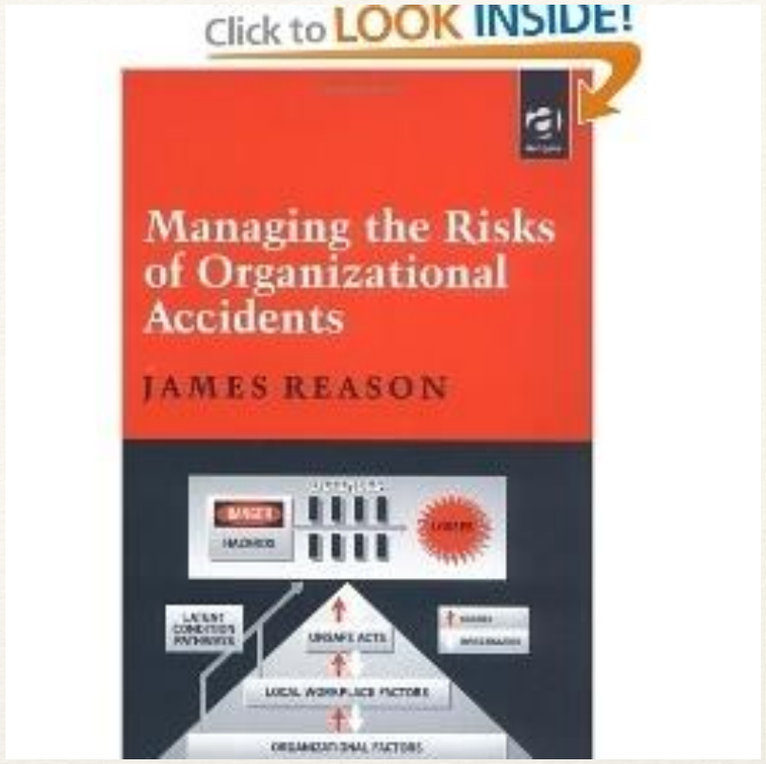
Control Room Design for Human Performance Improvement

ISA WWID Free Webinar Series



Center for Human Factors & Ergonomics CHFE

Managing the Risks of Organizational Accidents

Based on James Reason's book & DuPont Miracle on the Hudson - Preparer for Safety

presented by

Ian Nimmo of UCDS Inc.

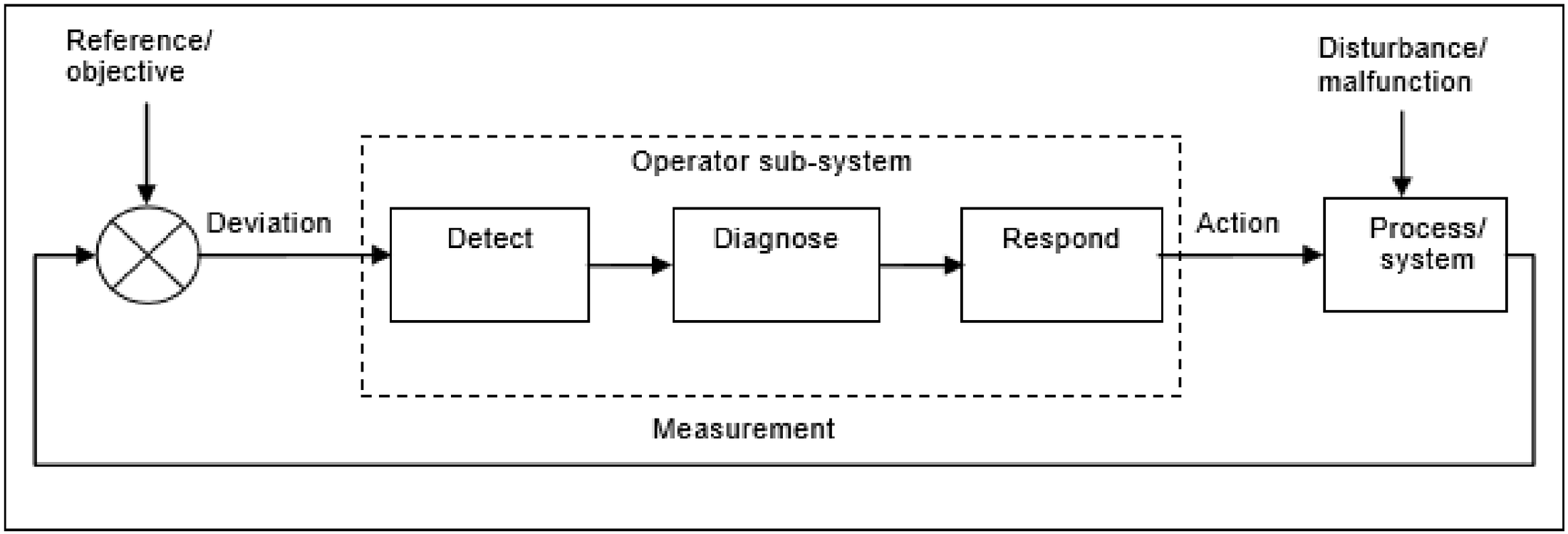
CHFE
CENTER FOR HUMAN FACTORS & ERGONOMICS

Chapter 12

Human Factors to Improve Operator Performance

- We rely on console (Process Control) Operators to be vigilant during long shifts and expect them to intervene during abnormal situations.
- How quickly and accurately they define a problem can make a major effect on uptime and safety.
- Operator performance is affected by the environment, workload, work team design, HMI, Alarm, communications, fatigue, procedures, training, and culture.

Feedback model of operator-process interaction



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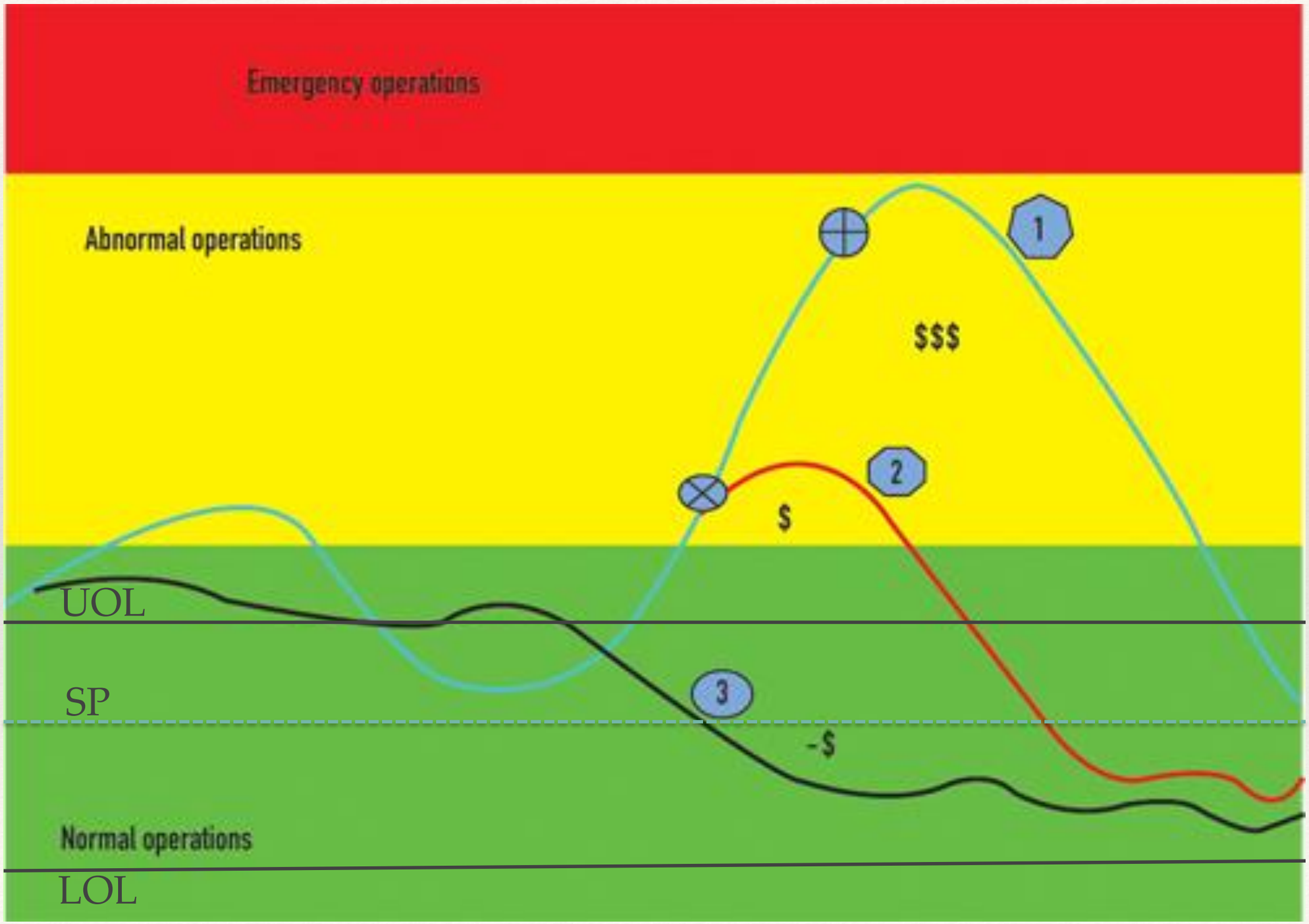
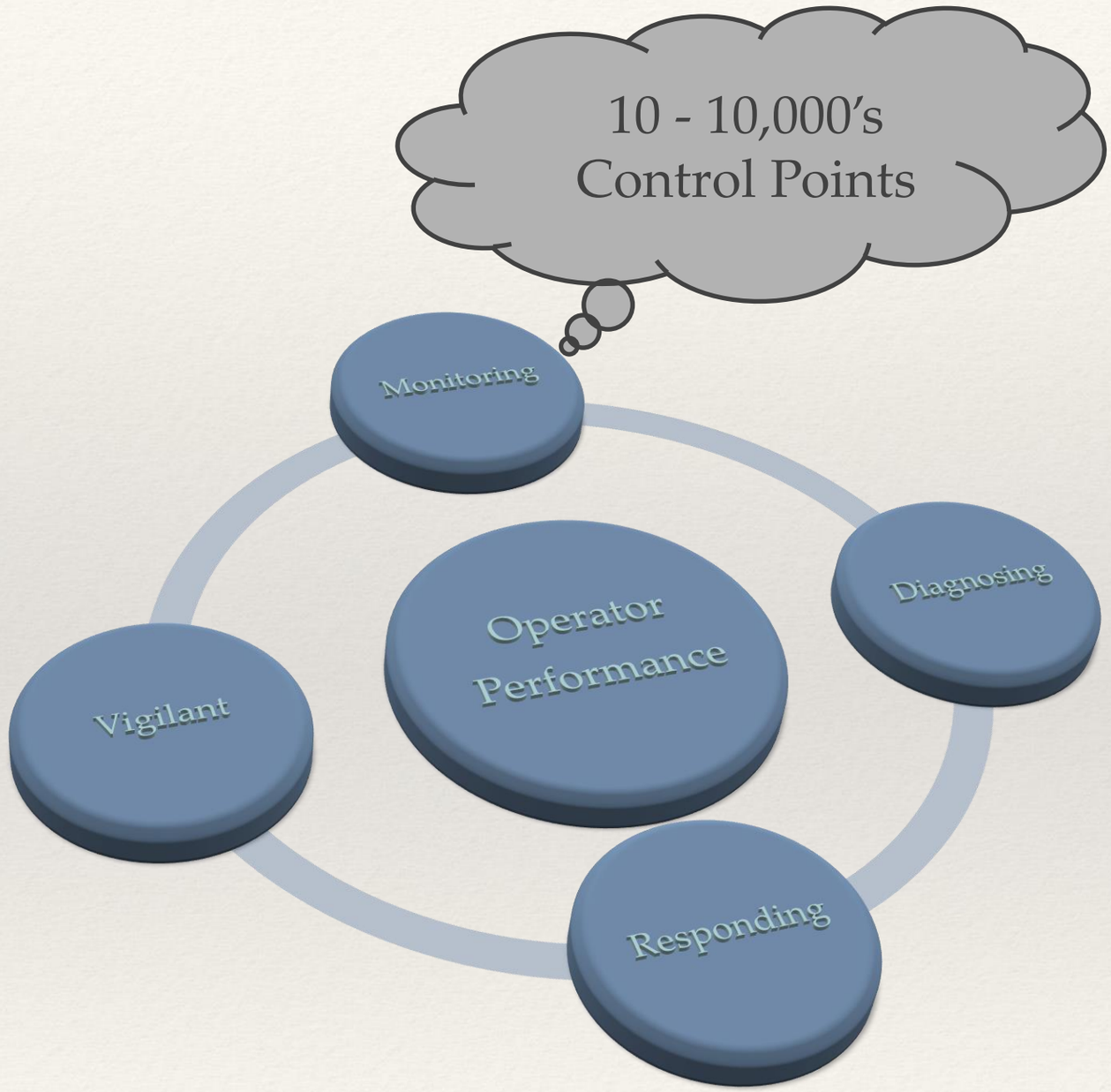
The Role of the Operator

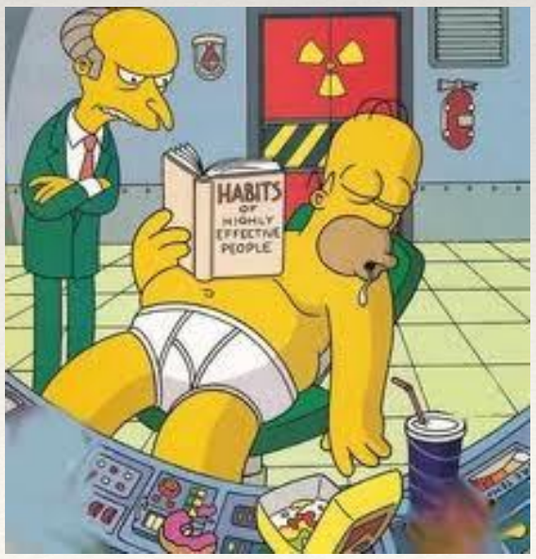


Operator Performance



Monitoring - Good Situation Awareness

- Using multiple screens on a Console
- Using Alarm Management tools
- Observations & Communications from Outside (Field) Operators or Maintenance People



Maintain Your Situation Awareness

- Know the Game Plan
- Anticipate Possible Events
- Follow Known Procedures
- Cross Check and Verify
- Verbalize “Red Flags”
- Provide on-going Updates

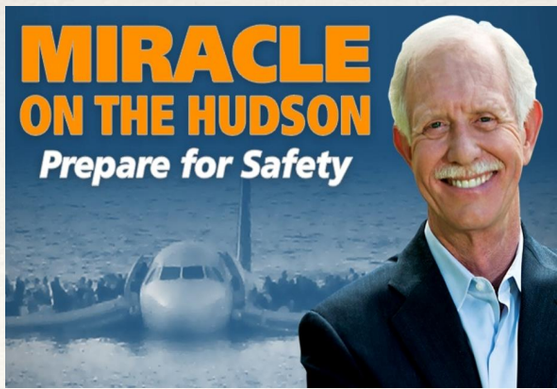
Maintain Your Situation Awareness

- The Loss of Situation Awareness usually occurs over a period and will leave a trail of clues or red flags that warn of lost or diminished Situation Awareness.
- Remain Alert at all times
- Situation awareness is the ability to identify, process, and comprehend the critical elements of information about what is happening to the team with regard to the mission.
- More simply stated, situation awareness is knowing at all times what is going on around you.

Responding correctly

<u>Competence</u>

- Possessing skills,
- Knowledge,
- Qualifications, and capacities to do job properly and safely
- Comes with training, education, and experience



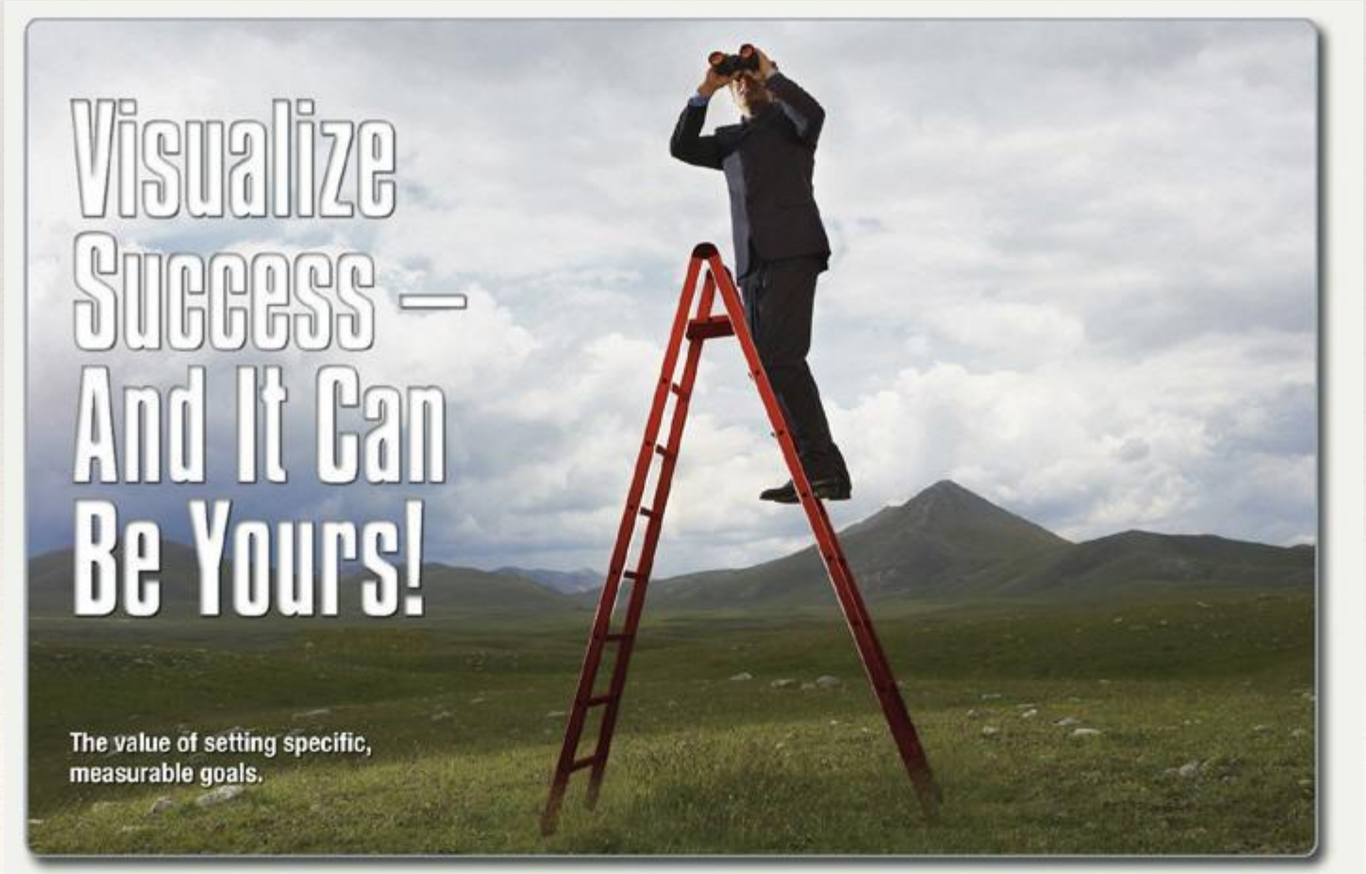
Monitoring & Responding

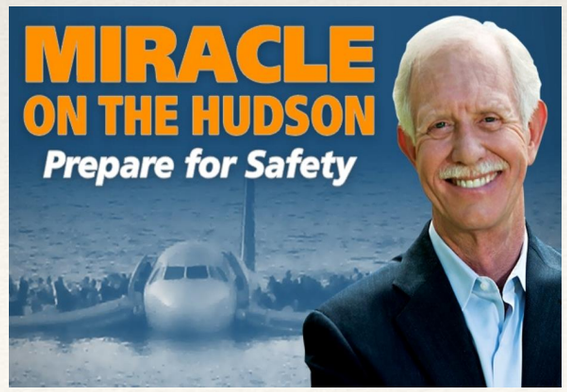
Practice **situational awareness**

- Scan your environment for hazards
- Consider how equipment, facilities, people, conditions may change
- Understand potential hazards
- Formulate mental plan for how to handle / avoid hazards

How to Develop Competence

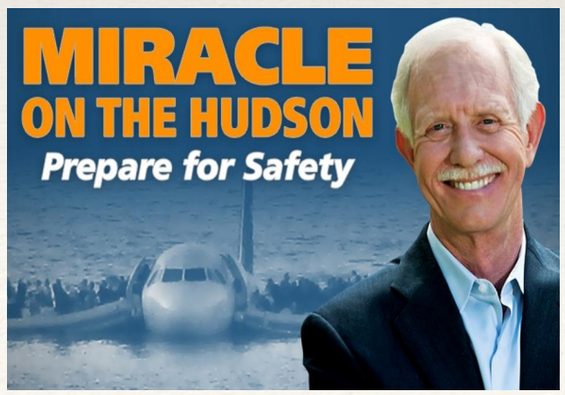
- Focus on task at hand
- Visualize completing task accurately and safely
- Mentally review safe work practices to follow



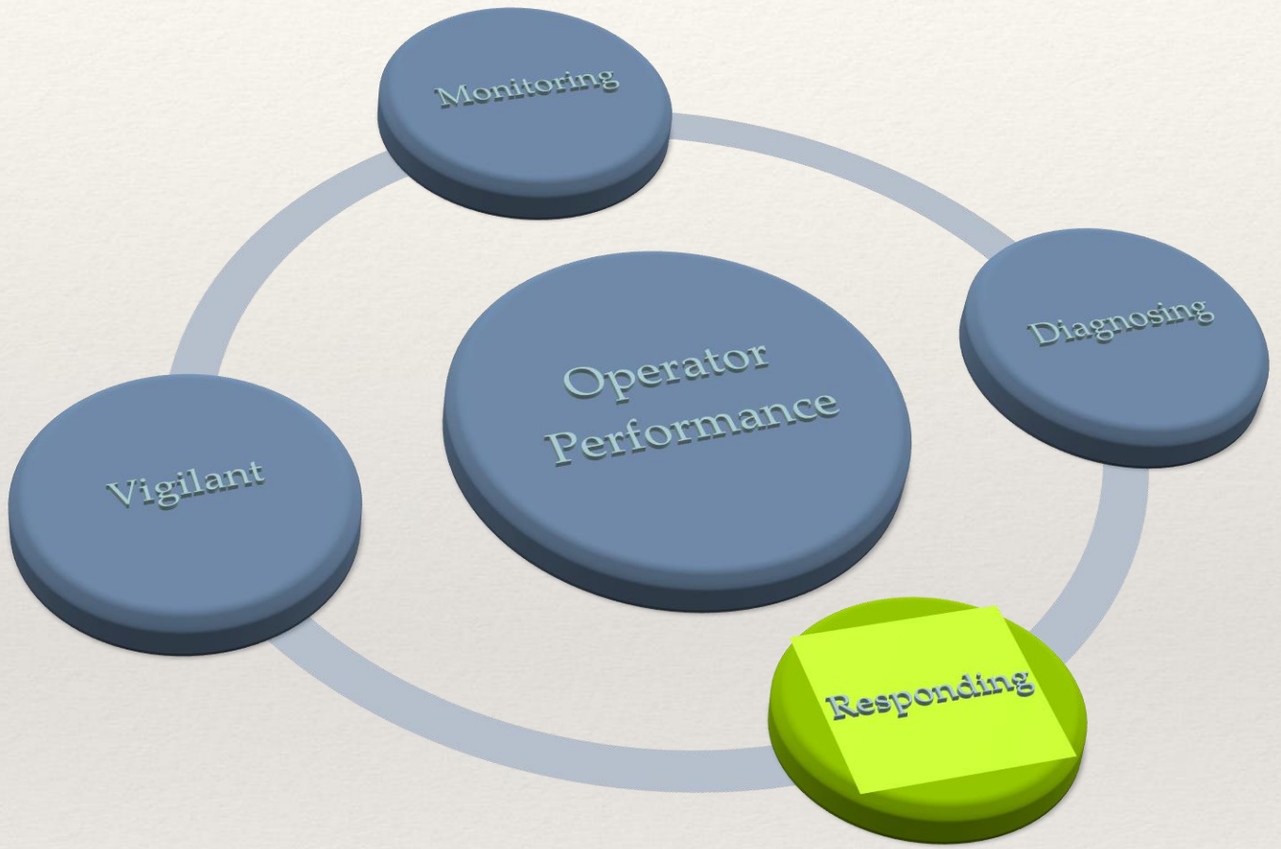


How to Develop Competence

- Visualize and anticipate possible scenarios and how to respond
- Take action to avoid mishaps and incidents that *could* happen
- Consider how your competence contributes to safety for you and others



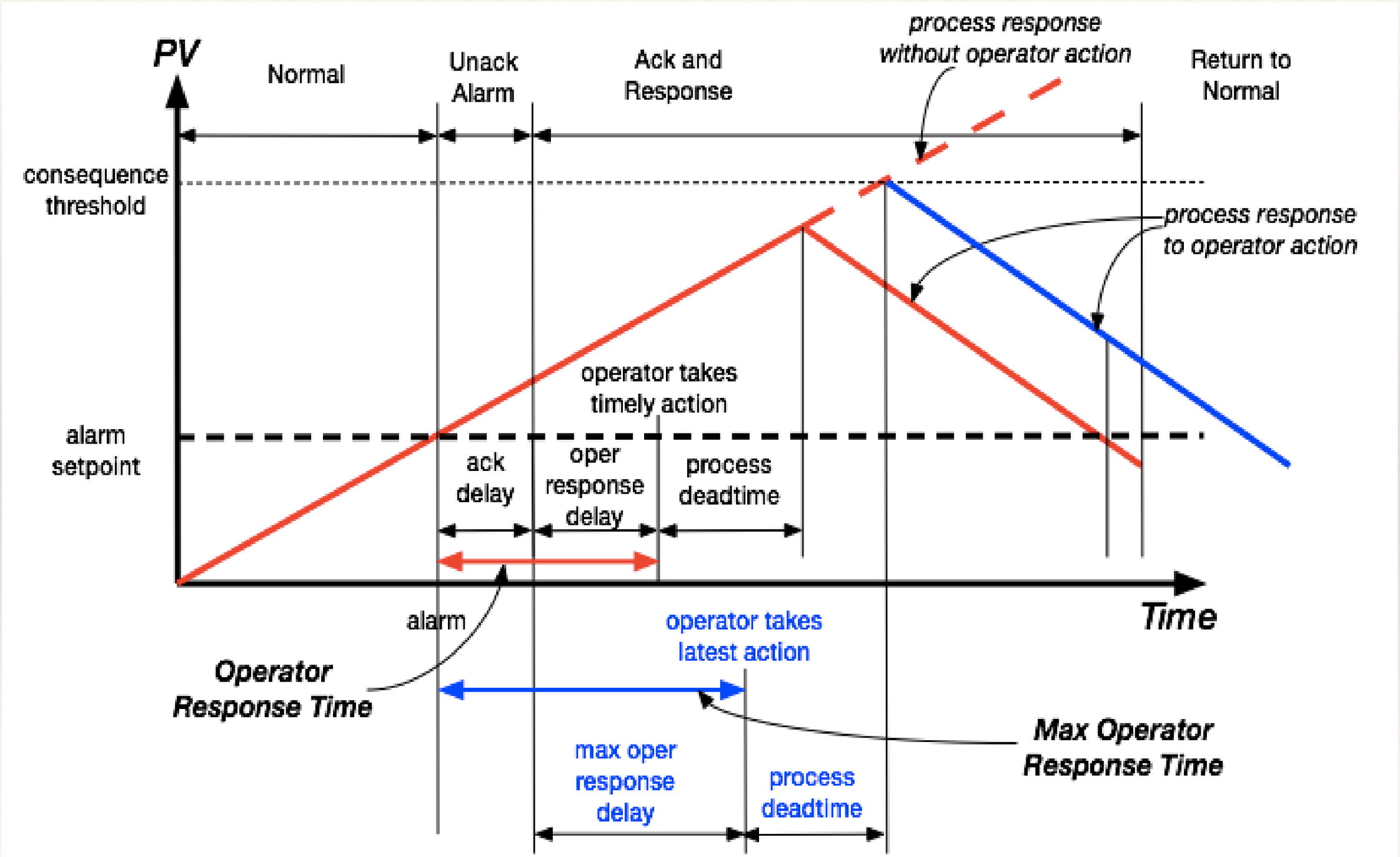
Responding



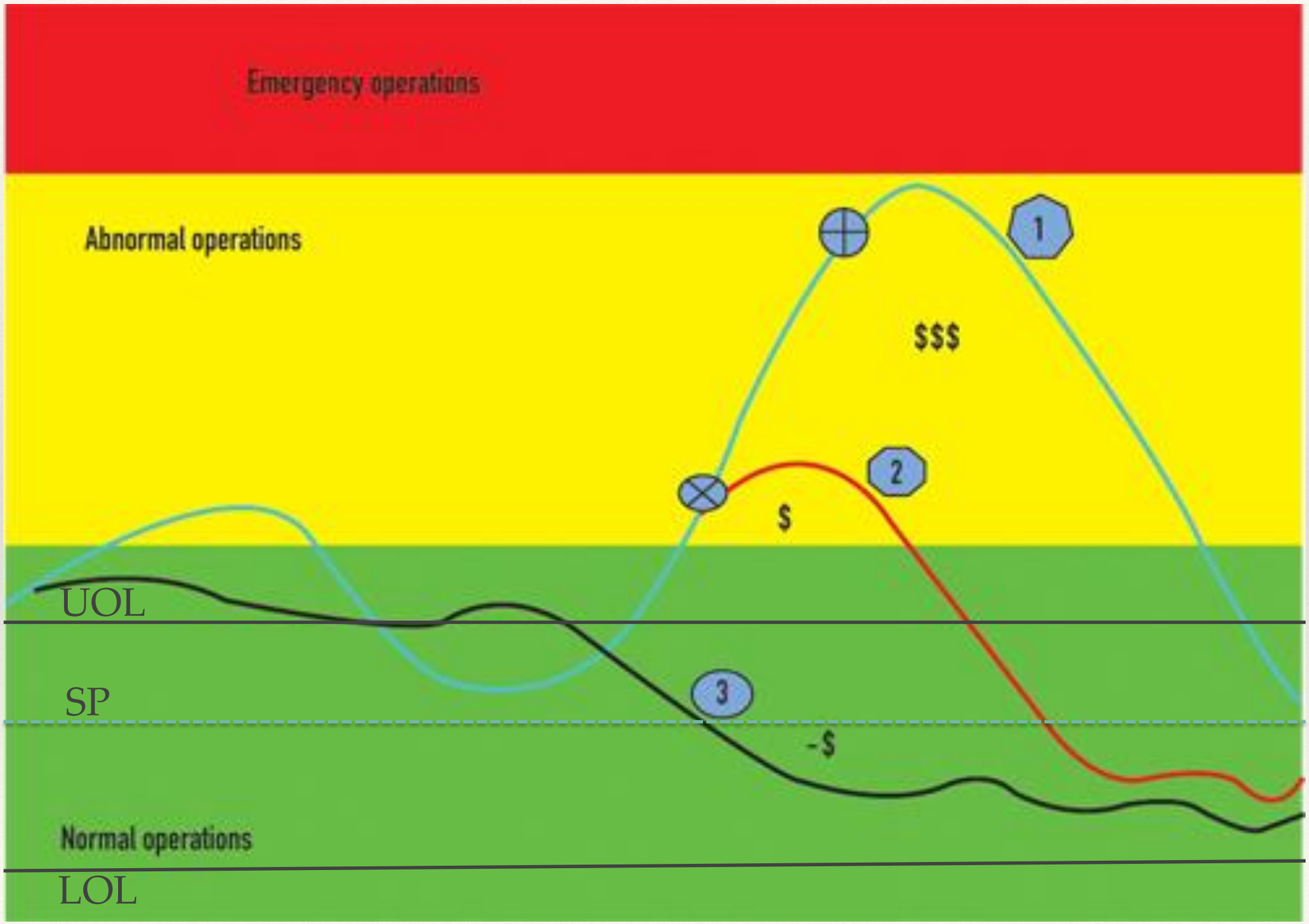
Responding –

a) the deviation from desired normal operation is detected,
b) the situation is diagnosed and the corrective action determined, and
c) the action is implemented to compensate for the disturbance.

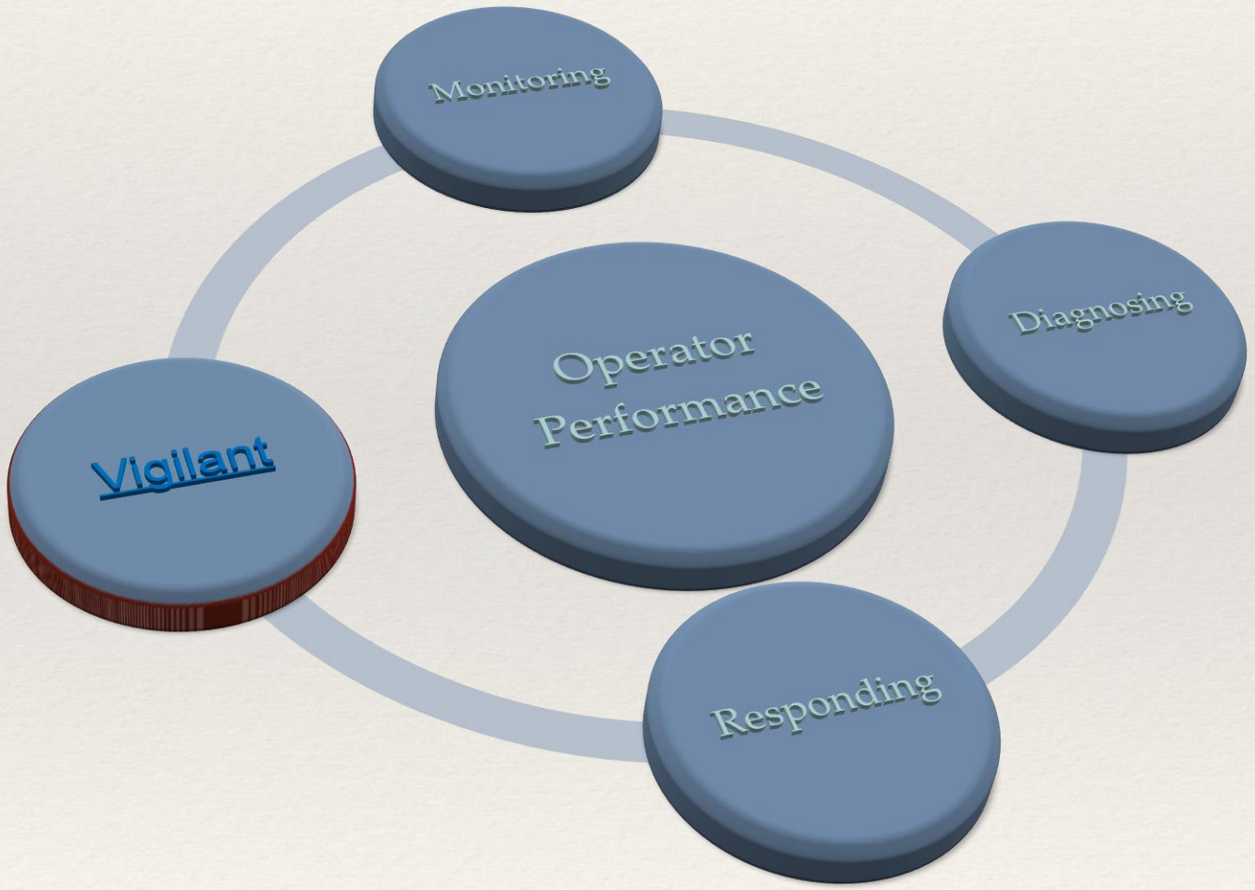
IEC 62682 Response Time



The Role of the Operator



Being Vigilant



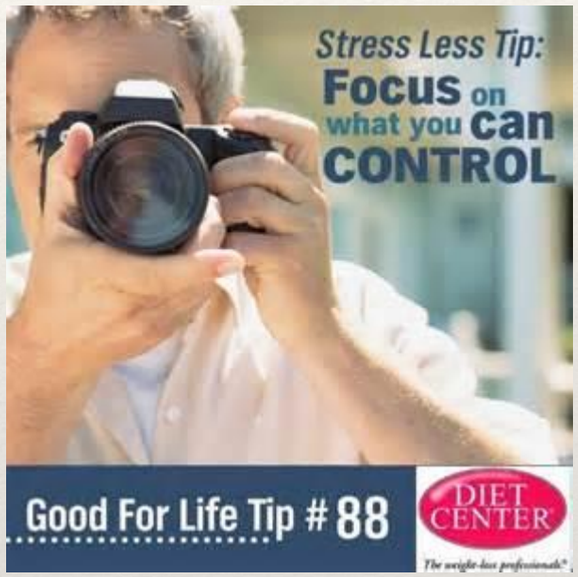
Being Vigilant

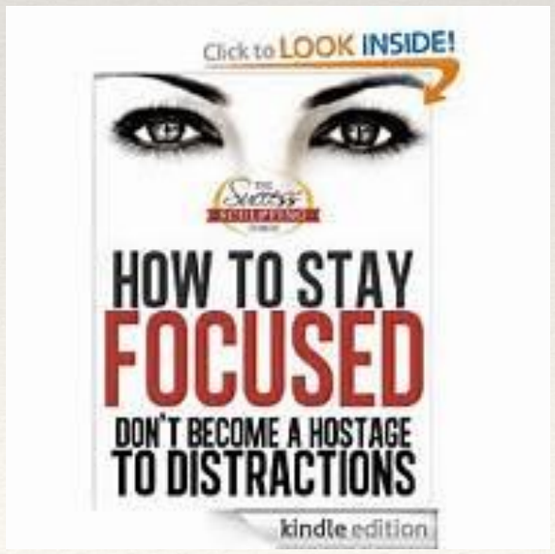
Being present in the moment

Dig deep, be mindful of situation

Stay **focused** on task at hand

Be fully engaged in safety





Being Vigilant

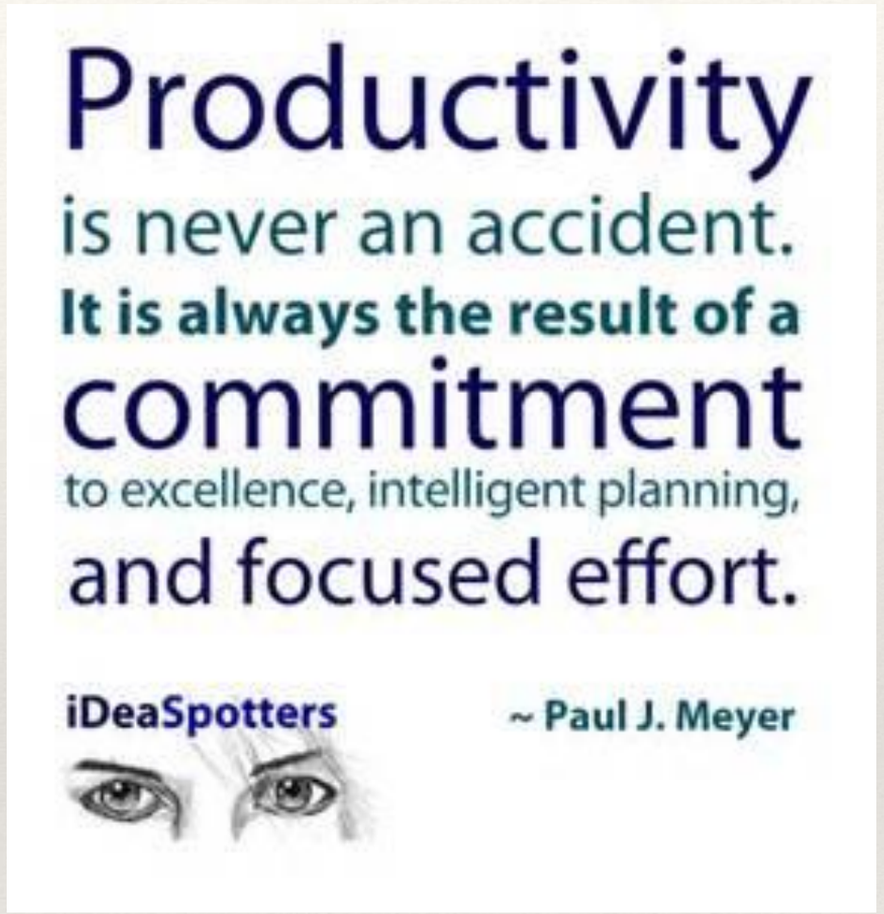
- Staying on point, day in and day out
- Choosing safe behavior over risky behavior
- **Preparing you to face once-in-a-lifetime moments**

Complacency

- Opposite of commitment
- Cutting corners
- Compromising on safety
- Leads to hazardous work environment

How to Demonstrate Commitment

- Be ready for work (Fit for Work)
  - Not tired
  - Not distracted
  - Not unprepared
- Lend a hand when needed
- Be thoughtfully and mindfully aware

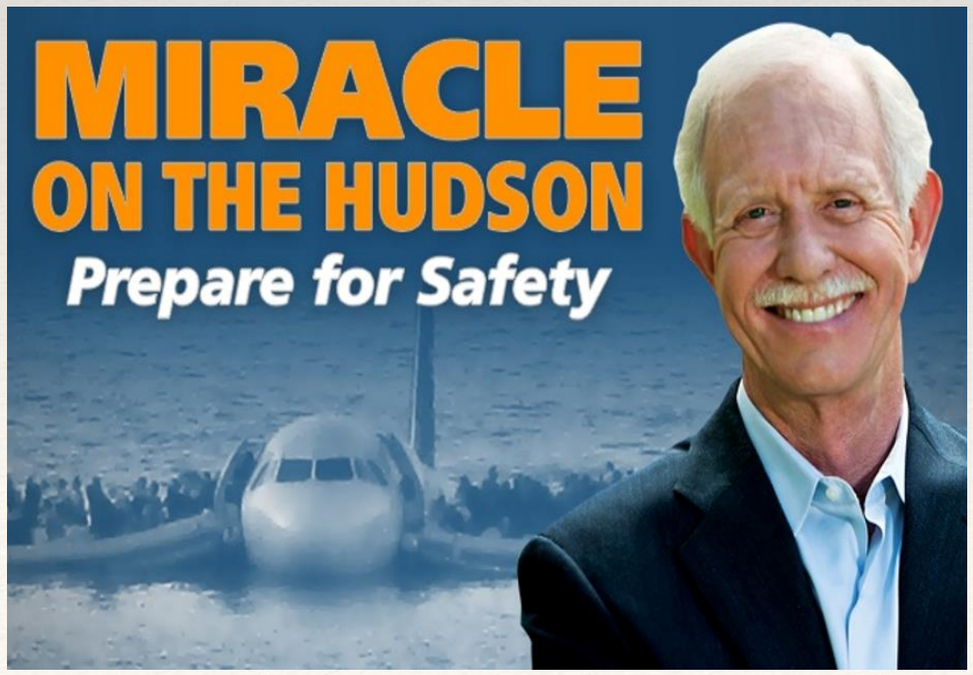


Committing to Work Safely

- Intentional
- A choice
- Commit to making safe choices every time
- Don’t take shortcuts
- Don’t be complacent (Coker Operators)
- Follow safety procedures every time you perform a task

Importance of Commitment

- **Never know when we'll be tested**
- Doing the little things prepares us for the big things
- Commit to safety, day in and day out



Sully's Journey to Competence

- Years of being conscientious, thorough and precise in daily duties
- Utilized **situational awareness**
- Trained for all types of emergencies
- Learned from other major airline events
- Visualized what to do to make it successful

Importance of Communication

- Less-than-safe workplace without it
- Good communication skills developed over time
  - Consciously developed daily
- Using precise, respectful language in regular communication
- Contributes to safe workplace
- Prepares us for emergencies when clear communication necessary

Safety Critical Communications

Approximately 20% of incidents involve breakdowns in shift-to-shift communications. Breakdowns such as:

1. Piper Alpha will dominate our industry when situation awareness is compromised between shift workers.
2. Esso Longford
3. BP Texas City

Communication Skills to Have

- Precise, open communication
- Open-ended questions
  - Encourages full, meaningful answer
- Begin with “why” or “how” or “tell me about…”

Human Factors in Control Room Design

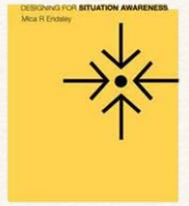
- Operators sitting in the dark
- Poor environmental controls
- Poor communications and collaboration
- Disturbances
- Poor Shift Change Practices
- Distractions – phones, people walking through, staff seeking information, maintenance requiring permits
- Acoustics
- Poor Ergonomics

Control Room Layout

- Adjacencies
- Functional Layout
- Console Ergonomics
- Viewing Angles
- Number of Screens
- Operator desktop

Control Rooms

Demons of SA



- Overloading of information including HMI's and Alarms
- Salience Issues with Displays
- Short-term memory issues
- Out of loop syndrome, like sitting with your back to control system while working on IT PC.
- Attention tunneling
- Errant Mental Model
- WAFOS (Workload, Anxiety, Fatigue and Other Stressors).

A new strategy!

High Performance Operations as a paradigm shift from our current practices that directly affect operator performance and create pathogens for human error.

- *The vast majority (80-85%) of human errors primarily result from the design of the work situation (the task, equipment, and environment), which managers directly control.*

Conclusion

- All accidents are preventable
  - Even Human Errors
- They are often simplistic in nature
- Often driven by Culture (old habits)
- Need measuring (Incident Investigation)
- Need a new Strategy, with HFE
- Need more education on Human Error

Questions?

If you would like to receive a technical paper on this topic with more detailed information please contact:-

Steve Maddox = smaddox@mycontrolroom.com

Or write and ask question to inimmo@mycontrolroom.com

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