Falling objects: Engaging the ”*man-in-the-loop*” to achieve real safety improvement

Agenda

- Introduction
- Foreign Object Damage – An aviation perspective
- Health, Safety and Environment – a holistic approach
- Engaging the human element
  - Culture
  - Leadership's role

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  - Health, Safety and Environment (HSE)


USS Nimitz CVN-68

Foreign Object Damage (FOD) in Aviation

*FOD costs the civil aviation industry 3-4 Billion dollars each year

Civil aviation describes the FOD program as a two phase process:

- Avoidance of foreign objects
- Removal of foreign objects

FOD program activities:

- FOD walkdowns
- ”*Good housekeeping*” activities
- Reporting and investigation
- Compiling data and trend analysis

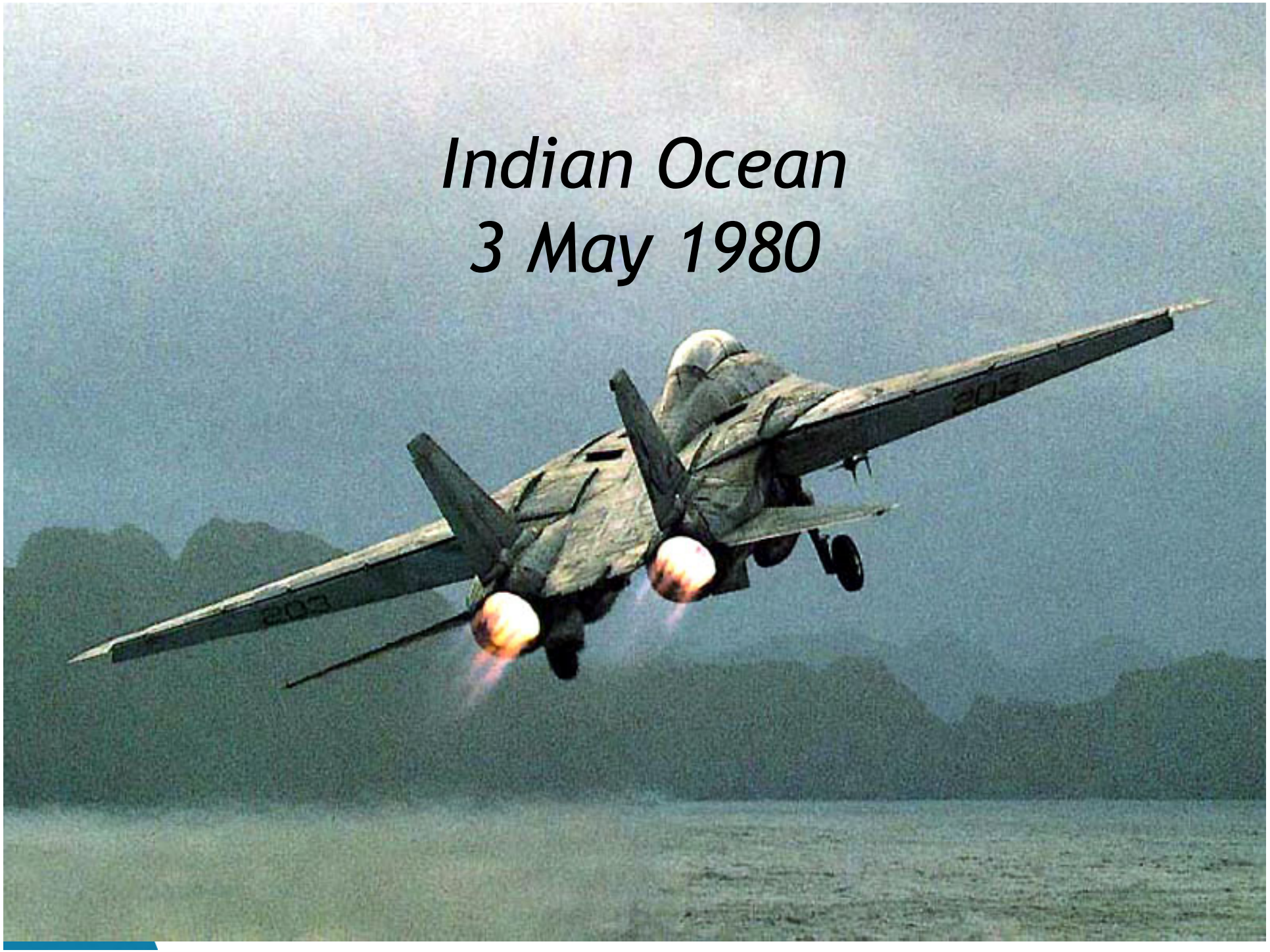
The FOD program today is an integrated part of the overall safety management system

- Safety culture/climate

But what about identification of foreign objects?

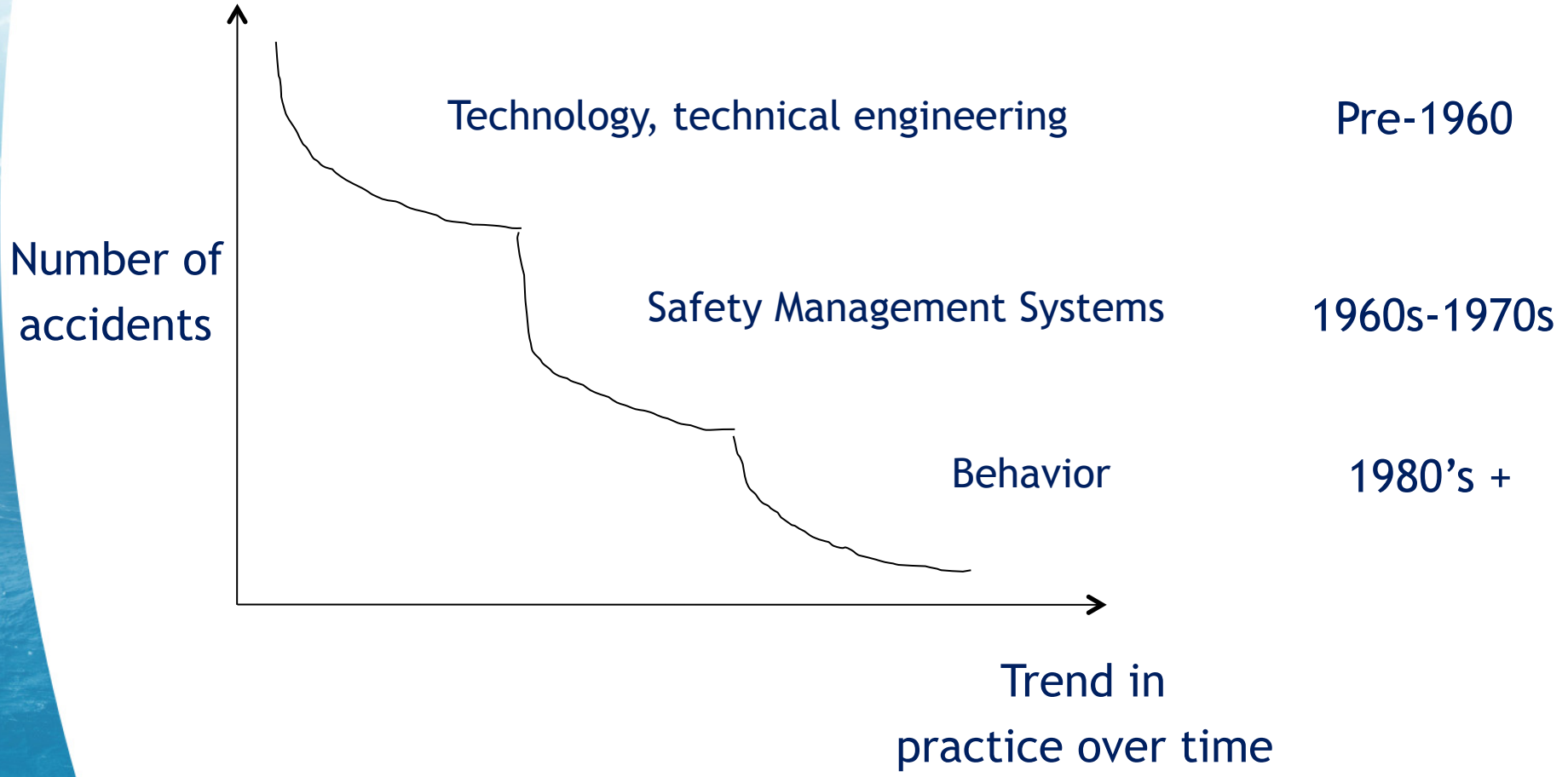
- Everyone's responsibility

What are foreign objects?


Indian Ocean
3 May 1980

Concorde 2000
Columbia Space Shuttle 2003

From engineering to behavior



A systems perspective

- *"Since both failures and successes are the outcome of normal performance variability, safety cannot be achieved by constraining – or eliminating it."*
- Normal Accident Theory – (Perrow, 1984)
- High Reliability Organizations (Rochlin et al., 1987)
- Resilience Engineering (Hollnagel et al., 2006)
  - Safety management cannot be based on a reactive approach alone

Understanding the nature of systems

- How systems are designed and developed to operate in an ”*expected*” environment
- How they *evolve* in response to the environment
- Based on our limited mental models – why a particular risk assessment might be limited
- Instead, expecting that challenges to system performance will occur – because systems evolve

The problem with models

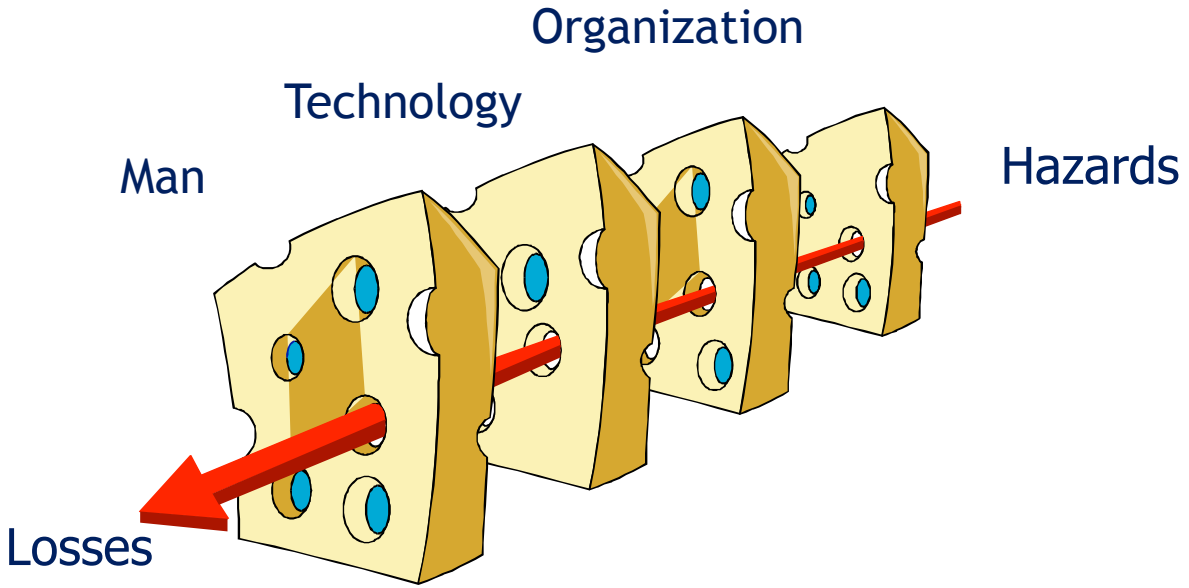
- ”*All models are wrong*” – Jay Forrester
- All models are simplifications of reality
  - Includes our system of rules and regulations
- Models are based on our limited cognative capacity
  - Short-cuts
  - Rules-of-thumb

Safety Management Systems

- Based on an ideal or rational view of an organization
- Where functions, roles and responsibilities are clearly defined ”*for people*” according to specified organizational goals, and as a result, the organization is designed to ”*behave*” in a rational way
- A prescriptive approach ending up with a normative organization against which practices can be measured or assessed

Swiss Cheese Model – Reason (1990)

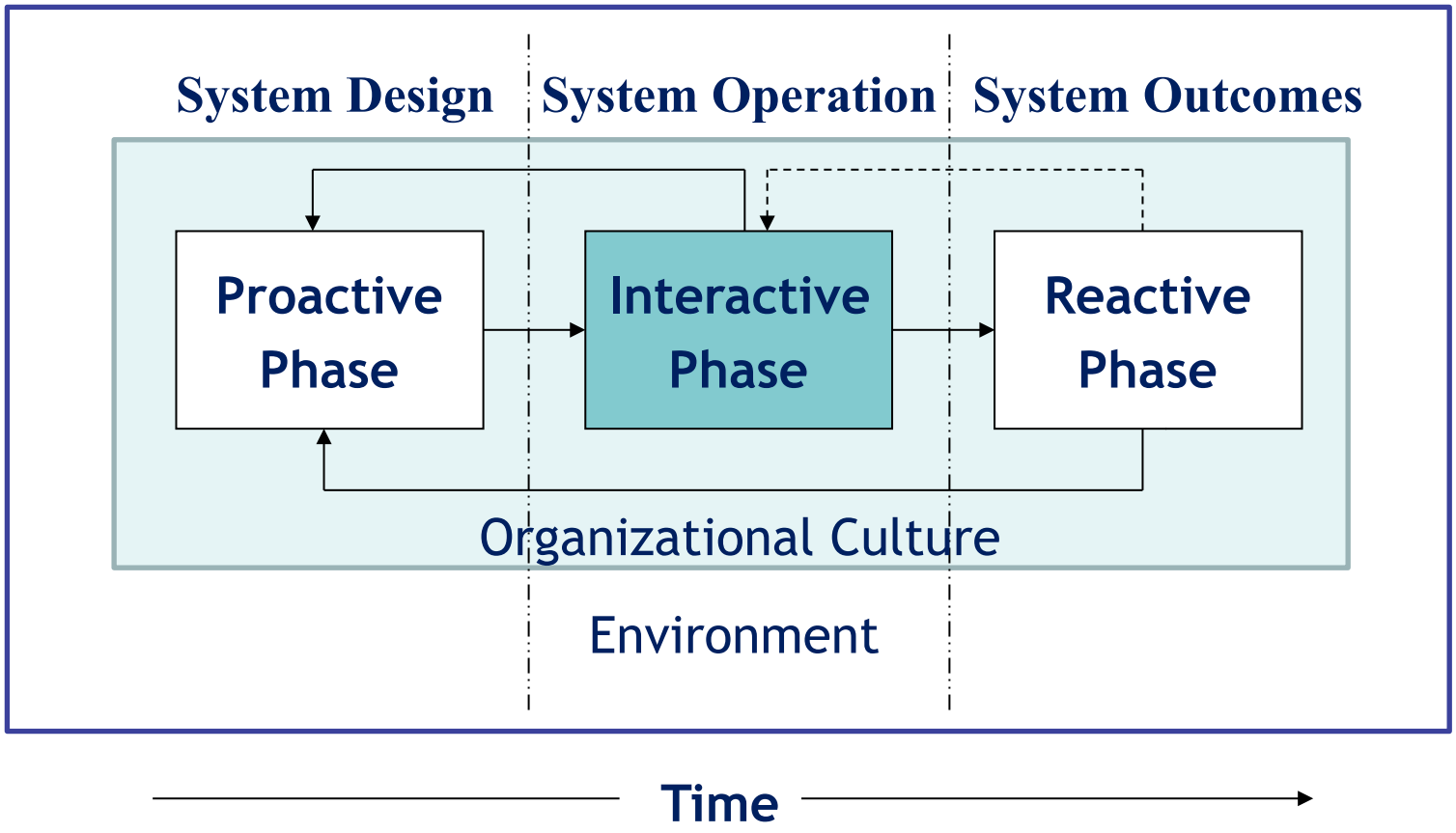
- Focus and the Man-in-the-loop in MTO and on HSE-culture.
- Need to involve those who feel the problem in the bodies – those on the shop floor.
- Last line of defence



Latent conditions

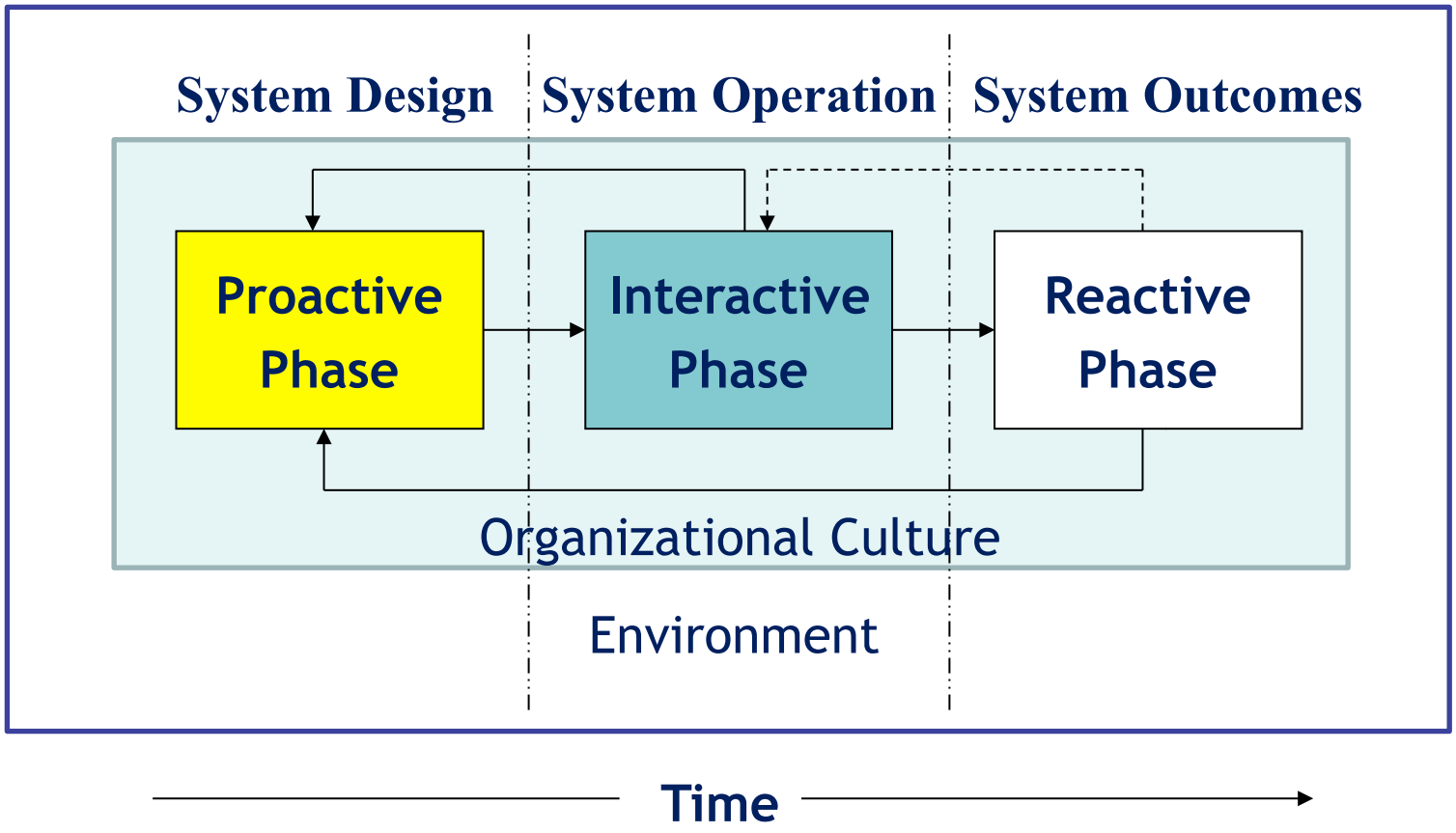
HSE Management Systems
(Lofquist, 2008:2010)

Socio-technical system



HSE Management Systems
(Lofquist, 2010)

Socio-technical system

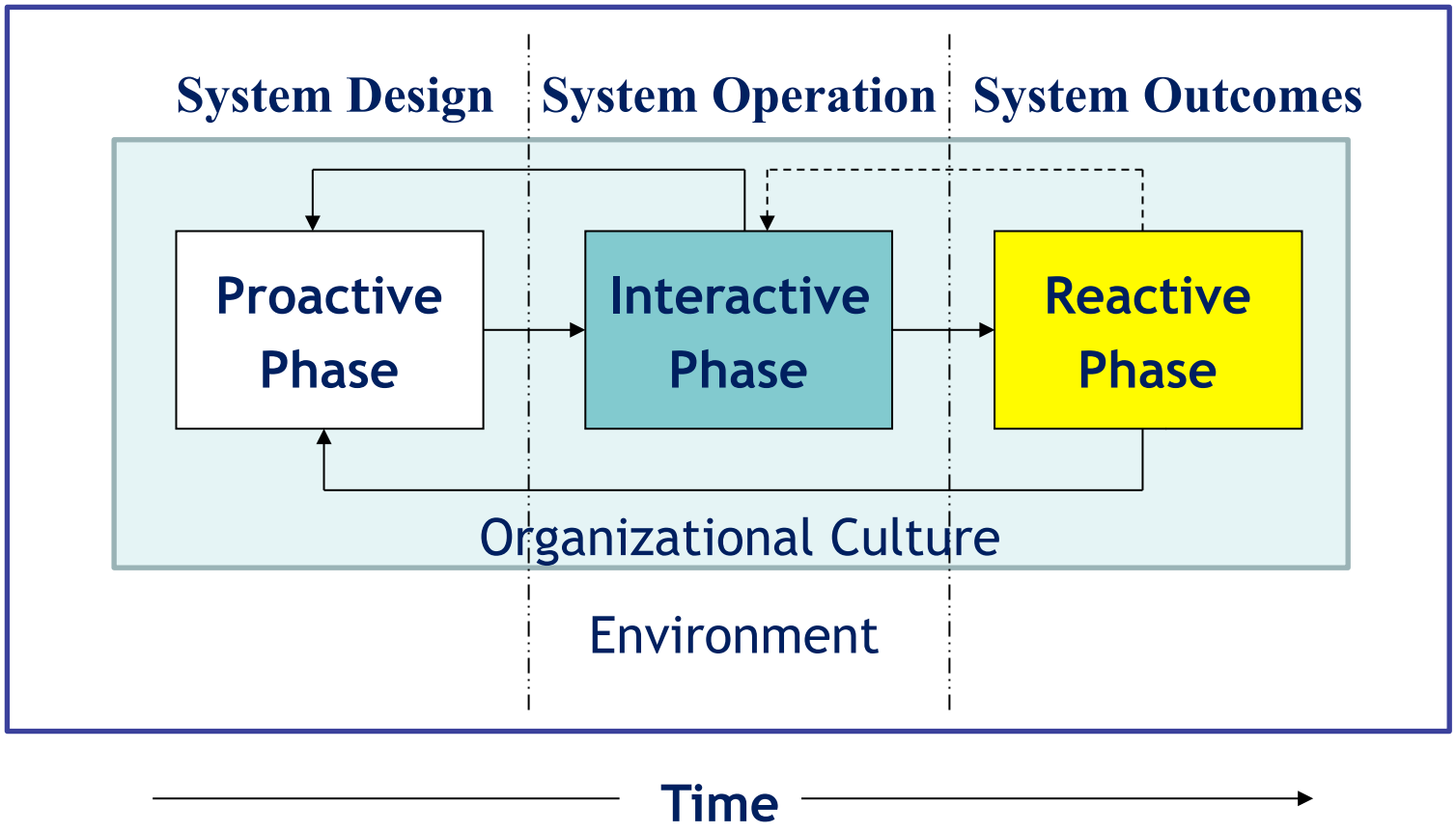


Proactive activities

- System design/redesign
- Processes, routines and procedures
  - Creation of barriers
  - Rules and regulations
- *Risk analysis (based on incomplete and/or changing assumptions)*
- Personnel selection
- Personnel training/retraining

HSE Management Systems
(Lofquist, 2008:2010)

Socio-technical system

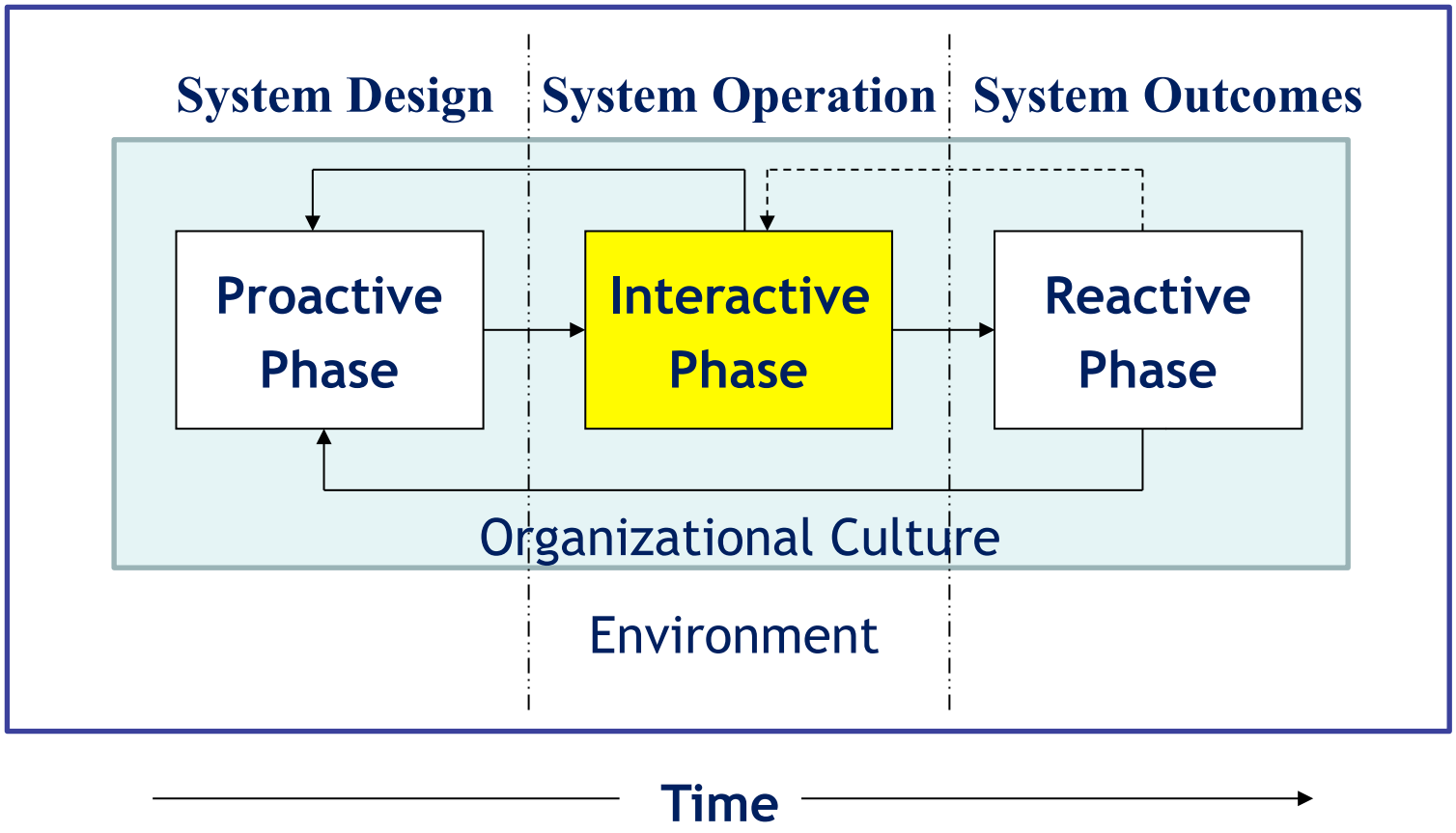


Reactive activities

- System outcomes
- Unplanned and undesired outcomes occur
- Incident and accident reporting
- Performance measurement

HSE Management Systems
(Lofquist, 2008:2010)

Socio-technical system

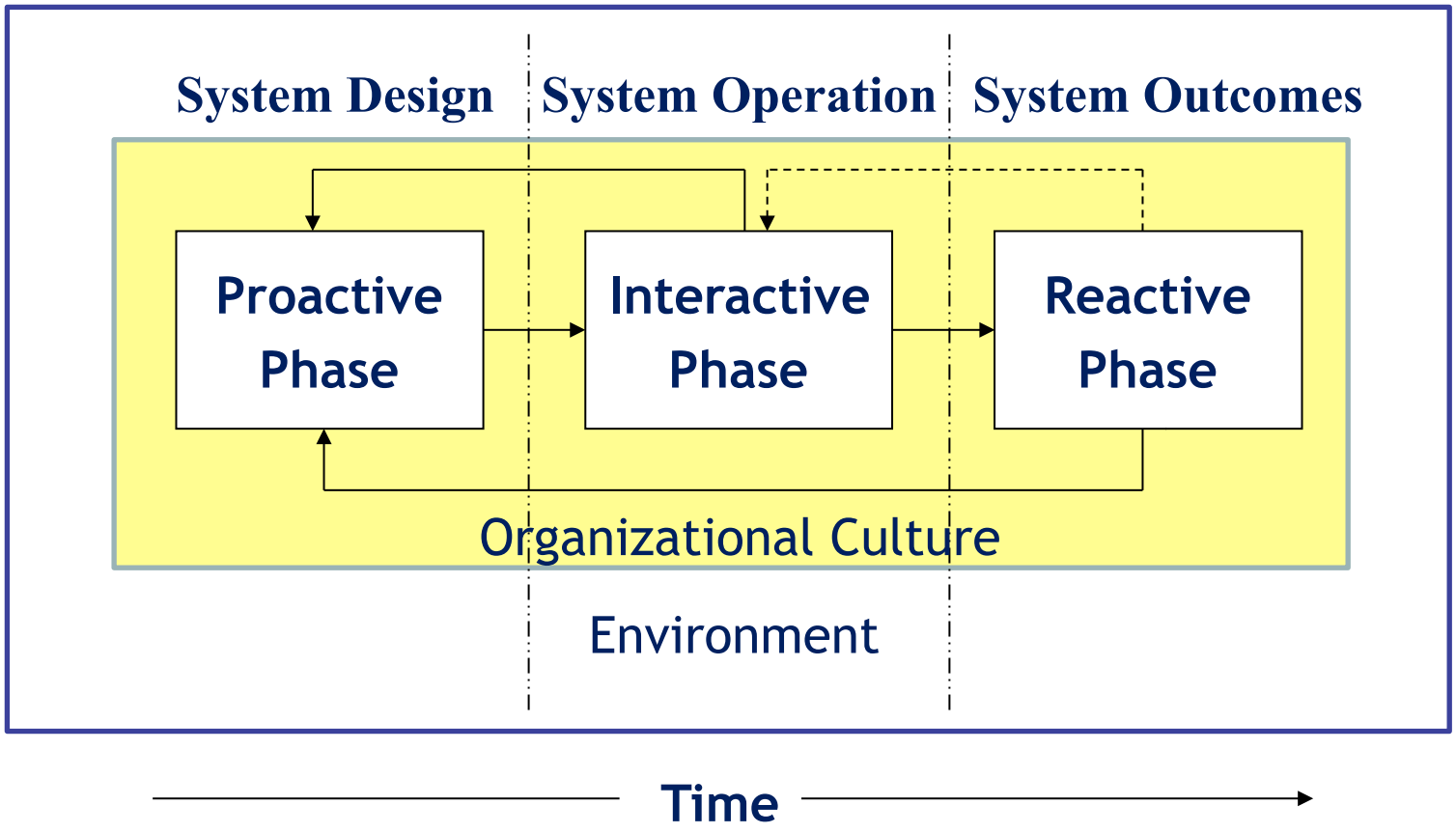


Engaging the ”*man-in-the-loop*”

- Socio-technical systems
- Understanding the nature of the human element in a systems context

HSE Management Systems
(Lofquist, 2008:2010)

Socio-technical system



Organizational culture (Schein, 2004)

- Culture – *a dynamic phenomenon that surrounds us at all times*
  - Constantly enacted and created by our interaction with others and **shaped by leadership behavior**
  - Creates a set of social structures, routines, rules and norms that guide and constrain behavior
- The dynamic processes of culture creation and management are the essence of leadership

Culture and leadership

- Two sides of the same coin
- Culture decides what defines leadership but leaders create and manage culture
- Leadership creates and changes culture, while management and administration act within culture
- Culture is the result of complex group learning processes that are only partly influenced by leader behavior

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Culture drives our thinking and actions

- Observed behavioral regularities when people interact
- Group norms
- Espoused values
- Informal ”*rules of the game*”
- Habits of thinking, mental models and linguistic paradigms – cognitive frameworks

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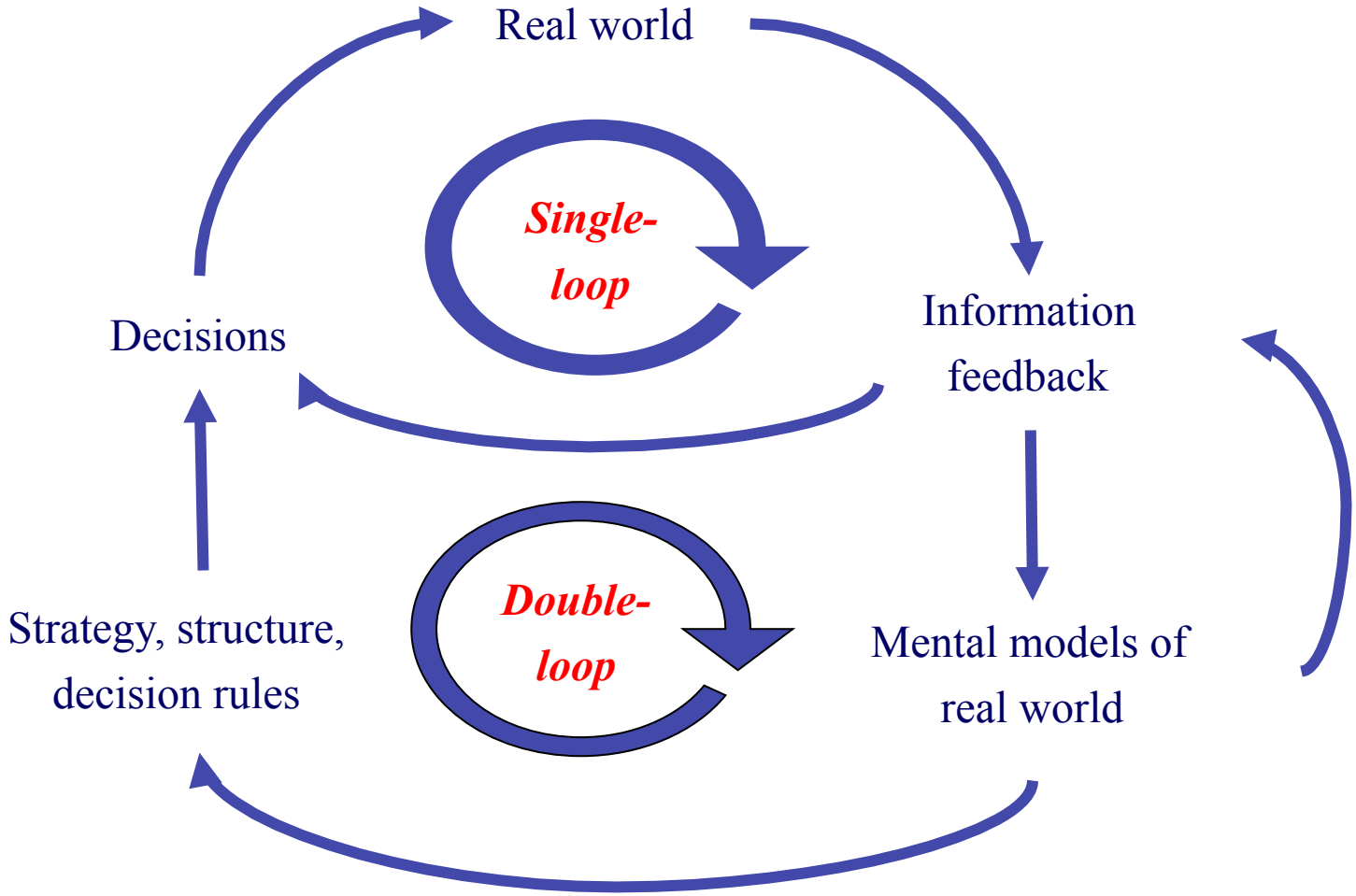
Double-loop learning (Argyris & Schön, 1974)



Zohar, 2010

- Conceptual attributes of the construct of safety climate
- Relative priorities
- Alignment between espousals and enactments
- Internal consistency
- Shared cognitions or social consensus
- Motivation for climate perceptions: social verification

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How do leaders embed their beliefs, values and assumptions

- Primary embedding:
  - What leaders pay attention to, measure and control
  - How leaders react to critical incidents and organizational crisis
  - How leaders allocate resources
  - Deliberate role modeling, teaching and coaching
  - How leaders allocate rewards and status
  - How leaders recruit, select, promote and excommunicate

High Reliability Organizations (HROs)

- Creating a supporting organizational culture
  - Creating a ”*learning environment*”
  - Mindfulness
    - Knowing (Education and training)
    - Sensemaking
    - Seeing (Noticing)
    - Responding (Reporting)
    - Taking action

Key points

- Targeting human error no longer target
- Safety is the presence of something not the absence of something
- Attempting to fix unreliable human behavior by:
  - Automation
  - More procedures and barriers
  - Increased monitoring
- Only people have adaptive capacity

Using the operators

- Operators, and their deep understanding of an application area is an important source of resilience – expertise in action
- Two main sources of resilience
  - Picking up the faint signals when ”*things are going wrong*”
  - Being able to develop resources that can adapt ”*on the fly*”
  - Identify potential dangers

Takk for meg