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NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Improving Human Performance:

From Individual to Organization and Sustaining the Results

March 27th 2012

RELIABILITY | ACCOUNTABILITY




RRM Direction

- **Reliability – addressing real problems to improve the reliability of the grid.**
- **Accountability – being accountable to customers, the industry and government for the performance of the grid.**
- **Learning – enabling the industry to learn from experience to improve future reliability performance.**
- **Risk-based model – focusing actions and programs on issues most important to grid reliability.**

Top Priority Reliability Issues

- Misoperations of relay protection and control systems
- Human errors by field personnel
- Ambiguous or incomplete voice communications
- Right-of-way maintenance
- Changing resource mix
- Integration of new technologies
- Preparedness for high impact, low frequency events
- Non-traditional threats via cyber security vulnerabilities

NERC President's Top Priority Issues for Bulk Power System Reliability, http://www.nerc.com/news_pr.php?npr=723 **at** http://www.nerc.com/fileUploads/File/News/NERC%20President%20Top%20Priority%20BPS%20Reliability%20Issues%201-7-11.pdf

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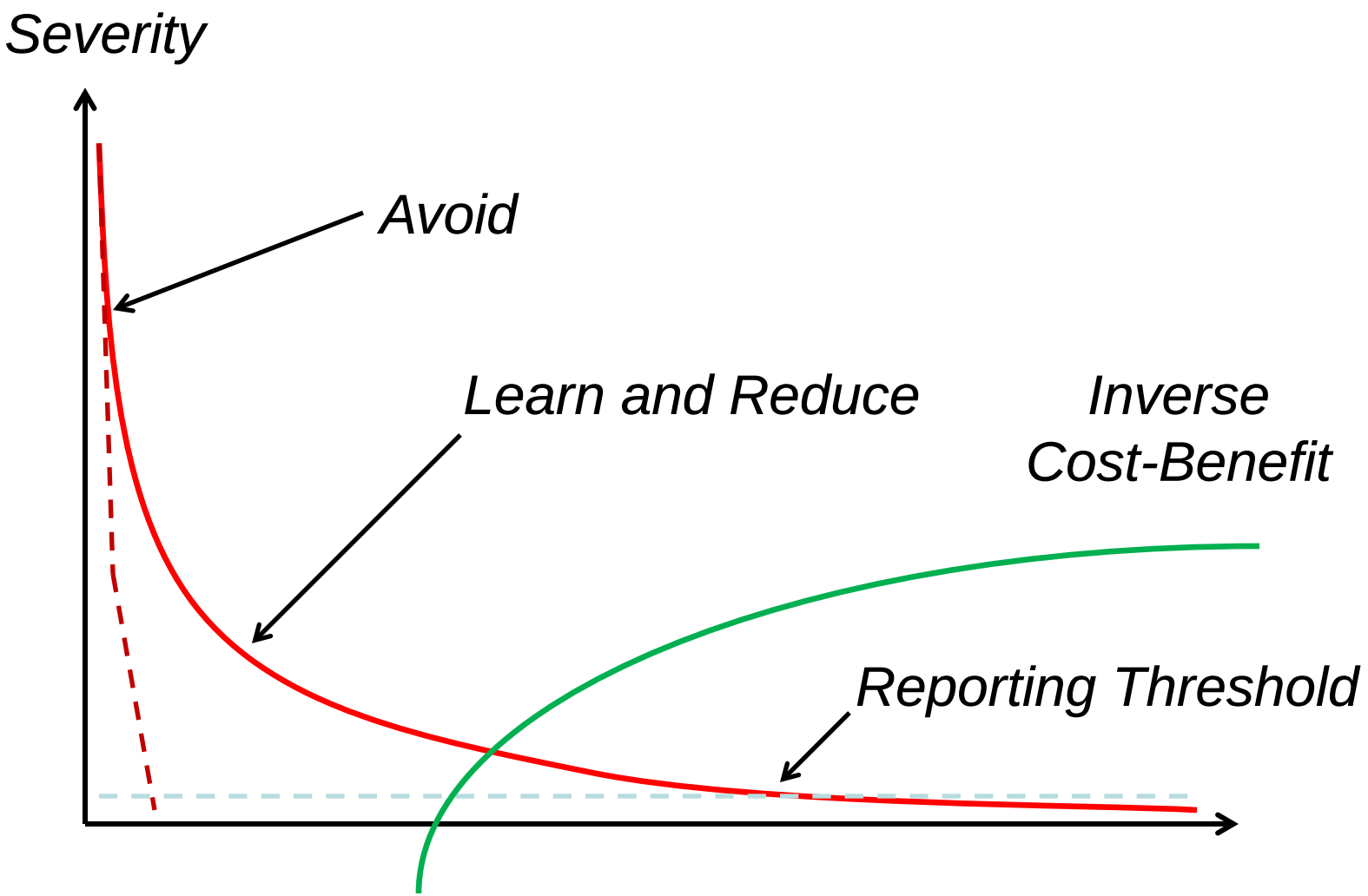
Reliability Risk Management Concept



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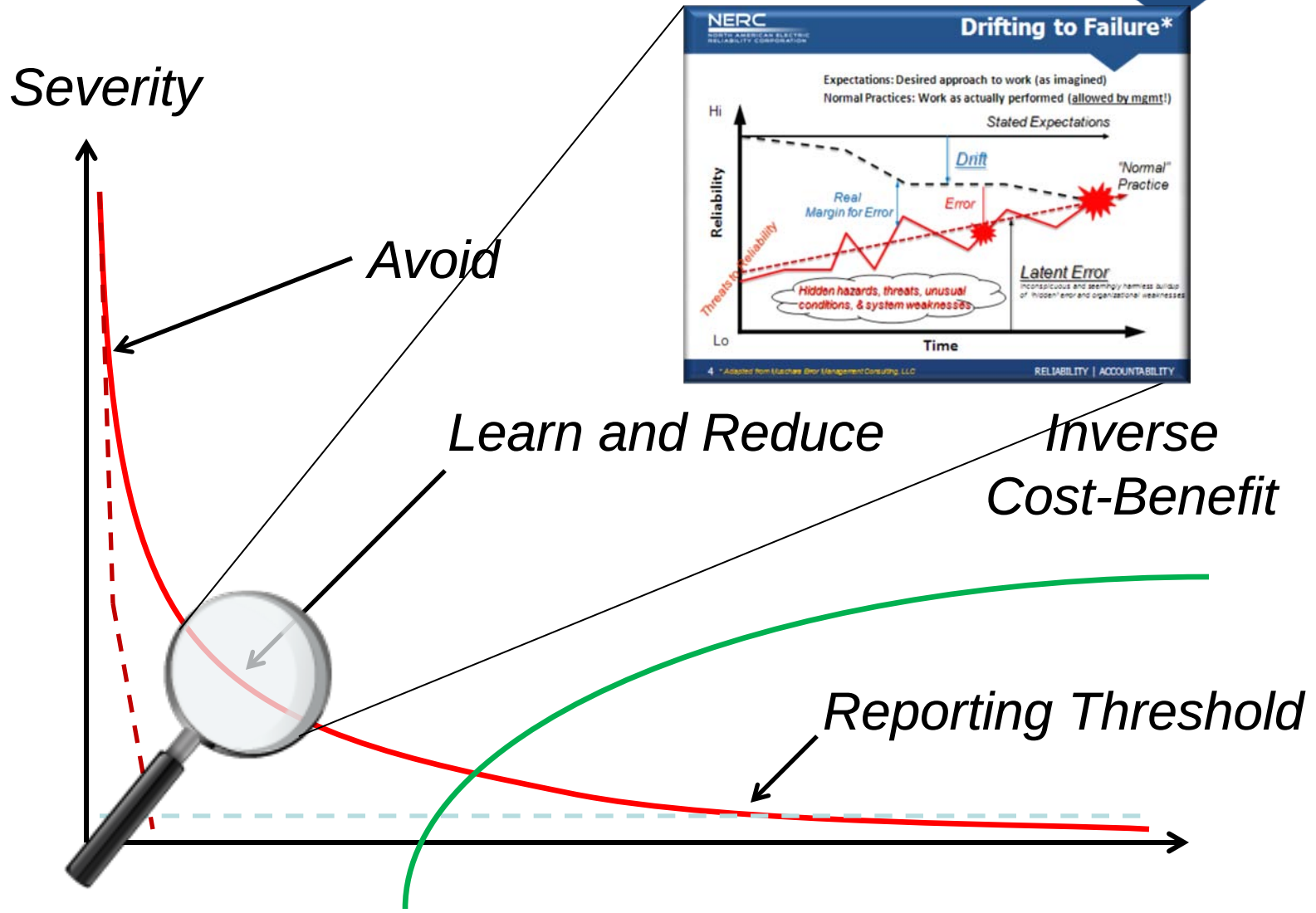
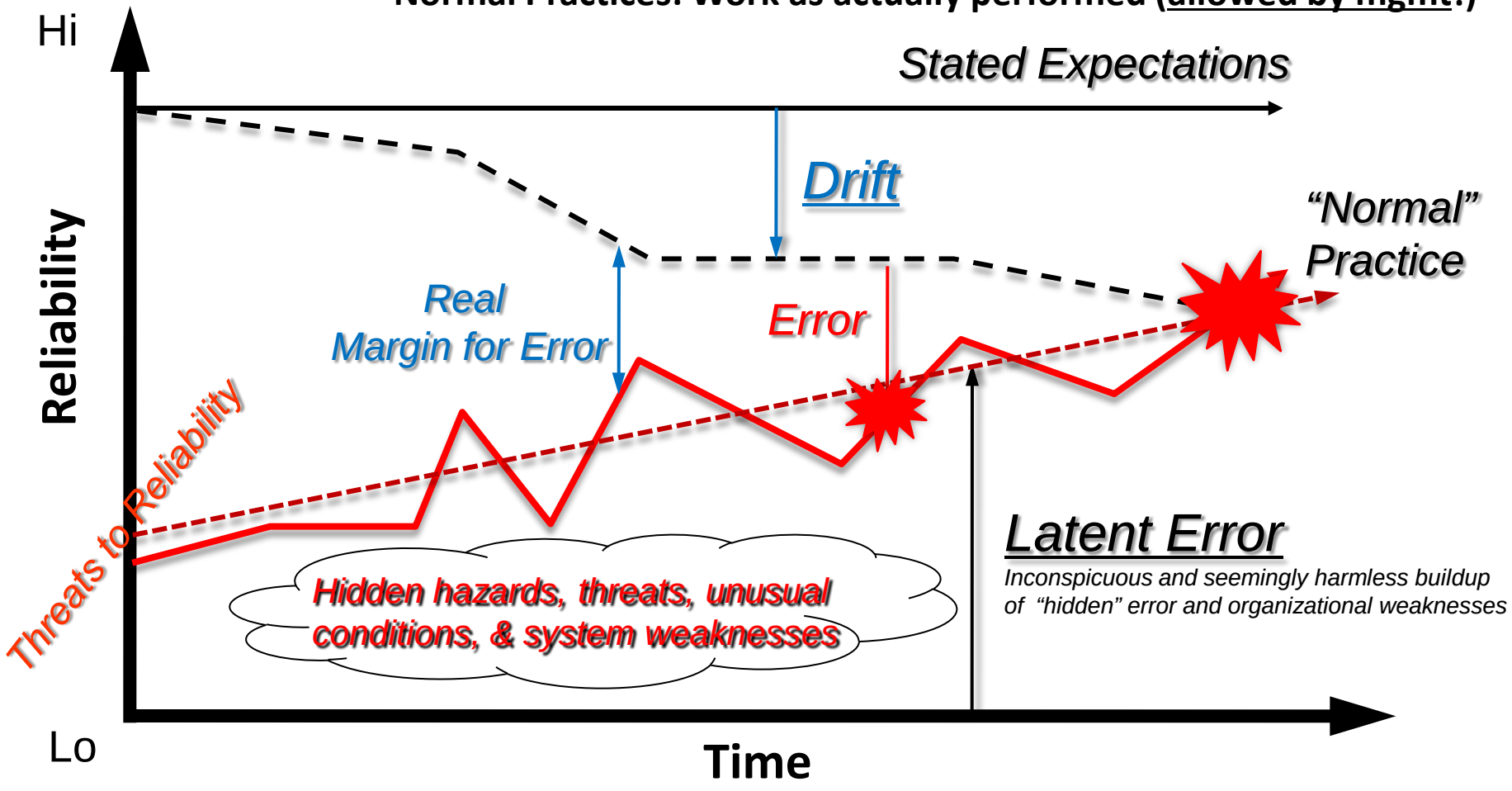


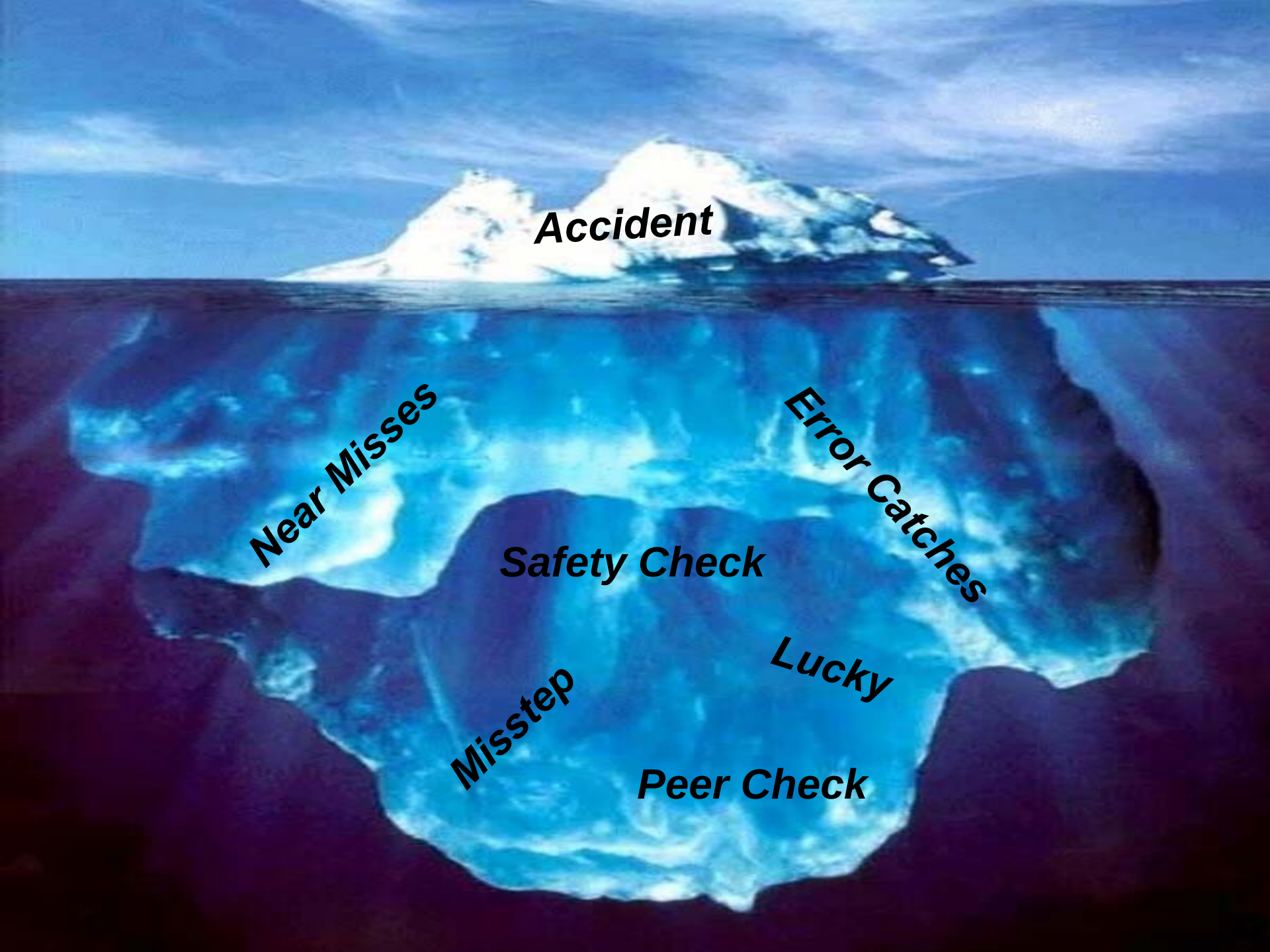
Drifting to Failure*

Expectations: Desired approach to work (as imagined)

Normal Practices: Work as actually performed (allowed by mgmt!)



 * Adapted from Muschara Error Management Consulting, LLC


Accident
Near Misses
Error Catches
Safety Check
Lucky
Misstep
Peer Check

Too Hard?

"Complicated Industry"
"Come along way"
"Can't get to zero"
"Automate, technology reduces the need for human operator"

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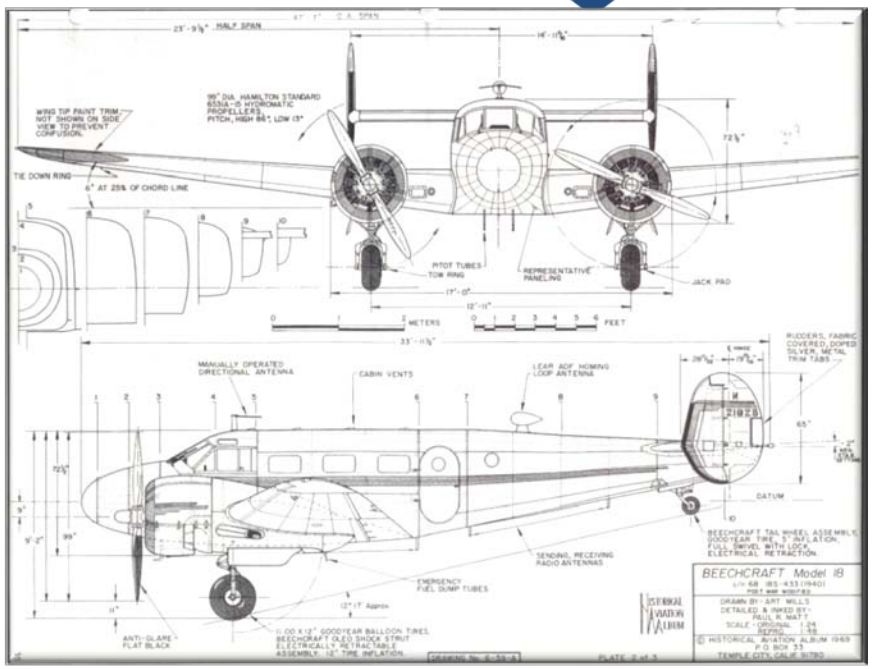
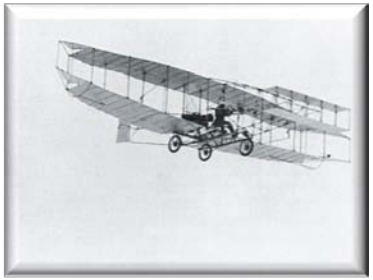
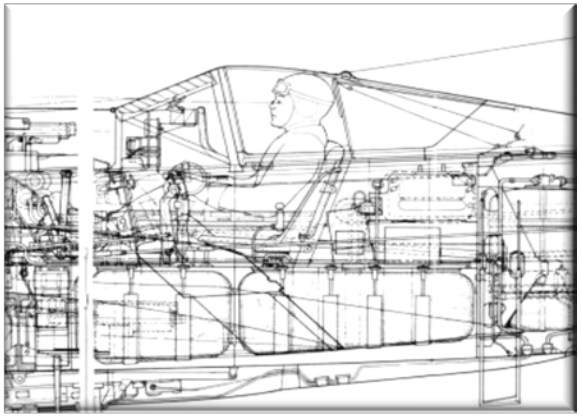
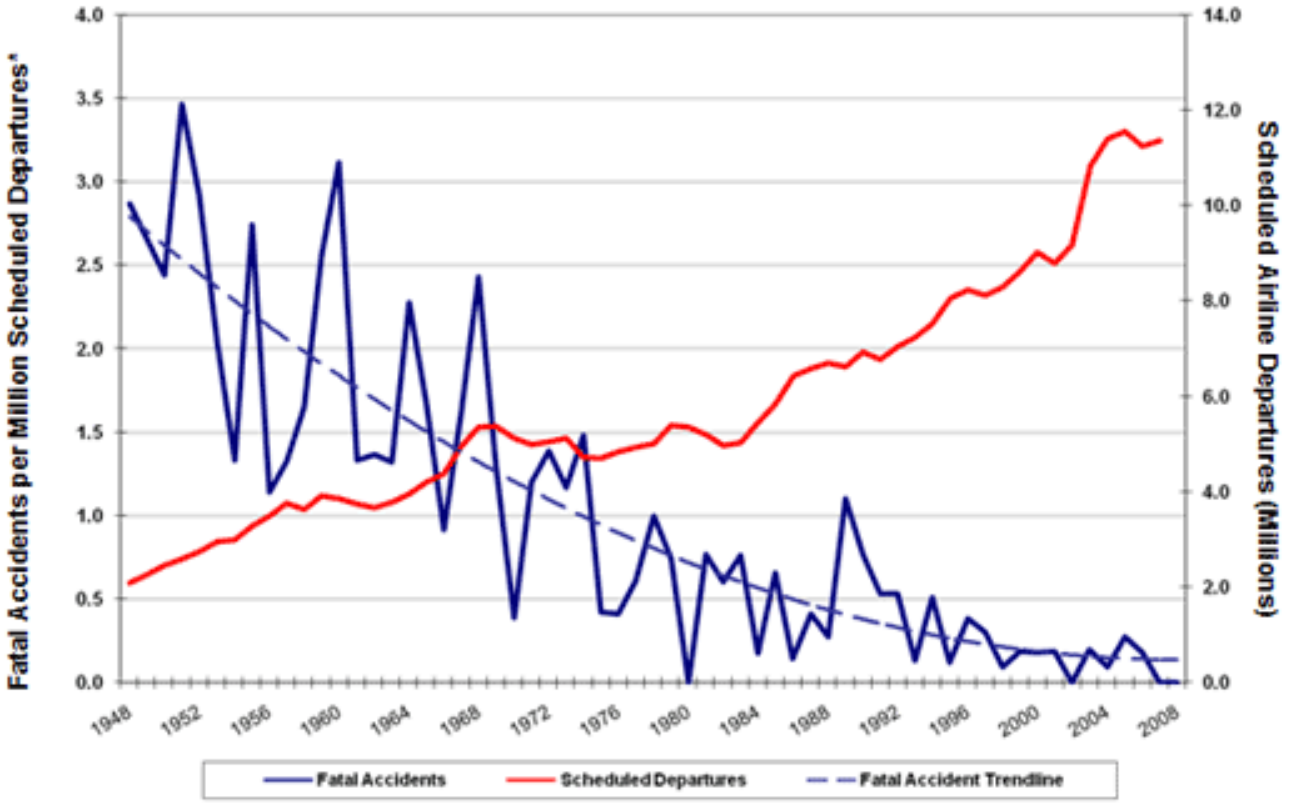






Challenge

With Each Decade, U.S. Airline Safety Has Improved



* Scheduled passenger and cargo operations of U.S. air carriers operating under 14 CFR 121; NTSB accident rates exclude incidents resulting from illegal acts

Source: National Transportation Safety Board (NTSB)

www.airlines.org/PublicPolicy/Testimony/Pages/testimony_5-13-09Senate.aspx&docid=qnHU9MAraY_WIM&w=550&h=403&ei=mdRbTvkrhLm3B8nyibgM&zoom=1&iact=rc&dur=62&page=2&tbnh=167&tbnw=216&start=50&ndsp=31&ved=1t:429,r:4,s:50&tx=110&ty=85

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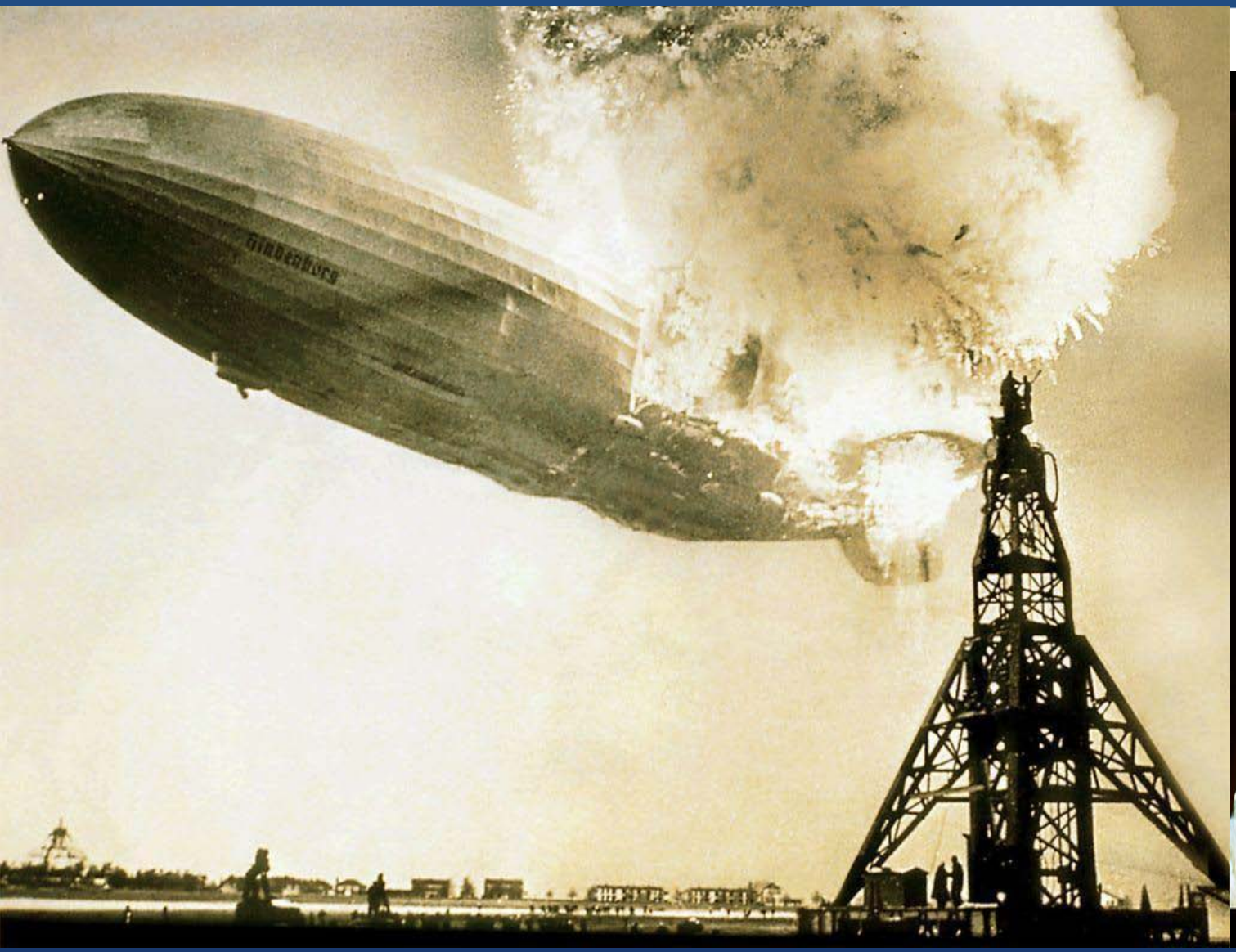
Stuff Happens



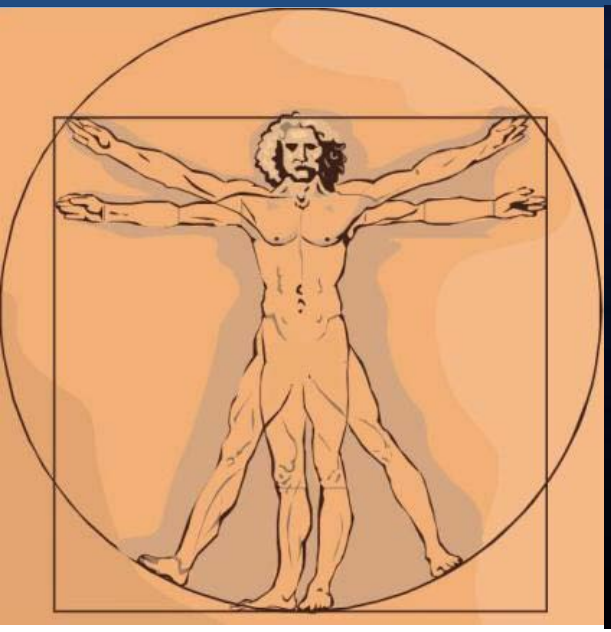
Human Performance Analysis

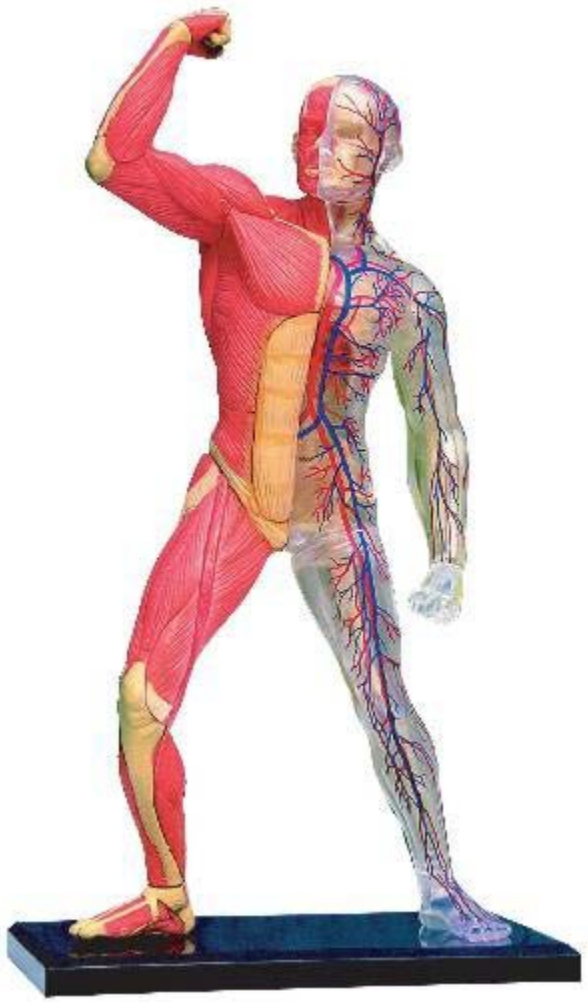
- We have not fully understood an event if we don't see the actors' actions as reasonable.

- The point of a human error investigation is to understand why people did what they did, not to judge them for what they did not do.

- The difference between an accident and a serious incident lies only in the result.

Human Performance





It is not a matter of if the automation fails, it is a matter of when.

Quick History of Human Performance

- Anthropometry
- Applied Psychology
- Cognitive Science
- Cognitive Psychology
- Engineering Psychology
- Aviation Psychology
- Ergonomics
- Experimental Psychology
- Human Factors
- Human Systems Integration
- Human Factors Psychology
- Industrial Design
- Industrial Engineering
- Industrial and Organizational Psychology
- Operations Research
- Physiological Psychology
- Psychology
- Statistics

Quick History

- Scientific understanding of the properties of human capability (Human Factors Science).
- The application of this understanding to the design, development and deployment of systems and services (Human Factors Engineering).
- Equipment design, Task design , Environmental Design, Training, Selection
- The art of ensuring successful application of Human Factors Engineering to a program (sometimes referred to as Human Systems Integration)

Human Factors

- Human factors involves the study of all aspects of the way humans relate to the world around them, with the aim of improving operational performance, safety, through life costs and/or adoption through improvement in the experience of the end user.
- The terms *human factors* and ergonomics have only been widely used in recent times; the field's origin is in the design and use of aircraft during WW II to improve aviation safety.

Human Factors Science

Human factors are sets of human-specific physical, cognitive, or social properties which either may interact in a critical or dangerous manner with technological systems, the human natural environment, or human organizations, or they can be taken under consideration in the design of ergonomic human-user oriented equipment.

Human Performance Improvement (HPI)

- **Human Performance Technology** (HPT), also known as **Human Performance Improvement** (HPI), "uses a wide range of interventions that are drawn from many other disciplines, including total quality management, process improvement, behavioral psychology, instructional systems design, organizational development, and human resources management" (ISPI, 2007).
- HPT is a systematic approach to improving individual and organizational performance (Pershing, 2006). HPT stresses a rigorous analysis of the requirements of organization, process and HP for new design and/or identifying the causes for performance gaps, and attempts to provide new designs and/or solutions to improve and sustain performance and to evaluate the results against the requirements.

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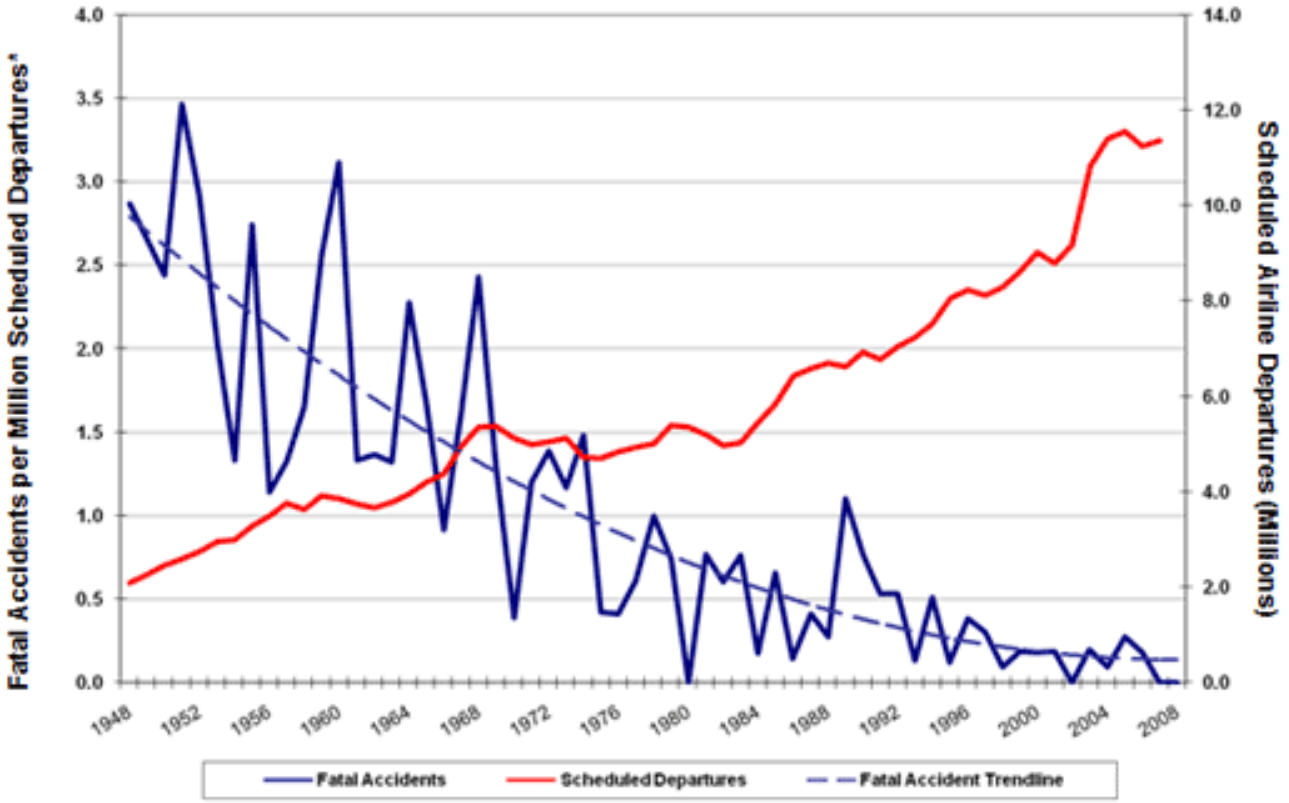

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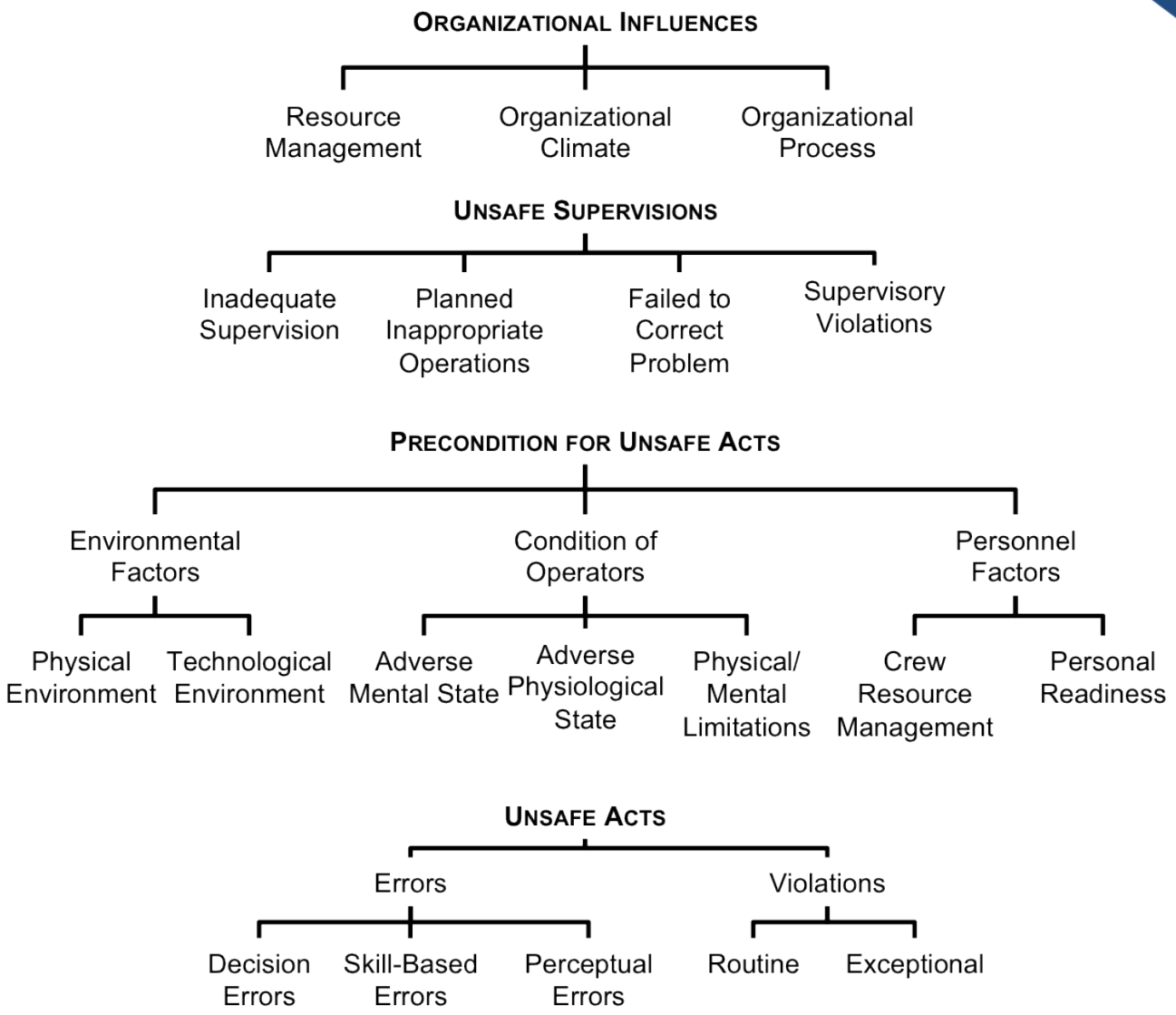
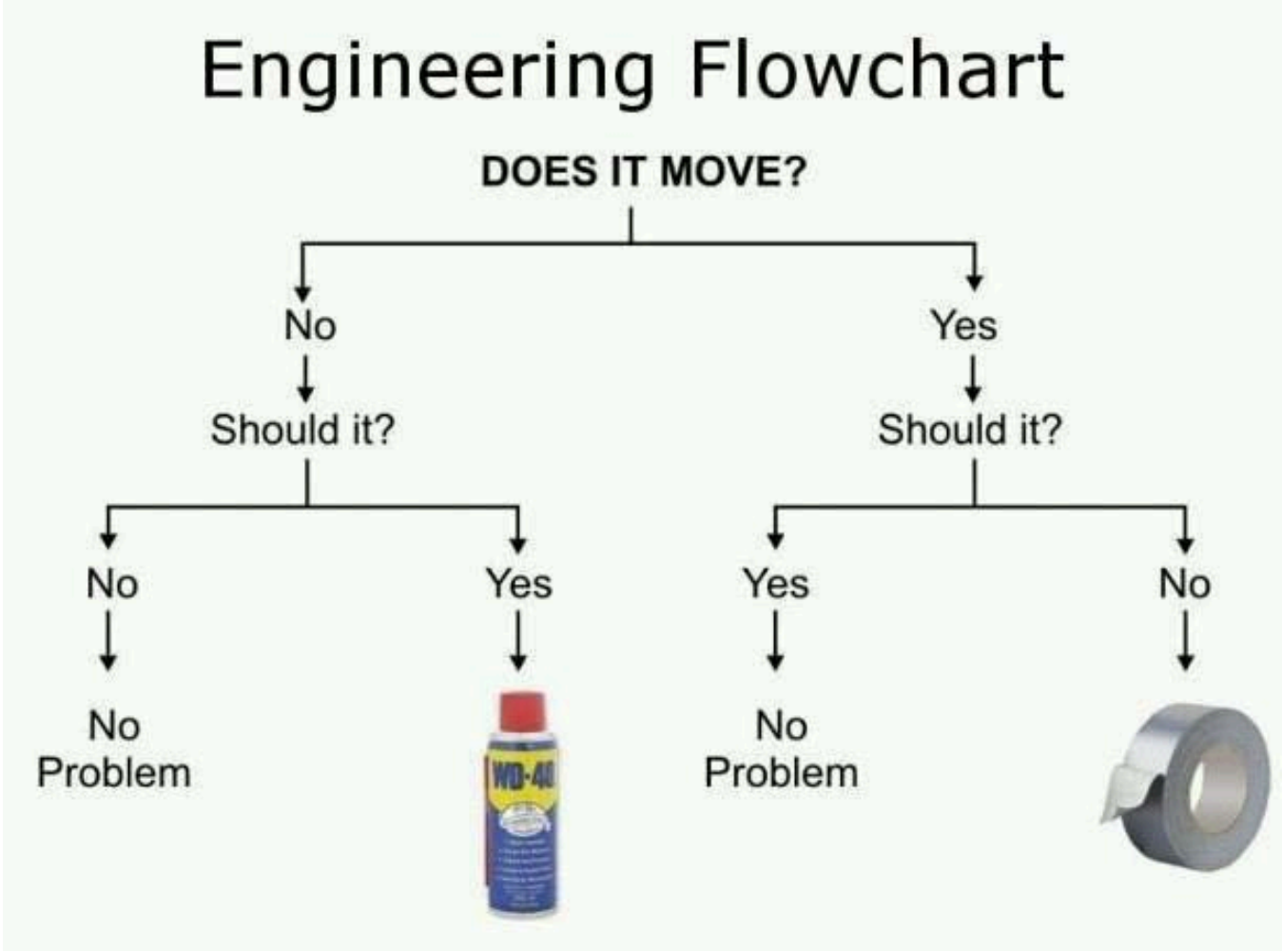
Human Factors Analysis and Classification



Flowchart for Human Performance



Sometimes it is a Human

Human Performance Tenets

- People are fallible, and all people make mistakes
- Error-likely situations are predictable, manageable, and preventable
- Individual behavior is influenced by organizational processes and values
- People achieve high levels of performance largely because of the encouragement and reinforcement received from leaders, peers, and subordinates
- Events can be avoided through an understanding of the reasons mistakes occur and application of the lessons learned from past events or near misses

Human Performance Tools

Human Performance Tools

- Two Minute rule
- Stop when unsure
- Self checking (also called STAR and touch STAR)
- Procedure use and adherence
- Three way communication
- Phonetic alphabet
- Pre-job brief
- Peer check
- Concurrent verification
- Independent verification
- Flagging operational barriers
- Place keeping
- Post job interview
- First Check

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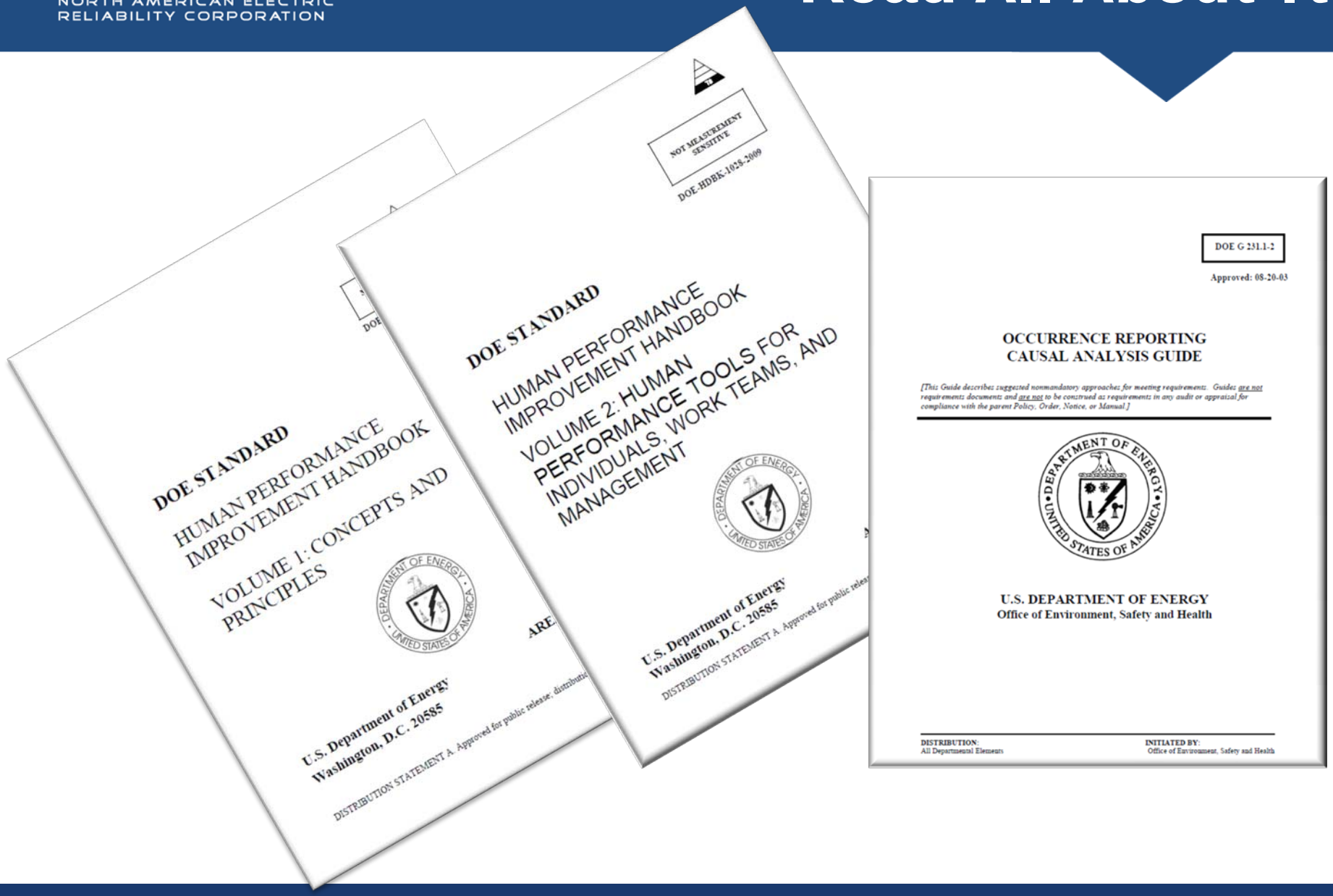
Read All About It



Five Questions

- Elegant simplicity
- Know thy user
- The rat is never wrong
- Actions not words
- You can’t afford not to know the truth

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Elegant simplicity

- Elegant simplicity
  - Russians and the US Space Program
  - How many tools in the box?
  - The tool shouldn't be harder than the task.
  - Surround the truth…it is out there somewhere…

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Know thy user

- Know thy user
  - Human Ingenuity
  - Only two hands, two eyes, see the pattern?
  - If you only have a minute, it only takes a minute…
  - Set me up for success…please…
  - Human nature

Signs

Darnell, M. J. (2006). Bad Human Factors Designs. Baddesigns.Com

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The rat is never wrong

- The rat is never wrong
  - Behaviorism
  - Not enforcing a policy is like not having a policy at all
  - Don’t have a rule that you aren’t going to enforce

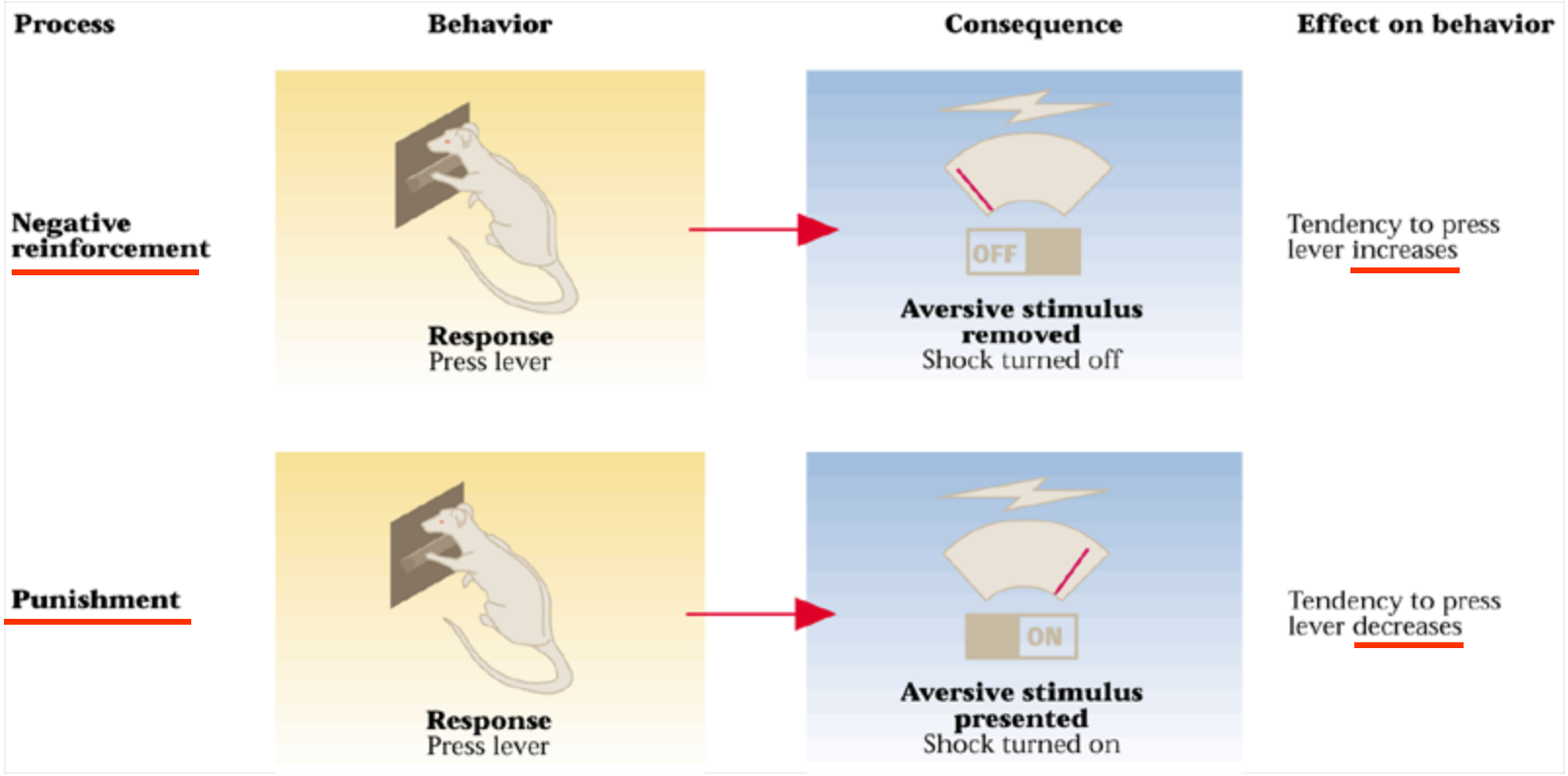
The rat is never wrong

Human behavior is shaped by interaction in the world…

- Punishment stops behavior
- Reinforcement shapes and sustains behavior

Silence is Consent

Punishment vs. Negative Reinforcement



Does the behavior increase or decrease?

Effective use of Punishment

Swift application

Consistency in punishment

Reduce or eliminate physical punishment

Explain the punishment

Alternative response available

Make punishment just severe enough to be effective

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Actions not words

- Actions not words
  - It is not important unless it is checked.
  - What is your story?
  - Are you telling your story up or down?
  - Live the dream

Tell your story…

Five Questions

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You can't afford not to know the truth

- You can't afford not to know the truth
  - Root cause
  - Just Culture
  - Near misses

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A Tale of Two Cylinders

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Or…When Good Pistons go Bad!

Why Root Cause Versus Apparent Cause?

- Facts
  - Jeep had 107k miles
  - Cylinders were fine…no abrasions (whew, got lucky)
  - Approx $2,500 to completely rebuild, same block just new pistons…
  - Just MTBF for pistons…or maybe not…

The rest of the story…

- Mechanic noticed some scalding on other pistons
- No history of ever over heating…
- Jeep was hit on right side, at 70k miles….
- Right fender was replaced, radiator and fan blade..no damage to engine block
- New Fan blade was installed backwards!!!!
- Jeep was running hotter than it should…just slightly…not enough to notice…and there was a new owner so there was no baseline…

Can Your Organization Handle the Truth?

"Before you tell the "truth" to the patient, be sure you know the "truth," and that the patient wants to hear it."

Journal of Chronic Diseases (1963)
Dr. Richard Clarke Cabot
(1868-1939)

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- Actions not words
  - It is not important unless it is checked.
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  - Root Cause

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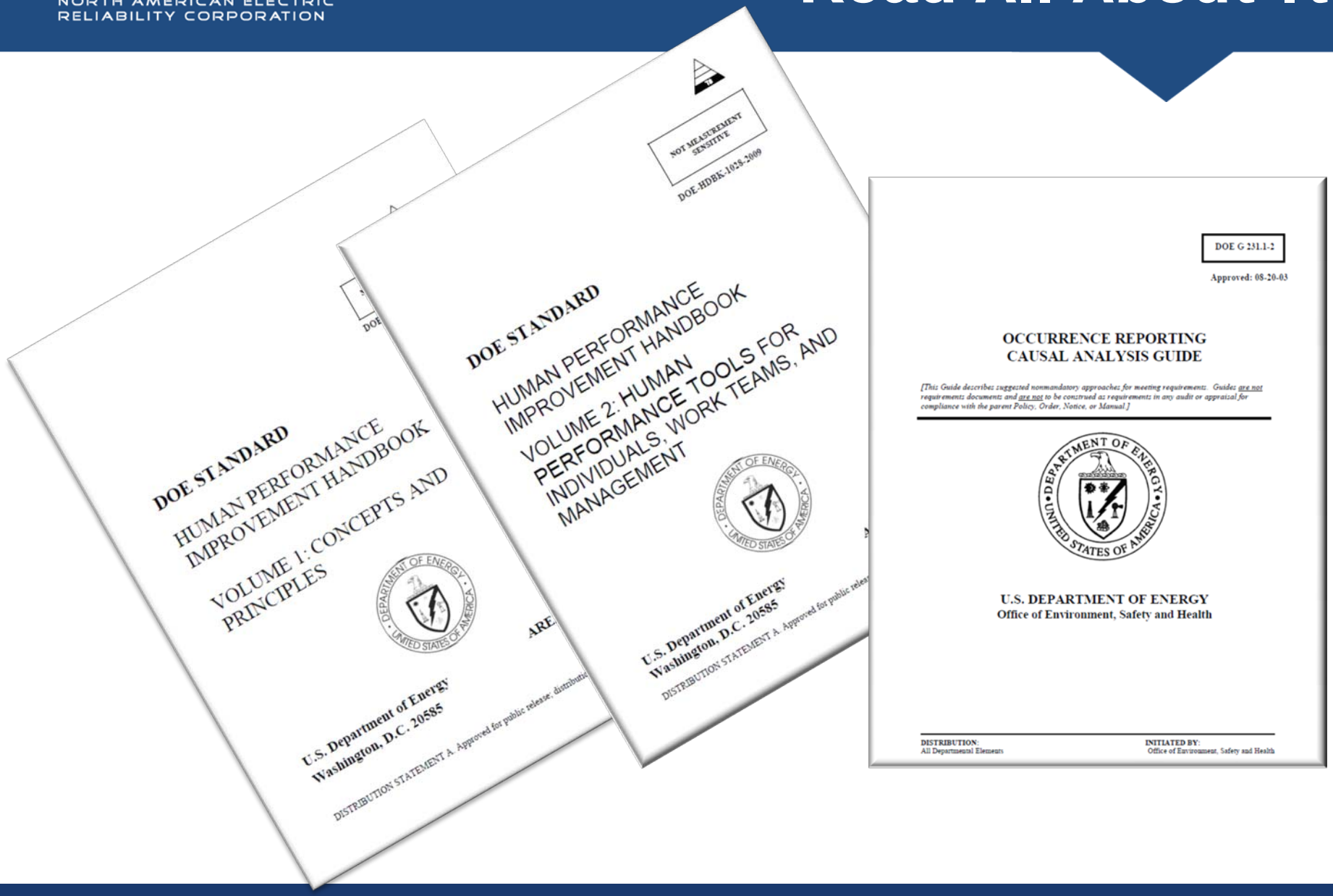

Six Human Considerations

- Attention
- Sensation
- Perception
- Cognition
- Decision making
- Action

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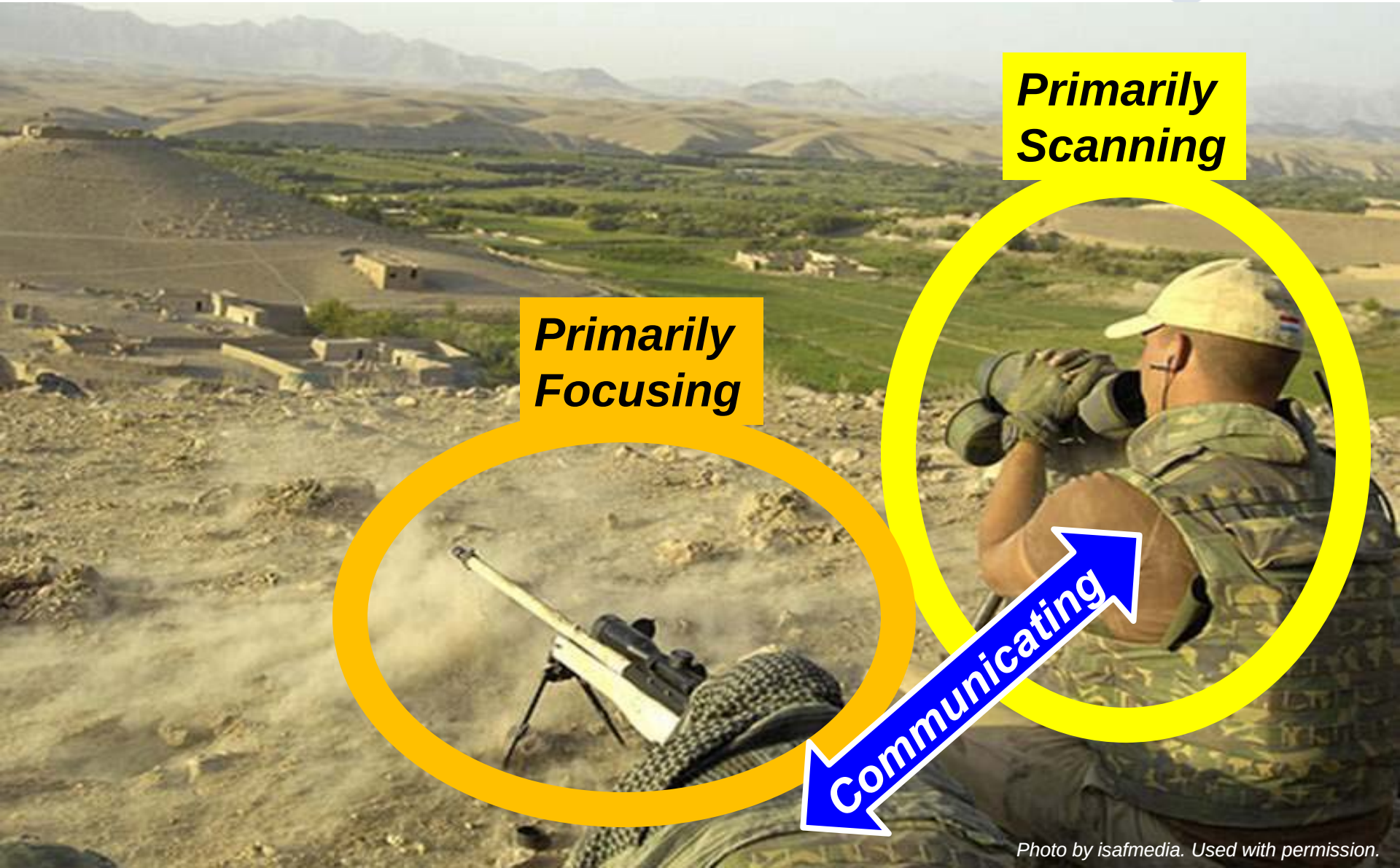
Attention

- Spotlight metaphor
- Each modality has its strengths
- Multiple Resource Theory

Photo by isafmedia. Used with permission.

*The sniper's mental state is **Focused**. The spotter's mental state is **Scanning**. Both communicate effectively with each other. The result? Situational Awareness that you can bet your life on.*



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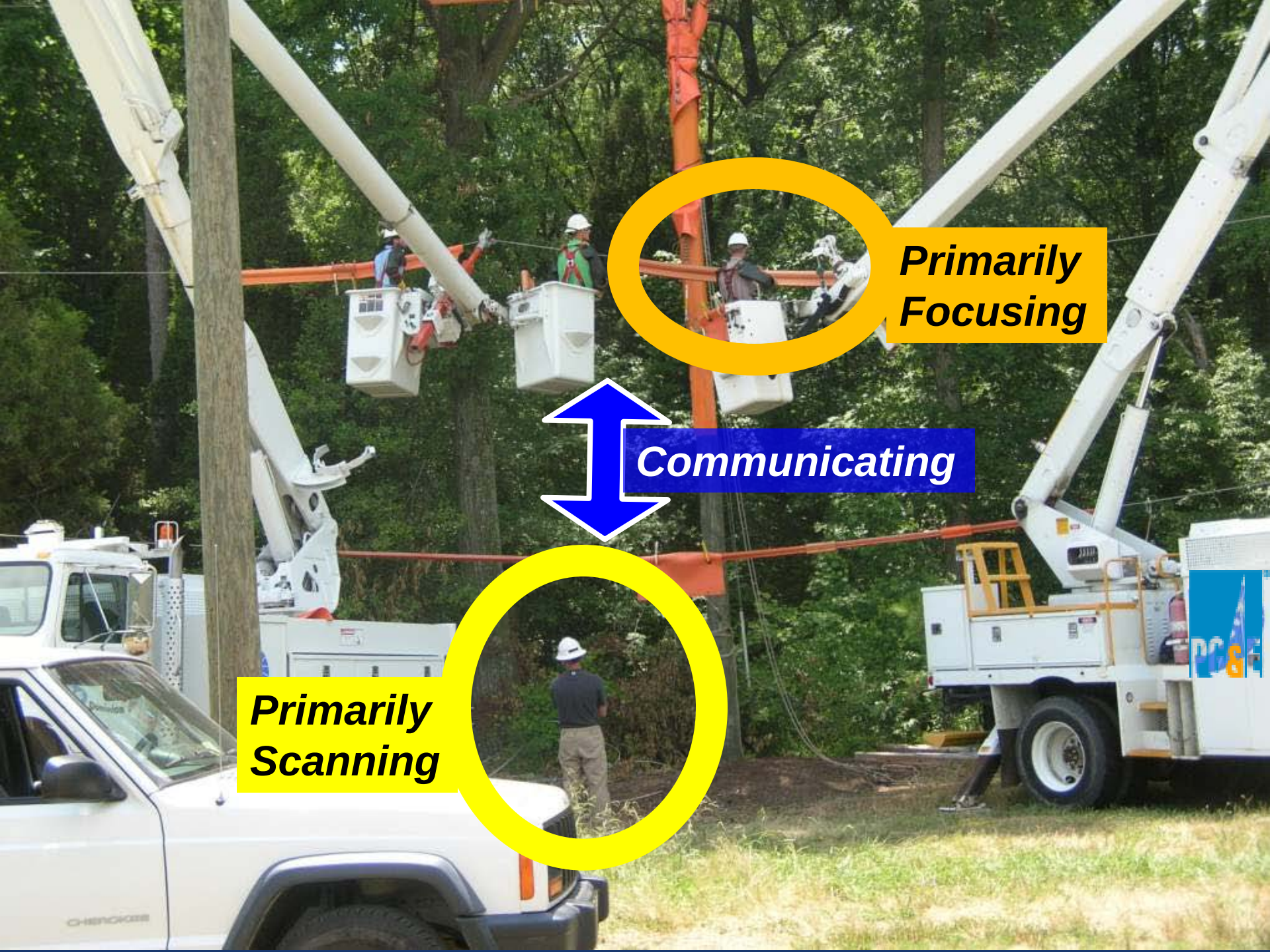
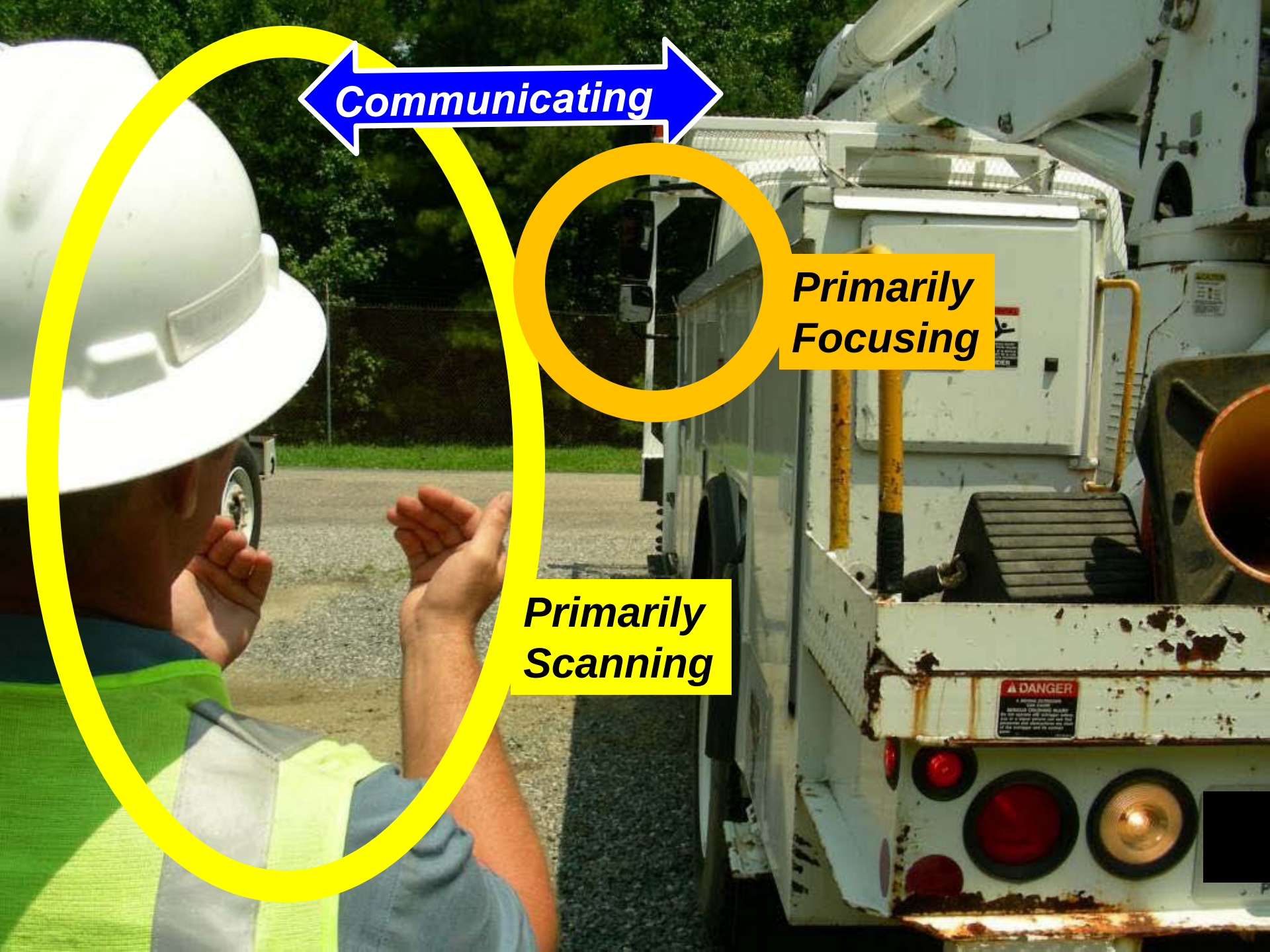

Primarily Focusing
Communicating
Primarily Scanning


DANGER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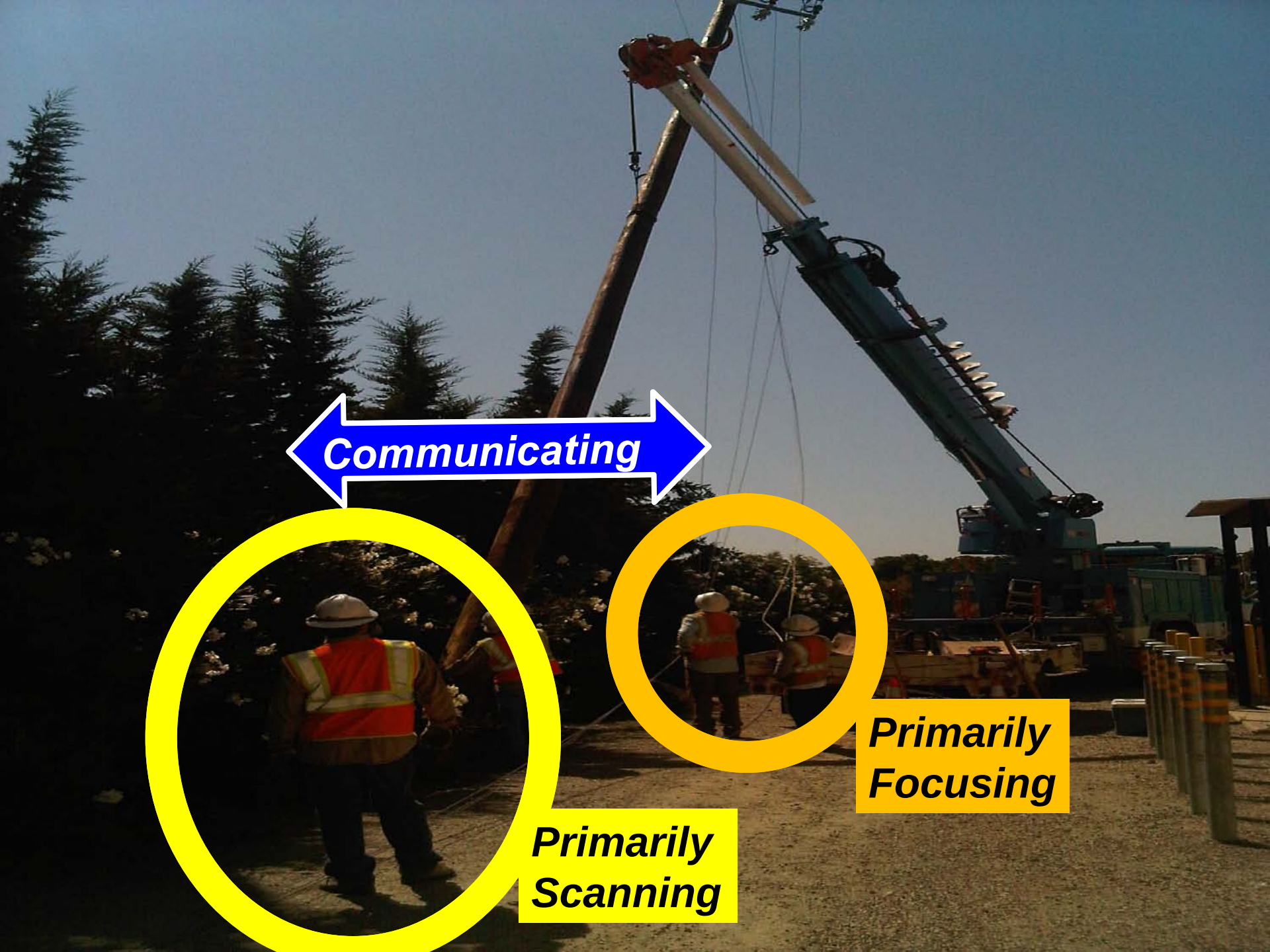
Communicating
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Sensation

- Human limitations
- Absolute Threshold
- Physiological Psychology


2300
7B
2300
7C
2300
7A


ABB

Hindsight is 20/20

Regular Insulin **N (for NPH Insulin).**


2300
7A

Six Human Considerations

- Attention
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Perception

- Perception is Reality
- Bottom Up versus Top Down
- Expectations

What about the science…

- CAPITAL LETTERS
  - WORD
  - EASIER
  - FASTER
  - BUT BECOMES MORE DIFFICULT WHEN PART OF A SENTENCE BECAUSE…
  - We use context to read and the shape matters

Hindsight is 20/20

Regular Insulin **N (for NPH Insulin).**


2300
7A

Communicating

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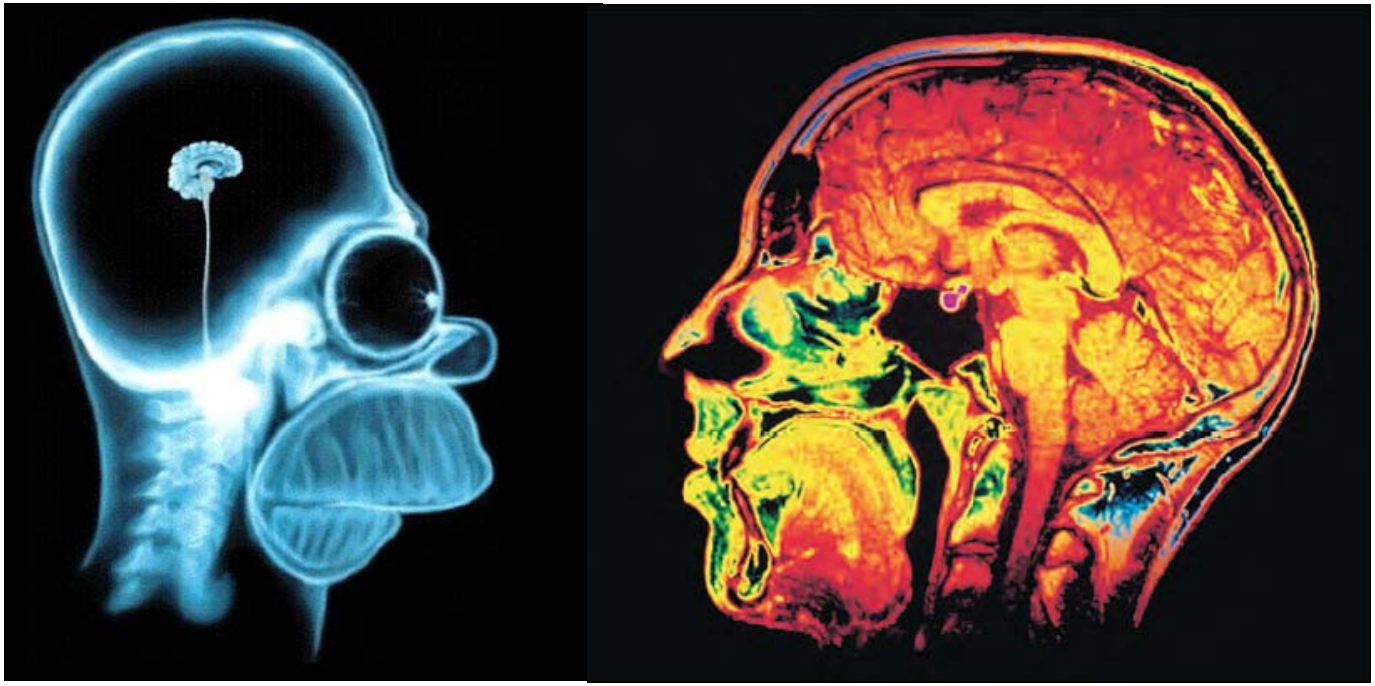
Cognition



Biological Bases for Behavior

Cognition

- What are you thinking about?
- Working memory versus Long Term Memory
- Experts versus Novices

Limited Working Memory

- Mind's short-term memory is the “workbench” for problem solving and decision-making.
- Actively involved during learning, storing, and recalling information.
- Often expressed as 7+ or -2.
- Limitations of short-term memory are at the root of forgetfulness; forgetfulness leads to omissions when performing tasks.
- Applying place-keeping techniques while using complex procedures compensates for this human limitation.

Working Memory

- Size 7 +/- 2 chunks
- VAFBICIADODIRA
  - VA FBI CIA DOD IRA
- Area codes
- Credit card numbers are divided into chunks….
- Expert memories…or really good chunkers

Doubting me still….

- Alphabet
  - 26 letters…
  - or 8 chunks?

ABCD EFG HIJK LMNOP

QRS TUV WX YZ

Mental Model

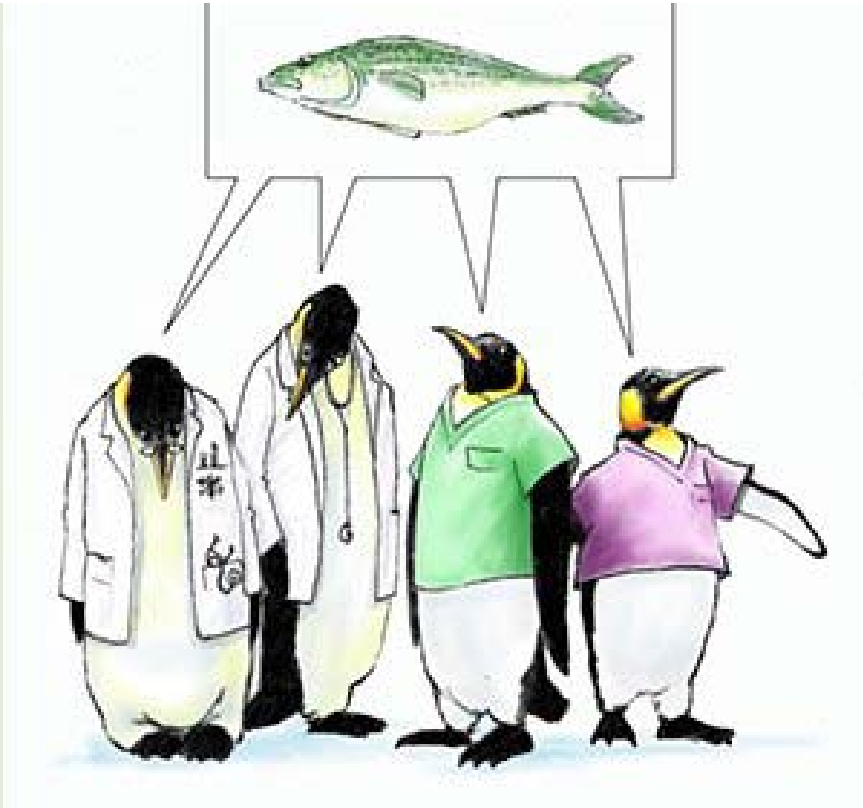
- One's understanding of a system, how it operates, its characteristics, performance parameters, couplings within itself and other systems and how one interacts with it.

- It is a representation of the surrounding world, the relationships between its various parts and a person's intuitive perception about his or her own acts and their consequences.

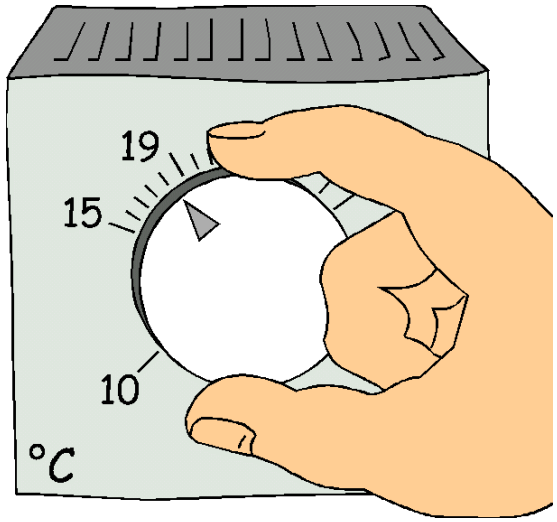
- Our mental models help to shape our behavior and define our approach to solving problems (a personal algorithm) and carrying out tasks, especially within a system.

- Mental models are like opinions, they can be partially or completely right or wrong, complete or incomplete and most often are unique for each individual.

Perfectly aligned mental model



Improper Mental Model Example



Some people believe that you can heat/cool a room faster by setting the thermostat to a higher/lower temperature than you really want, as if the thermostat were a valve for the heating/cooling system that lets more heat/cool air into the room the higher/lower you set it. In fact, the thermostat is simply an on/off switch for the heat/cool. It turns on as long as the room temperature is below/above the thermostat setting, and turns off when the thermostat setting is reached.

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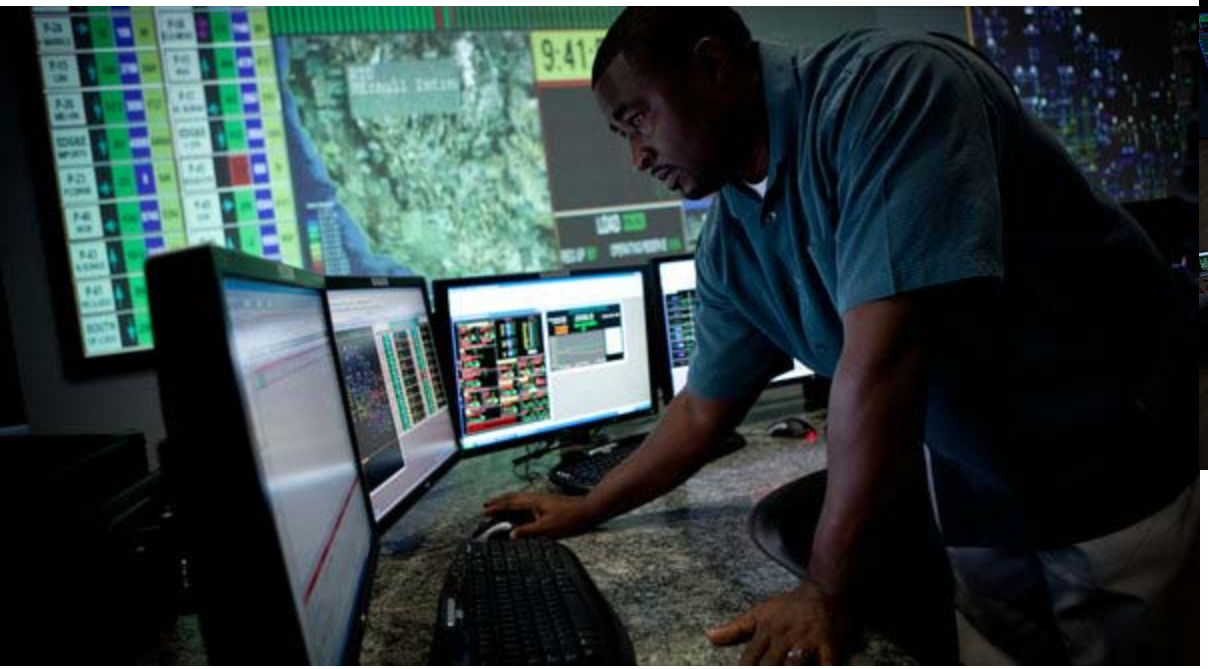
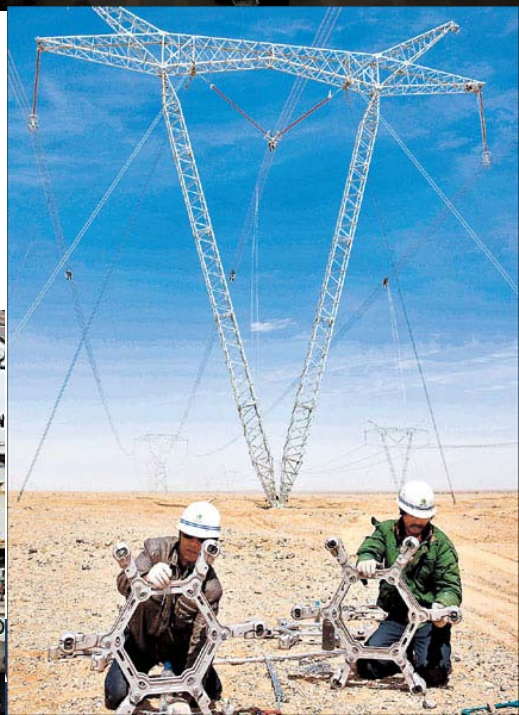
Contextual Task Analysis



Max Whittaker for The New York Times

Hydro



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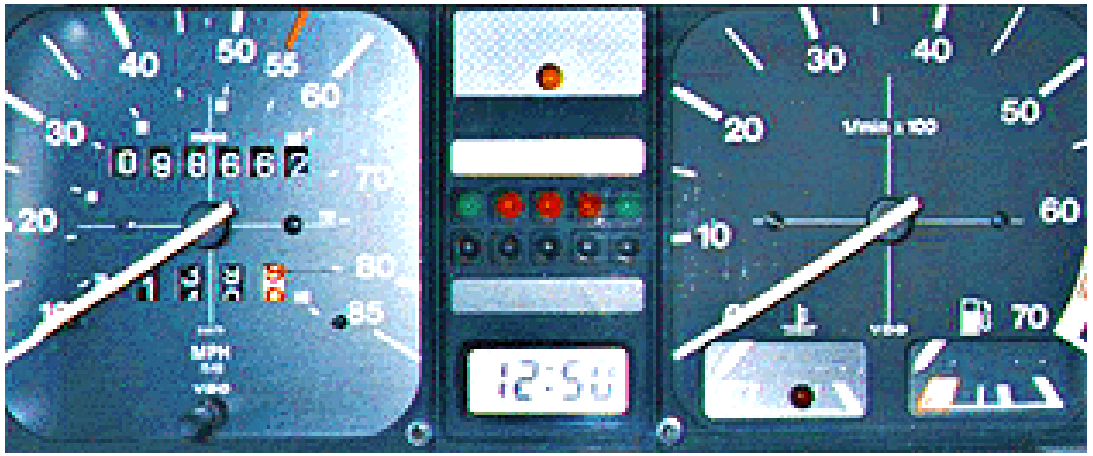
Decision Making

- Information overload
- Experts vs Novices
- Heuristics and Biases

Signs



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Information Overload

Heuristics and Biases

• **Avoidance of Mental Strain –** Humans are reluctant to engage in lengthy concentrated thinking, as it requires high levels of attention for extended periods. Thinking is a slow, laborious process that requires great effort. People tend to look for familiar patterns and apply well-tried solutions to a problem. The mental biases and heuristics, or shortcuts, often used to reduce mental effort and expedite decision-making include:

• **Assumptions –** A condition taken for granted or accepted as true without verification of the facts.

• **Habit –** An unconscious pattern of behavior acquired through frequent repetition.

Heuristics and Biases

Confirmation bias – The reluctance to abandon a current solution—to change one's mind—in light of conflicting information due to the investment of time and effort in the current solution. This bias orients the mind to "see" evidence that supports the original supposition and to ignore or rationalize away conflicting data.

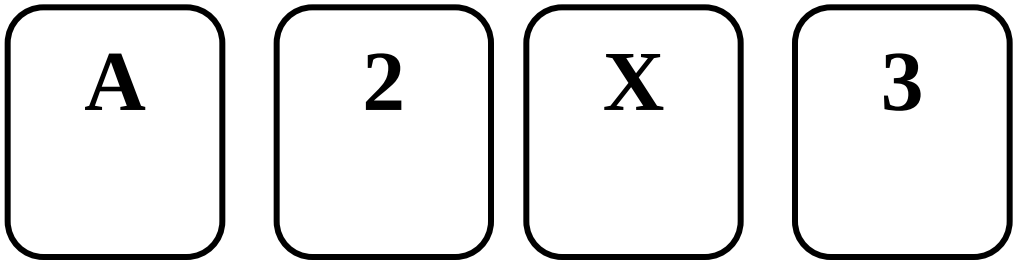
Similarity bias – The tendency to recall solutions from situations that appear similar to those that have proved useful from past experience.

Frequency bias – A gamble that a frequently used solution will work; giving greater weight to information that occurs more frequently or is more recent.

Availability heuristic – The tendency to settle on solutions or courses of action that readily come to mind and appear satisfactory; more weight is placed on information that is available (even though it could be wrong).

Confirmation Bias

Below are four cards. Each card has a letter on one side and a digit on the other side. You are to verify whether or not the following rule is true: If there is a vowel on one side, there is an even number on the other side. You should verify this rule by turning over 2 cards. Which cards do you choose?

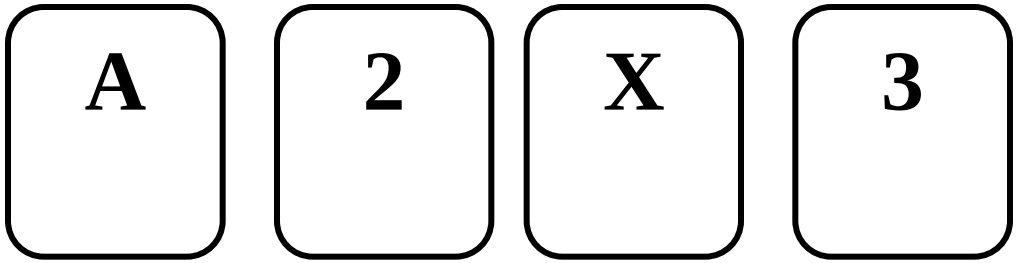


Confirmation Bias Continued

Verify Rule: If there is a vowel on one side, there is an even number on the other side.

Answer: A and 3

If there's a vowel on the other side of the 3 card then the rule is dead



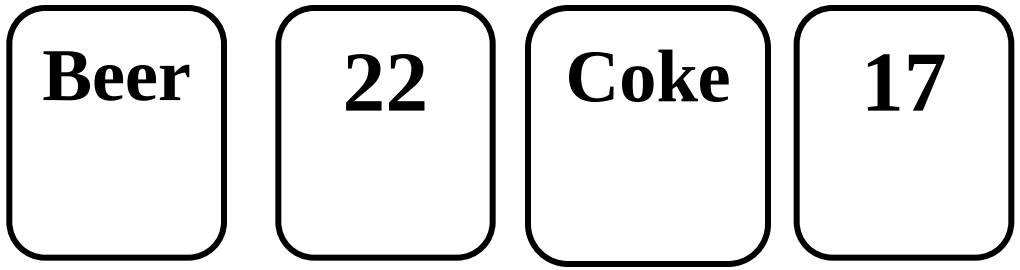
Most people choose "A" and "2". Why? Because of a confirmation bias.

Confirmation Bias Continued

It would seem, then that we stink at logic.

But . . . .

IF A PERSON IS DRINKING BEER, THEN THE PERSON MUST BE OVER 21 YEARS OF AGE. Select the 2 cards that you definitely need to turn over to determine whether or not they are violating the rule.



Confirmation Bias Continued

- People generally seek evidence that will confirm, not falsify, a hypothesis
- Solve problems and syllogisms by applying information to pre-existing schemas
- More relevant = easier to solve
- The Bottom Line: People are not logic machines who can plug any problem into a logical formula

Availability Heuristic

- Availability Heuristic
  - estimating the likelihood of events based on their availability in memory
  - if instances come readily to mind (perhaps because of their vividness), we presume such events are common
  - We tend to be overly influenced by events that come easily to mind

Availability Heuristic

Is the letter “k” most likely to occur in the first position of a word or the third position?

Availability Heuristic

- **Answer:** "k" is 2-3 times more likely to be in the third position
- Most people respond that "k" is more frequent in the first position. Why does this occur?
- Because it is easier to recall words starting with "k" , people overestimate the number of words starting with "k"

Availability Heuristic

Which of the following are more frequent causes of death in the U.S.?

Rate how confident you are in your choice on a scale from 0 (guessing) to 100 (absolutely certain that your choice is correct).

1. All accidents or strokes?
   confidence rating?
2. Electrocution or asthma?
   confidence rating?
3. Homicide or diabetes?
   confidence rating?
4. Lightning or appendicitis?
   confidence rating?
5. Drowning or Leukemia?
   confidence rating?

Availability Heuristic

Which of the following are more frequent causes of death in the U.S.?

1. All accidents (55,000) or strokes (102,000)
2. Electrocution (500) or asthma (920)
3. Homicide (9200) or diabetes (19,000)
4. Lightning (52) or appendicitis (440)
5. Drowning (3600) or Leukemia (7100)

Six Human Considerations

- Attention
- Sensation
- Perception
- Cognition
- Decision making
- Action

Moving slow to move fast

- All human performance tools deliberately slow things down to ultimately speed things up by avoiding delays that accompany events triggered by active errors.

- When used conscientiously, these tools give the individual more time to think about the task at hand; about what is happening, what will happen, and what to do if things do not go as expected.

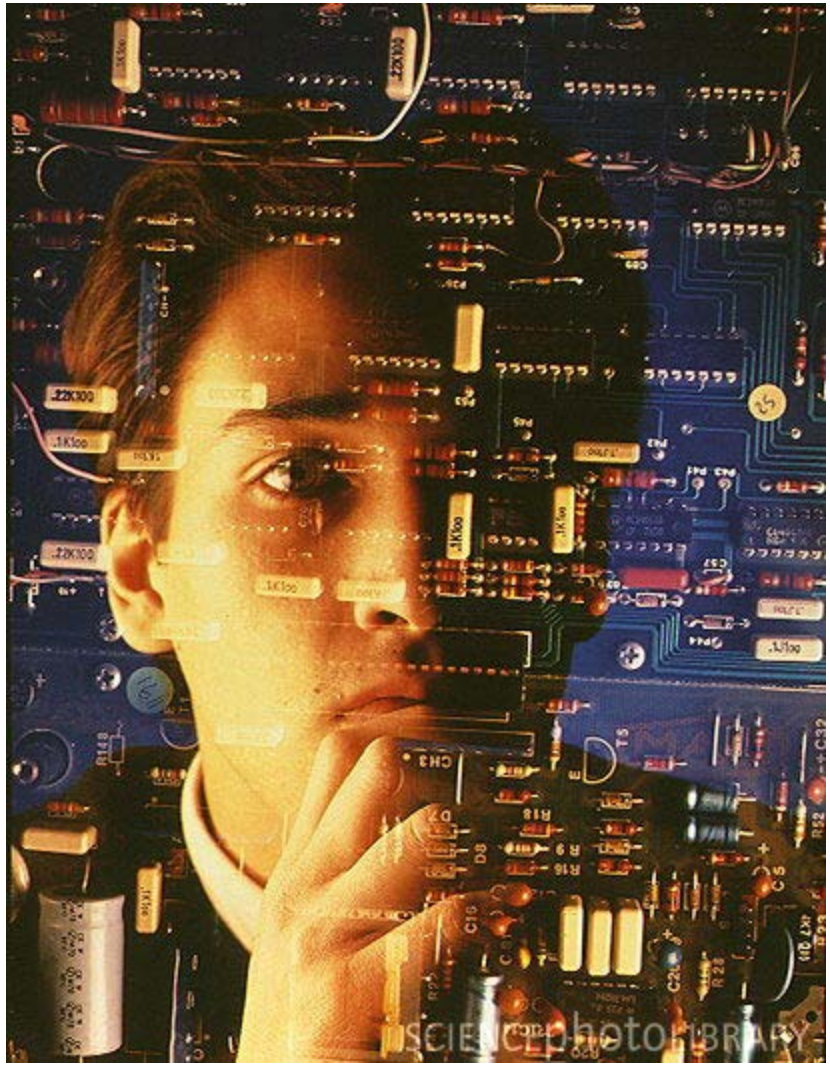
Action

Rasmussen's Classifications

- Human Error Classifications
  - Skill Based
  - Rule Based
  - Knowledge Based
- Driving example: Often times a human will operate in all three levels, going back and forth in a single event.

Improper Mental Model (cont)

- Skill - Does not really effect
- Rule – Usually not a factor
- Knowledge – Real problem



Six Human Considerations

- Attention
- Sensation
- Perception
- Cognition
- Decision making
- Action

Six Human Considerations

- Attention
- Sensation

} Scan

- Perception
- Cognition

} Focus

- Decision making
- Action

} Act

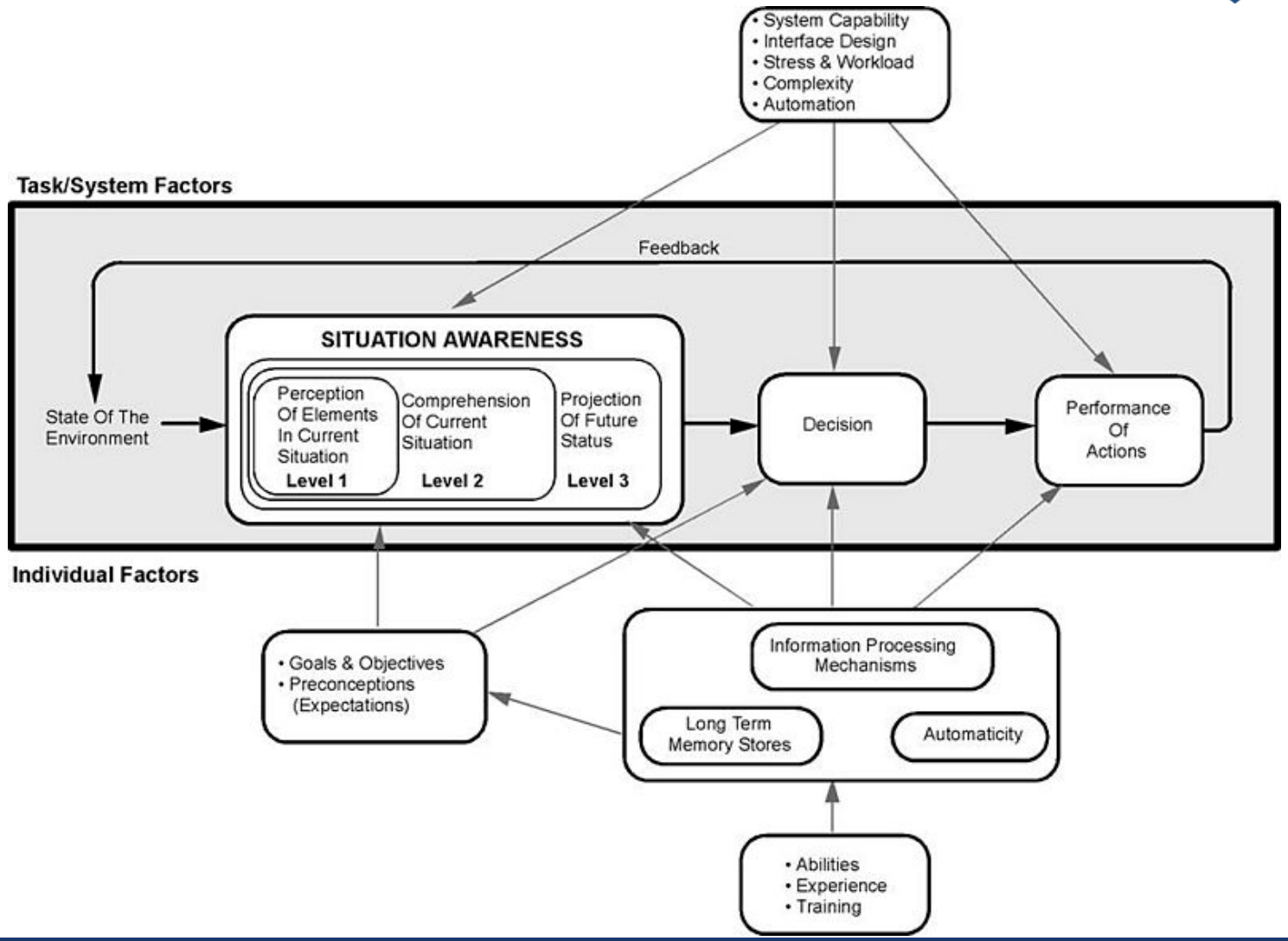
Situational Awareness

- Situational awareness is defined as the accuracy of a person's current knowledge and understanding of actual conditions compared to expected conditions at a given time. DOE

- The perception of the elements in the environment within a volume of time and space, the comprehension of their meaning and the projection of their status in the near future.

Endsley, M. R. (1995). Toward a theory of situation awareness in dynamic systems. Human Factors, 37(1), 32-64.

Situational Awareness



http://en.wikipedia.org/wiki/Situation_awareness

Stress

• Stress is the body's mental and physical response to a perceived threat(s) in the environment. It is the perception one has about his or her ability to cope with the threat.

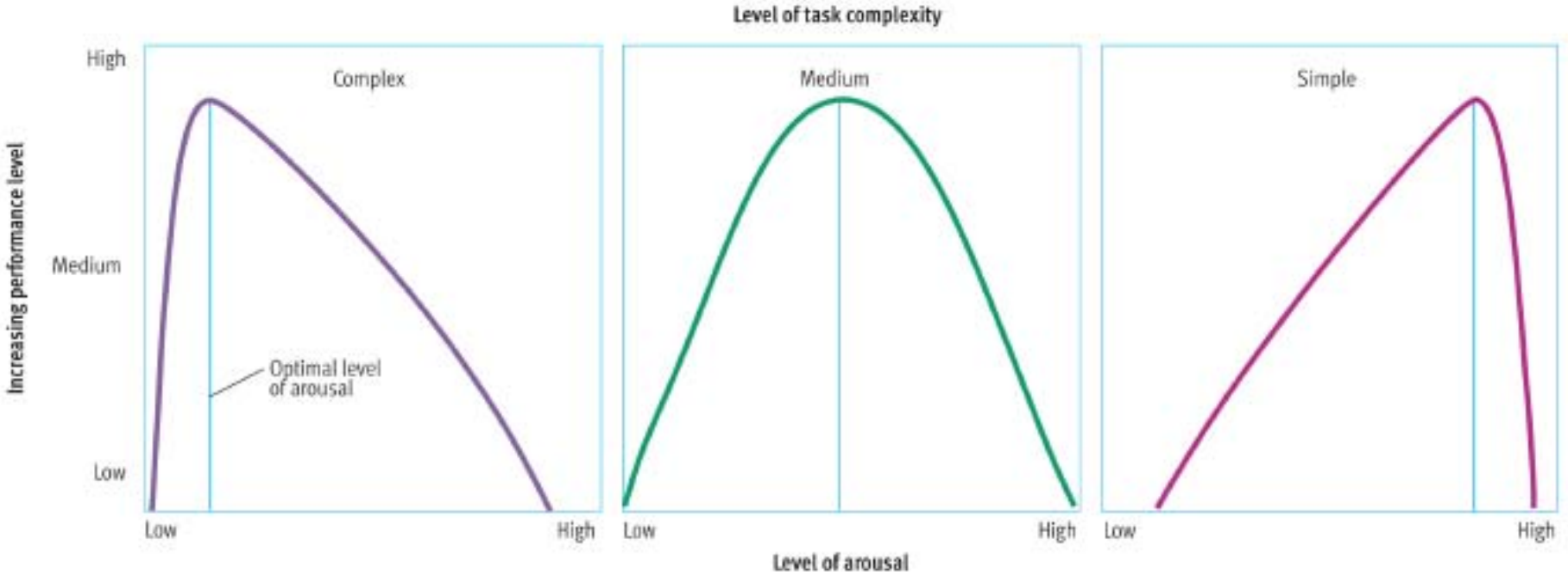
• Stress in itself is not a bad thing. Some stress is normal and healthy. Stress may result in more focused attention, which in some situations could actually be beneficial to performance.

• The problem with stress is that it can accumulate and overpower a person, thus becoming detrimental to performance. Stress increases as familiarity with a situation decreases. It can result in panic, inhibiting the ability to effectively sense, perceive, recall, think, or act. Anxiety and fear usually follow when an individual feels unable to respond successfully.

• Along with anxiety and fear, memory lapses are among the first symptoms to appear. The inability to think critically or to perform physical acts with accuracy soon follows.

Is stress always a bad thing?

emotional arousal vs task performance



Inverted-U Hypothesis

TWIN - Error Precursors

Task Demands	Work Environment
Time pressure (in a hurry)	Distractions / Interruptions
High workload (memory requirements)	Changes / Departure from routine
Simultaneous, Multiple tasks	Confusing displays / control
Repetitive actions (monotony)	Work - arounds
Unclear goals, roles, or responsibilities	Unexpected equipment conditions
Lack of or unclear standards	Back shift or recent shift change
Complex / High information flow	
Individual Capabilities	**Human Nature**
Unfamiliarity with task (first time)	Stress
Lack of knowledge (faulty mental model)	Habit patterns
Imprecise communication habits	Assumptions
Lack of proficiency; inexperience	Complacency / over confidence
Overzealousness for safety critical task	Inaccurate risk perception
Illness or fatigue – Fitness for duty	Communication shortcuts
Lack of big picture	

Latent Organizational Weaknesses

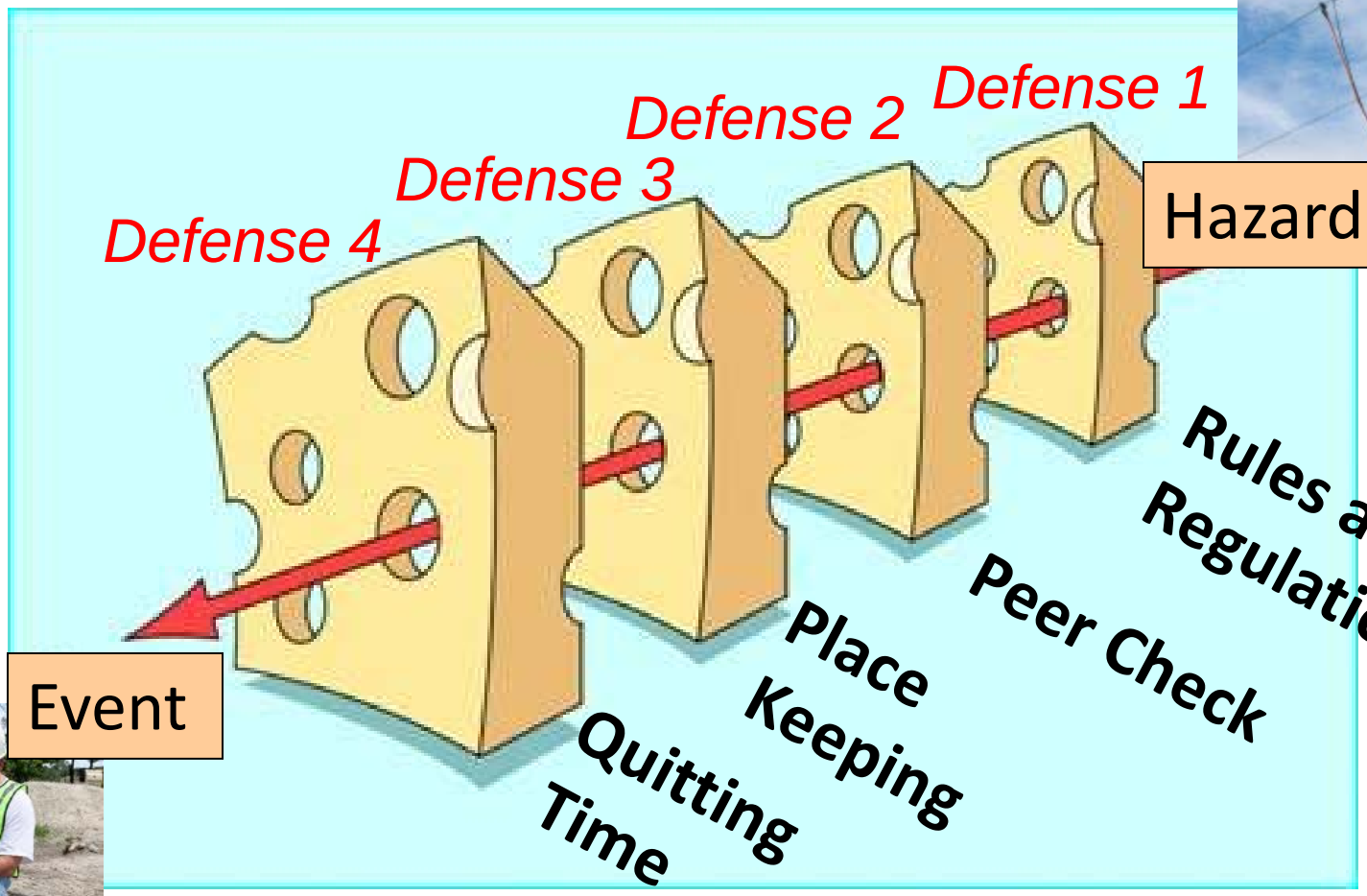
Pre-Job Briefing	**Values & Norms**
Communications – Oral & Written	**Maintenance Processes**
Work Planning & Scheduling	**Procedure Development**
Controls, Measures and Monitoring	**Goals & Priorities**
Design & Modifications	**Organizational Structure**
Task Structure	**Roles & Responsibilities**
Written Guidance: **Rules, Policies and Practices**	**Training & Qualification**

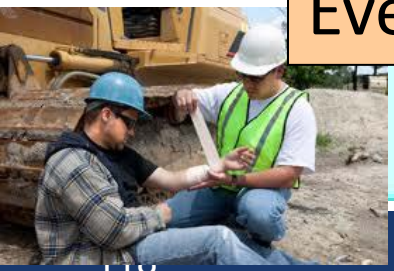
- *A review of the INPO industry event data base reveals that* ***events occur more often due to error-prone tasks and error-prone work environments than from error-prone individuals***
- *Error-prone tasks and work environments are typically created by latent organizational weaknesses.*

Source: Reason – 1991 (modified)

Defenses

But it is possible that under the <u>wrong set</u> of circumstances, an event could occur….





Set Me Up for Success

- **Those things that "set-up" a mistake to happen**
  - **Task demands are greater than the worker's abilities**
  - **Confusing conditions make the job harder**
  - **New techniques not used before**
  - **Mental shortcuts**
  - **Lack-of or unclear standards**
  - **Illness / Fatigue**

- **Distractions**
- **Interruptions**
- **Unplanned changes**

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Common Error Precursors

Task Demands	Individual Capabilities
o **High workload** (memory requirements)	o **Unfamiliarity with task / First time**
o **Time pressure** (in a hurry)	o **Lack of knowledge** (faulty mental model)
o **Simultaneous, multiple tasks**	o **New technique not used before**
o **Repetitive actions / Monotony**	o **Imprecise communication habits**
o **Irrecoverable actions**	o **Lack of proficiency; Inexperience**
o **Interpretation requirements**	o **Unsystematic problem-solving skills**
o **Unclear goals, roles, or responsibilities**	o **"Can do" attitude for safety-critical task**
o **Lack of or unclear standards**	o **Illness or fatigue; general health**
Work Environment	**Human Nature**
o **Distractions / Interruptions**	o **Stress**
o **Changes / Departure from routine**	o **Habit patterns**
o **Confusing procedure / Vague guidance**	o **Assumptions**
o **Confusing displays / controls**	o **Complacency / Overconfidence**
o **Work-arounds / OOS instrumentation**	o **Mind set (intentions)**
o **Hidden system responses**	o **Inaccurate risk perception**
o **Unexpected equipment conditions**	o **Mental shortcuts or biases**
o **Lack of alternative indication**	o **Limited short-term memory**

NERC CCAP

North American Electric Reliability Corporation Causal Code Assignment Process

An event and data analysis tool

The Reliability Risk Management Group (RRM) has designed, developed, and implemented the North American Energy Reliability Corporation (NERC) Causal Code Assignment Process to allow accurate, efficient trending and subsequent analysis of events for sharing and providing a cooperative forum focused on improving the reliability of the Bulk Power System (BPS).

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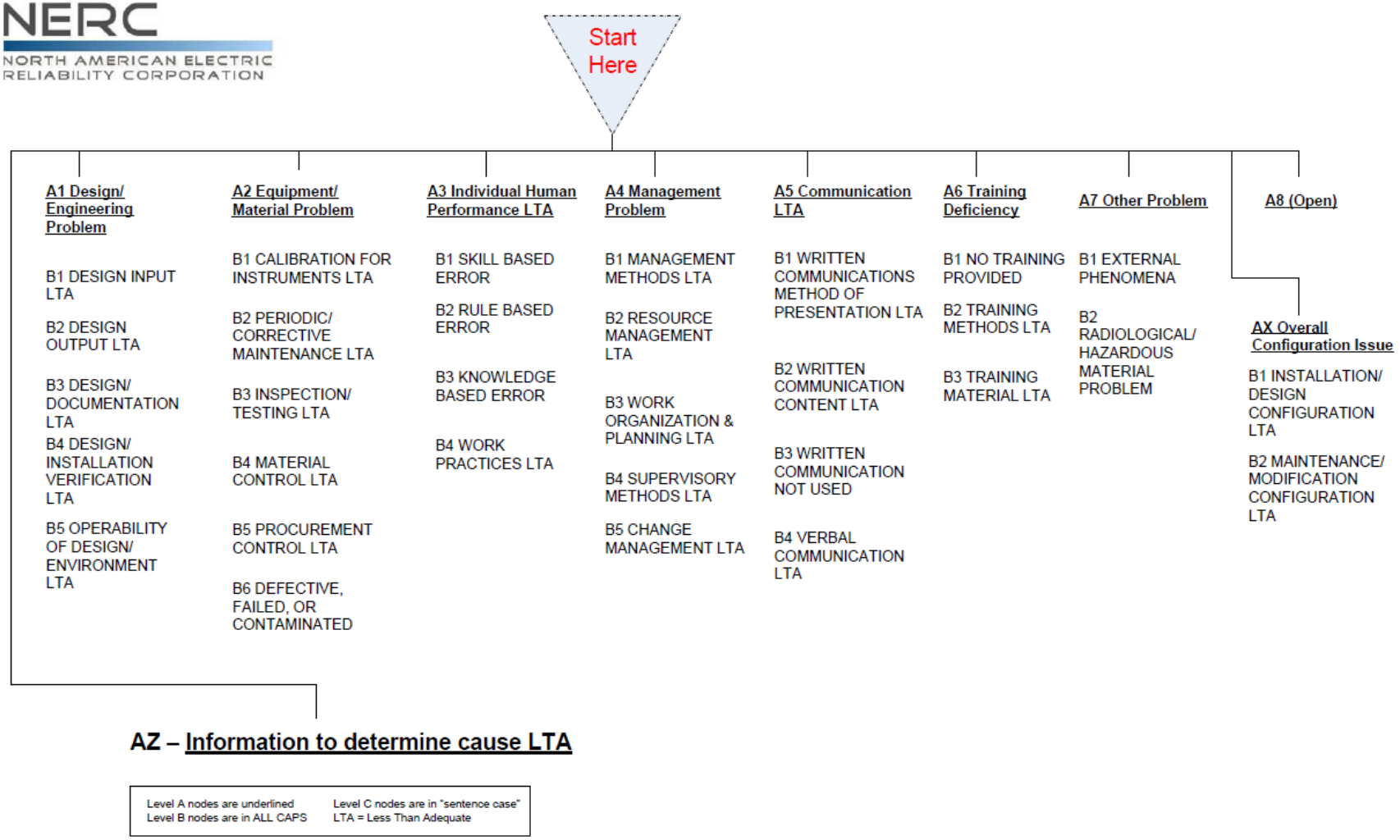

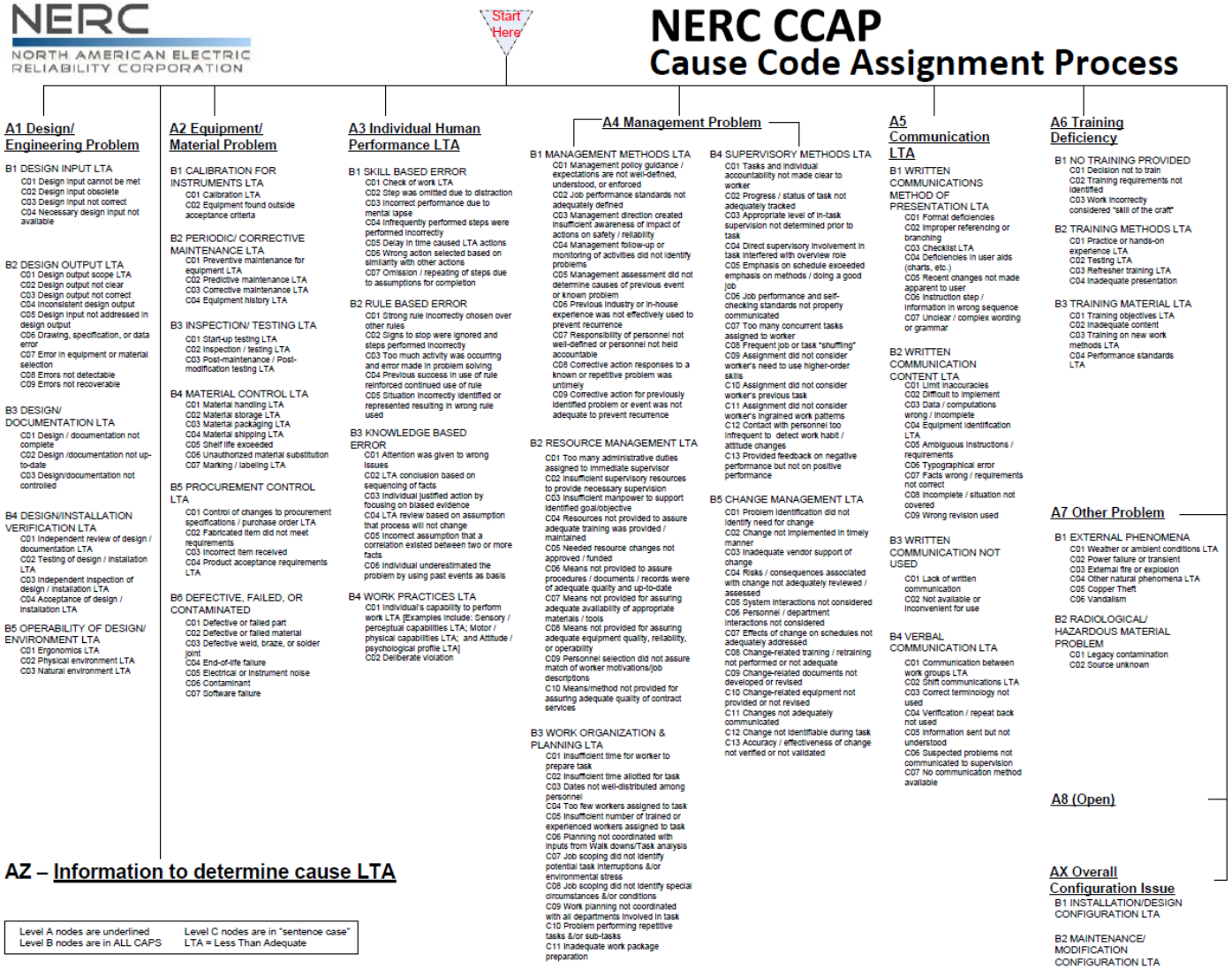
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Start Here
NERC CCAP
Cause Code Assignment Process
A1 Design/ Engineering Problem
B1 DESIGN INPUT LTA
C01 Design input cannot be met
C02 Design input obsolete
C03 Design input not correct
C04 Necessary design input not available
B2 DESIGN OUTPUT LTA
C01 Design output scope LTA
C02 Design output not clear
C03 Design output not correct
C04 Inconsistent design output
C05 Design input not addressed in design output
C06 Drawing, specification, or data error
C07 Error in equipment or material selection
C08 Errors not detectable
C09 Errors not recoverable
B3 DESIGN/ DOCUMENTATION LTA
C01 Design / documentation not complete
C02 Design /documentation not up-to-date
C03 Design/documentation not controlled
B4 DESIGN/INSTALLATION VERIFICATION LTA
C01 Independent review of design / documentation LTA
C02 Testing of design / installation LTA
C03 Independent inspection of design / installation LTA
C04 Acceptance of design / installation LTA
B5 OPERABILITY OF DESIGN/ ENVIRONMENT LTA
C01 Ergonomics LTA
C02 Physical environment LTA
C03 Natural environment LTA
A2 Equipment/ Material Problem
B1 CALIBRATION FOR INSTRUMENTS LTA
C01 Calibration LTA
C02 Equipment found outside acceptance criteria
B2 PERIODIC/ CORRECTIVE MAINTENANCE LTA
C01 Preventive maintenance for equipment LTA
C02 Predictive maintenance LTA
C03 Corrective maintenance LTA
C04 Equipment history LTA
B3 INSPECTION/ TESTING LTA
C01 Start-up testing LTA
C02 Inspection / testing LTA
C03 Post-maintenance / Post-modification testing LTA
B4 MATERIAL CONTROL LTA
C01 Material handling LTA
C02 Material storage LTA
C03 Material packaging LTA
C04 Material shipping LTA
C05 Shelf life exceeded
C06 Unauthorized material substitution
C07 Marking / labeling LTA
B5 PROCUREMENT CONTROL LTA
C01 Control of changes to procurement specifications / purchase order LTA
C02 Fabricated item did not meet requirements
C03 Incorrect item received
C04 Product acceptance requirements LTA
B6 DEFECTIVE, FAILED, OR CONTAMINATED
C01 Defective or failed part
C02 Defective or failed material
C03 Defective weld, braze, or solder joint
C04 End-of-life failure
C05 Electrical or instrument noise
C06 Contaminant
C07 Software failure
A3 Individual Human Performance LTA
B1 SKILL BASED ERROR
C01 Check of work LTA
C02 Step was omitted due to distraction
C03 Incorrect performance due to mental lapse
C04 Infrequently performed steps were performed incorrectly
C05 Delay in time caused LTA actions
C06 Wrong action selected based on similarity with other actions
C07 Omission / repeating of steps due to assumptions for completion
B2 RULE BASED ERROR
C01 Strong rule incorrectly chosen over other rules
C02 Signs to stop were ignored and steps performed incorrectly
C03 Too much activity was occurring and error made in problem solving
C04 Previous success in use of rule reinforced continued use of rule
C05 Situation incorrectly identified or represented resulting in wrong rule used
B3 KNOWLEDGE BASED ERROR
C01 Attention was given to wrong issues
C02 LTA conclusion based on sequencing of facts
C03 Individual justified action by focusing on biased evidence
C04 LTA review based on assumption that process will not change
C05 Incorrect assumption that a correlation existed between two or more facts
C06 Individual underestimated the problem by using past events as basis
B4 WORK PRACTICES LTA
C01 Individual's capability to perform work LTA [Examples include: Sensory / perceptual capabilities LTA; Motor / physical capabilities LTA; and Attitude / psychological profile LTA]
C02 Deliberate violation
A4 Management Problem
B1 MANAGEMENT METHODS LTA
C01 Management policy guidance / expectations are not well-defined, understood, or enforced
C02 Job performance standards not adequately defined
C03 Management direction created insufficient awareness of impact of actions on safety / reliability
C04 Management follow-up or monitoring of activities did not identify problems
C05 Management assessment did not determine causes of previous event or known problem
C06 Previous industry or in-house experience was not effectively used to prevent recurrence
C07 Responsibility of personnel not well-defined or personnel not held accountable
C08 Corrective action responses to a known or repetitive problem was untimely
C09 Corrective action for previously identified problem or event was not adequate to prevent recurrence
B2 RESOURCE MANAGEMENT LTA
C01 Too many administrative duties assigned to immediate supervisor
C02 Insufficient supervisory resources to provide necessary supervision
C03 Insufficient manpower to support identified goal/objective
C04 Resources not provided to assure adequate training was provided / maintained
C05 Needed resource changes not approved / funded
C06 Means not provided to assure procedures / documents / records were of adequate quality and up-to-date
C07 Means not provided for assuring adequate availability of appropriate materials / tools
C08 Means not provided for assuring adequate equipment quality, reliability, or operability
C09 Personnel selection did not assure match of worker motivations/job descriptions
C10 Means/method not provided for assuring adequate quality of contract services
B3 WORK ORGANIZATION & PLANNING LTA
C01 Insufficient time for worker to prepare task
C02 Insufficient time allotted for task
C03 Dates not well-distributed among personnel
C04 Too few workers assigned to task
C05 Insufficient number of trained or experienced workers assigned to task
C06 Planning not coordinated with inputs from Walk downs/Task analysis
C07 Job scoping did not identify potential task interruptions &/or environmental stress
C08 Job scoping did not identify special circumstances &/or conditions
C09 Work planning not coordinated with all departments involved in task
C10 Problem performing repetitive tasks &/or sub-tasks
C11 Inadequate work package preparation
B4 SUPERVISORY METHODS LTA
C01 Tasks and individual accountability not made clear to worker
C02 Progress / status of task not adequately tracked
C03 Appropriate level of in-task supervision not determined prior to task
C04 Direct supervisory involvement in task interfered with overview role
C05 Emphasis on schedule exceeded emphasis on methods / doing a good job
C06 Job performance and self-checking standards not properly communicated
C07 Too many concurrent tasks assigned to worker
C08 Frequent job or task "shuffling"
C09 Assignment did not consider worker's need to use higher-order skills
C10 Assignment did not consider worker's previous task
C11 Assignment did not consider worker's ingrained work patterns
C12 Contact with personnel too infrequent to detect work habit / attitude changes
C13 Provided feedback on negative performance but not on positive performance
B5 CHANGE MANAGEMENT LTA
C01 Problem identification did not identify need for change
C02 Change not implemented in timely manner
C03 Inadequate vendor support of change
C04 Risks / consequences associated with change not adequately reviewed / assessed
C05 System interactions not considered
C06 Personnel / department interactions not considered
C07 Effects of change on schedules not adequately addressed
C08 Change-related training / retraining not performed or not adequate
C09 Change-related documents not developed or revised
C10 Change-related equipment not provided or not revised
C11 Changes not adequately communicated
C12 Change not identifiable during task
C13 Accuracy / effectiveness of change not verified or not validated
A5 Communication LTA
B1 WRITTEN COMMUNICATIONS METHOD OF PRESENTATION LTA
C01 Format deficiencies
C02 Improper referencing or branching
C03 Checklist LTA
C04 Deficiencies in user aids (charts, etc.)
C05 Recent changes not made apparent to user
C06 Instruction step / information in wrong sequence
C07 Unclear / complex wording or grammar
B2 WRITTEN COMMUNICATION CONTENT LTA
C01 Limit inaccuracies
C02 Difficult to implement
C03 Data / computations wrong / incomplete
C04 Equipment identification LTA
C05 Ambiguous instructions / requirements
C06 Typographical error
C07 Facts wrong / requirements not correct
C08 Incomplete / situation not covered
C09 Wrong revision used
B3 WRITTEN COMMUNICATION NOT USED
C01 Lack of written communication
C02 Not available or inconvenient for use
B4 VERBAL COMMUNICATION LTA
C01 Communication between work groups LTA
C02 Shift communications LTA
C03 Correct terminology not used
C04 Verification / repeat back not used
C05 Information sent but not understood
C06 Suspected problems not communicated to supervision
C07 No communication method available
A6 Training Deficiency
B1 NO TRAINING PROVIDED
C01 Decision not to train
C02 Training requirements not identified
C03 Work incorrectly considered "skill of the craft"
B2 TRAINING METHODS LTA
C01 Practice or hands-on experience LTA
C02 Testing LTA
C03 Refresher training LTA
C04 Inadequate presentation
B3 TRAINING MATERIAL LTA
C01 Training objectives LTA
C02 Inadequate content
C03 Training on new work methods LTA
C04 Performance standards LTA
A7 Other Problem
B1 EXTERNAL PHENOMENA
C01 Weather or ambient conditions LTA
C02 Power failure or transient
C03 External fire or explosion
C04 Other natural phenomena LTA
C05 Copper Theft
C06 Vandalism
B2 RADIOLOGICAL/ HAZARDOUS MATERIAL PROBLEM
C01 Legacy contamination
C02 Source unknown
A8 (Open)
AX Overall Configuration Issue
B1 INSTALLATION/DESIGN CONFIGURATION LTA
B2 MAINTENANCE/ MODIFICATION CONFIGURATION LTA
AZ – Information to determine cause LTA
Level A nodes are underlined
Level B nodes are in ALL CAPS
Level C nodes are in "sentence case"
LTA = Less Than Adequate

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Questions?

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