciplines of HROs: A Deeper Look

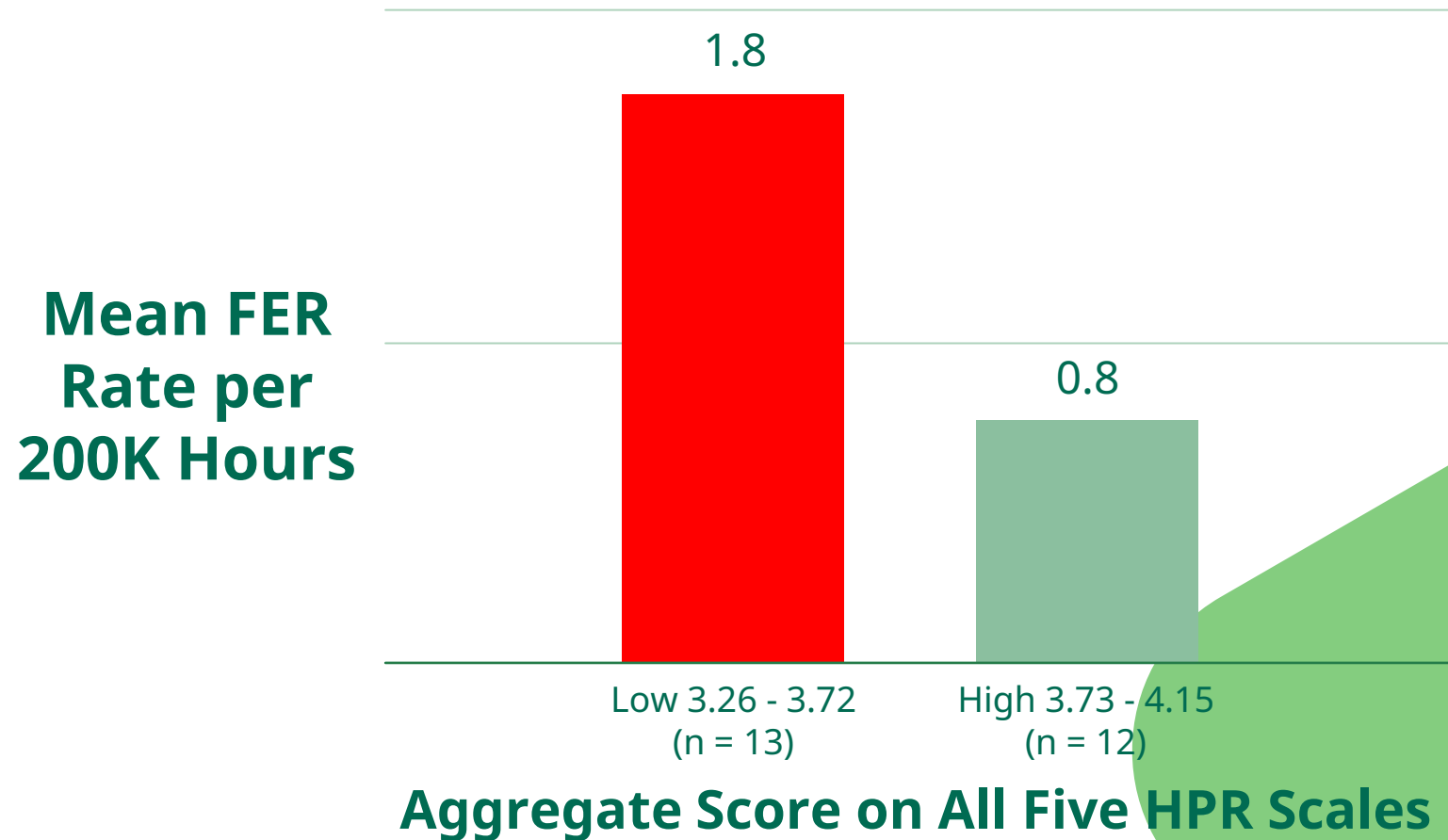


Framework For A High Reliability Organization (HRO)



- Targeted activity plans based on risk
 - Each Function has a unique set of risks
- Anticipation
- Questioning
- Diligence
- Resilience
- Learning
- “In process” metrics to evaluate performance

Average Fire Explosion Release (FER) Rates Lower When Reliability (HPR) Scores were Higher





The Importance of Getting Safety Critical Tasks Done Right

Leaders create cultures by “what they systematically pay attention to. This can mean anything from what they notice and comment on to what they measure, control, reward and in other ways systematically deal with.”

– Edgar Schein

MIT Sloan School of Management

Background – Foundation Foods Group: Fatal Liquid Nitrogen Release (January 28, 2021)

- Manufacturing change from Ammonia Freezers to Liquid Nitrogen Immersion Freezers to increase production rates.
- Many production issues during start-up and commissioning.
- Troubleshooting by Maintenance personnel on January 28 that involved adjusting level and other safety controls by changing software settings.
- Uncontrolled leak of liquid nitrogen.
- 6 Fatalities; 9 Hospitalized; Extensive Regulatory Action; Massive Litigation.
- CSB Incident Investigation:

<https://www.csb.gov/foundation-food-group-fatal-chemical-release/>



US Chemical Safety Board Investigation Findings: Case Study Discussion

1. Absence of a Documented Process Safety Management System
2. Inadequate Emergency Preparedness
3. Failure to Install Atmospheric Monitoring and Alarm Systems
4. Single Point of Failure in Equipment Design
5. Inadequate Product Stewardship by Equipment Supplier

With the Benefit of 20/20 Hindsight, Let's Discuss:

- Detail One Safeguard or Action that Likely Could have Prevented this Disaster.
- What HRO Organizational Attributes were Missing in this Operation?
- How Could “Chronic Unease” be Used to Help Prevent Similar Accidents?



Anticipation Characteristics

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2

3

4

5

Low Anticipation

- No news is good news
- Absence of failure is taken as an indication that problems are mitigated or not present
- Upward reporting is discouraged; shoot the messenger
- Variances or anomalies are accepted as noise and allowed to continue

High Anticipation

- Quiet periods trigger deeper seeking
- Recognition that problems are always in the making
- Reporting of 'weak signals' is encouraged
- Variances and anomalies are investigated thoroughly to prevent upsets and improve learning and understanding

Building a Practice of Questioning



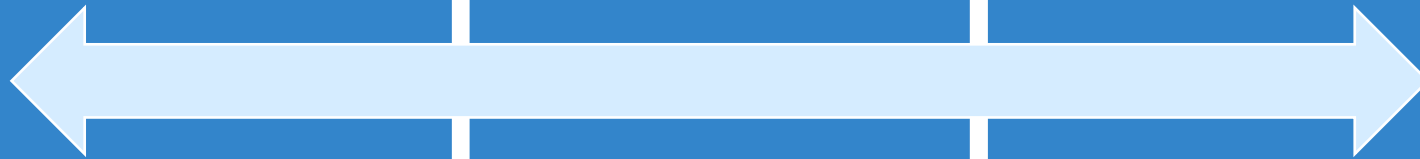
Create
Constructive
Dialogue



Question
Effectively



Make
Decisions
Transparent



Diligence and Urgency

Low Diligence

- Normalization of deviance
- Little management of change
Performance varies; high error rate
- Optionality

High Diligence

- Few process exceptions
- Changes documented diligently
- Uniformity in understanding and approach



Low Urgency

- Little time pressure
- Output de-emphasized

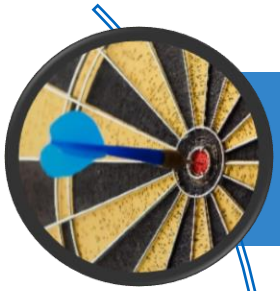
High Urgency

- Bias for action; time is precious
- Work performed quickly
- Output is not expected to stop
- Output is the most important metric



Diligence: Stay true to process

How do we get to the 'sweet spot'?



1. Emphasize execution over urgency



2. Regularly engage in checking



3. Consider Impact of Human Error



Human & Organizational Performance (HOP)

A New Approach to Safety & Reliability

Human and Organizational Performance (HOP) helps organizations:

- Recognize that **human error is inevitable**
- Shift from **blame** to **learning**
- Improve **system design** to reduce failure potential
- Foster a **strong safety culture**

HOP Principles are widely used in:

- ✓ High-hazard industries (chemical, oil & gas, energy, healthcare)
- ✓ Process safety and operational risk management



The Five Principles of HOP

Finding “Ways to Fail Safely”

- **People Make Mistakes – Error is Normal**
- **Blame Fixes Nothing**
- **Context Drives Behavior**
 - **Systems Influence Performance**
- **Learning is Essential for Improvement**
- **Response Matters – How Leaders React Shapes Culture**

The Seven Brain-Centered Hazards™



Fast Brain Functioning

Conducting important tasks without conscious thought and reliance on habits.



Visual Recognition

Missing important information due to the human visual system.



Divided Attention

Attempting to multi-task leads to missed information and error.



Memory

Operating on information that feels correct in the moment and relying on our memory system.



Social Think

Our innate need to go along with our group/tribe prevents us from approaching others.



Fatigue

When our brains or bodies are fatigued our risk for error increases significantly.



Stress & Urgency

When we notice hints of urgency from others, we put pressure on ourselves to complete tasks.

Organizational Resilience Characteristics

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Low Resilience

- Emergency procedures are not practiced or drilled
- Communication and decision making is hierarchical and deferred up the line
- Incidents are not used to capture lessons or make changes and adjustments

High Resilience

- Actions to address potential upset conditions are rehearsed consistently
- Communication, roles and decision making is clear
- Post-upset conditions are used as learning vehicles



Learning Organization Characteristics

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Low Learning

- Incidents are not used to capture lessons or make changes and adjustments.
- Investigation Root Causes “Blame Employees”
- Organizational Learning Messages are Held by Limited Personnel
- Learning is an “Event”

High Learning

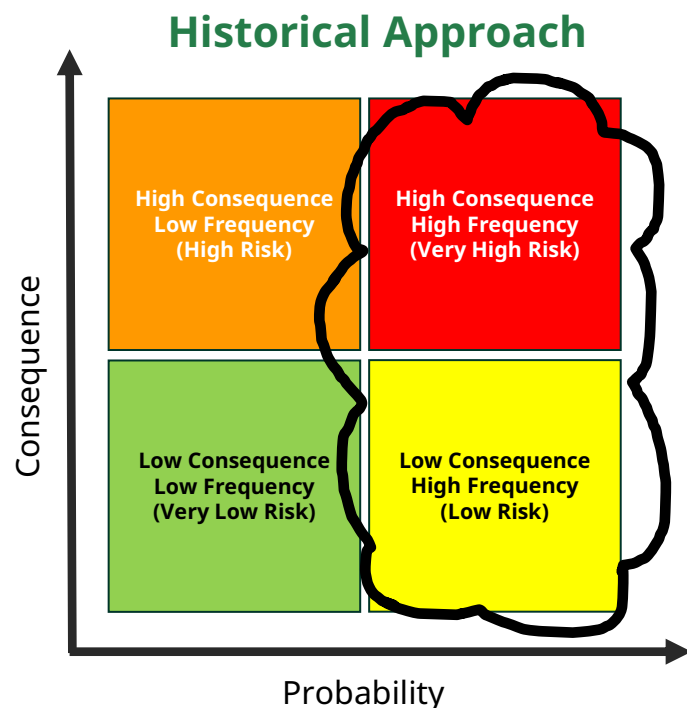
- Post-upset conditions are used as learning vehicles
- Investigation Root Causes Point to System Issues
- Organizational Learning Messages are Consistently Understood by Everyone
- Learning is a “Process” that leads to Corrective/Preventive Actions that are Sustained



What About Incident Precursor Metrics?

Precursor	Example Metrics
Anticipation	<ul style="list-style-type: none">• % Accident Events Identified by PHA or Hazard Evaluation• Number of Hazard Reports Filed
Questioning	<ul style="list-style-type: none">• Number of Stop Work or Job Pauses Executed• Number of Safety Critical Objects Failing Inspection in “As Found” Condition
Diligence	<ul style="list-style-type: none">• % Accidents Events Predicted by PHA or Hazard Evaluation, but had One or More Barrier Failures• Corrective & Preventive Actions Completed on Site
Resilience	<ul style="list-style-type: none">• Emergency Drills on Facility Major Accident Hazards (including follow-up actions)
Learning	<ul style="list-style-type: none">• Local Incident Learning applied through Site / Company

The High Reliability Journey: A Call to Action!

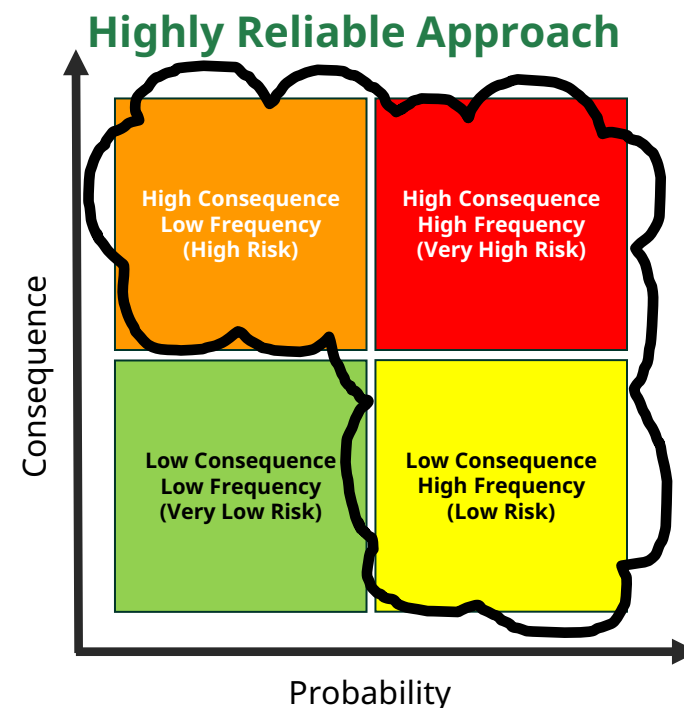


Historical Focus

- Only high frequency events
- Lagging metrics
- Report only incidents
- Investigate only “recordable” incidents
- Causal factors: technical & operational
- Assume past performance predicts future
- Learning environment: primarily internal



**Mindful Use
Of Reliability
Focus**



Future Focus

- Add High Consequence, Low Frequency events
- Leading & “in-process” metrics
- Report near misses & other significant events as well
- Investigate events with high learning value
- Causal factors: organizational & management system
- Assume the worst case is indeed possible
- Learning environment: External as well as internal

References

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<https://www.dekra.us/en/organizational-safety-reliability/the-five-disciplines-of-hros/>

DEKRA – The Truth and Challenges of Cultivating Chronic Unease
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DEKRA – Becoming a High Reliability Organization: Assessing Organizational Process Safety
<https://www.dekra.us/en/organizational-safety-reliability/becoming-a-hro/>

DEKRA – Brain-Centered Performance (Human Factors)
[Brain-Centered Performance: Understanding How the Brain Works For Safe Work](#)

DEKRA – Preventing Catastrophic Incidents Infographic
[Preventing Catastrophic Incidents Infographic \(dekra.us\)](#)

DEKRA – Catastrophic Incident Prevention Leadership Infographic
<https://www.dekra.us/en/process-safety-training/catastrophic-incidents-infographic/>

Thank You!



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