

# Safety Culture & Safety Scanning

## 94. Sicherheitswissenschaftliches Kolloquium, Wuppertal

Prof. Dr. Oliver Straeter  
Universität Kassel  
Fakultät für Maschinenbau  
Arbeits- und Organisationspsychologie

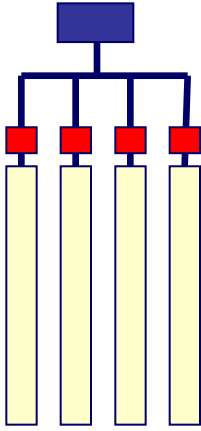
Heinrich-Plett-Strasse 40  
D-34132 Kassel

Tel: +49 561 804 4211  
eMail: [straeter@ifa.uni-kassel.de](mailto:straeter@ifa.uni-kassel.de)

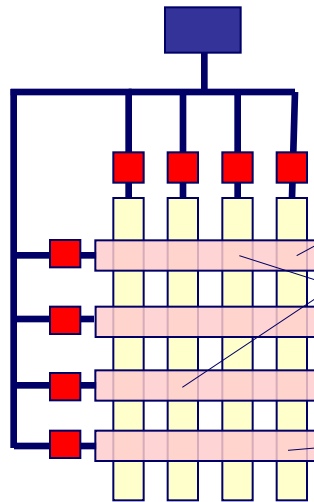
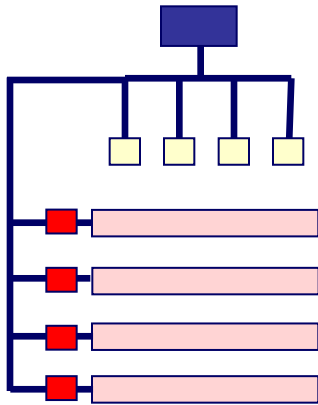
Sicherheitskultur ist üblicherweise umschrieben mit einer sicherheitsgerichteten Grundhaltung, Verantwortung und Handlungsweise aller Mitarbeiter auf allen Hierarchiestufen, die sich in sicherheitsgerichteten Tätigkeiten äußert und über die erforderlichen Tätigkeiten zur Erfüllung interner oder externer Anforderungen hinaus geht. Sicherheitskultur umfasst dazu die Gesamtheit der Eigenschaften und Verhaltensweisen innerhalb eines Unternehmens und beim Einzelnen.

# Warum ist Safety Culture relevant?

Aufbauorganisation



Ablauforganisation



Implizite  
Organisation

Implizite  
Organisation



## Artifacts (norms)

Processes and visible organizational structures

Meaning difficult to interpret

## Values

Strategies, goals and philosophy

How the organization is presented to external people?

## Basic assumptions

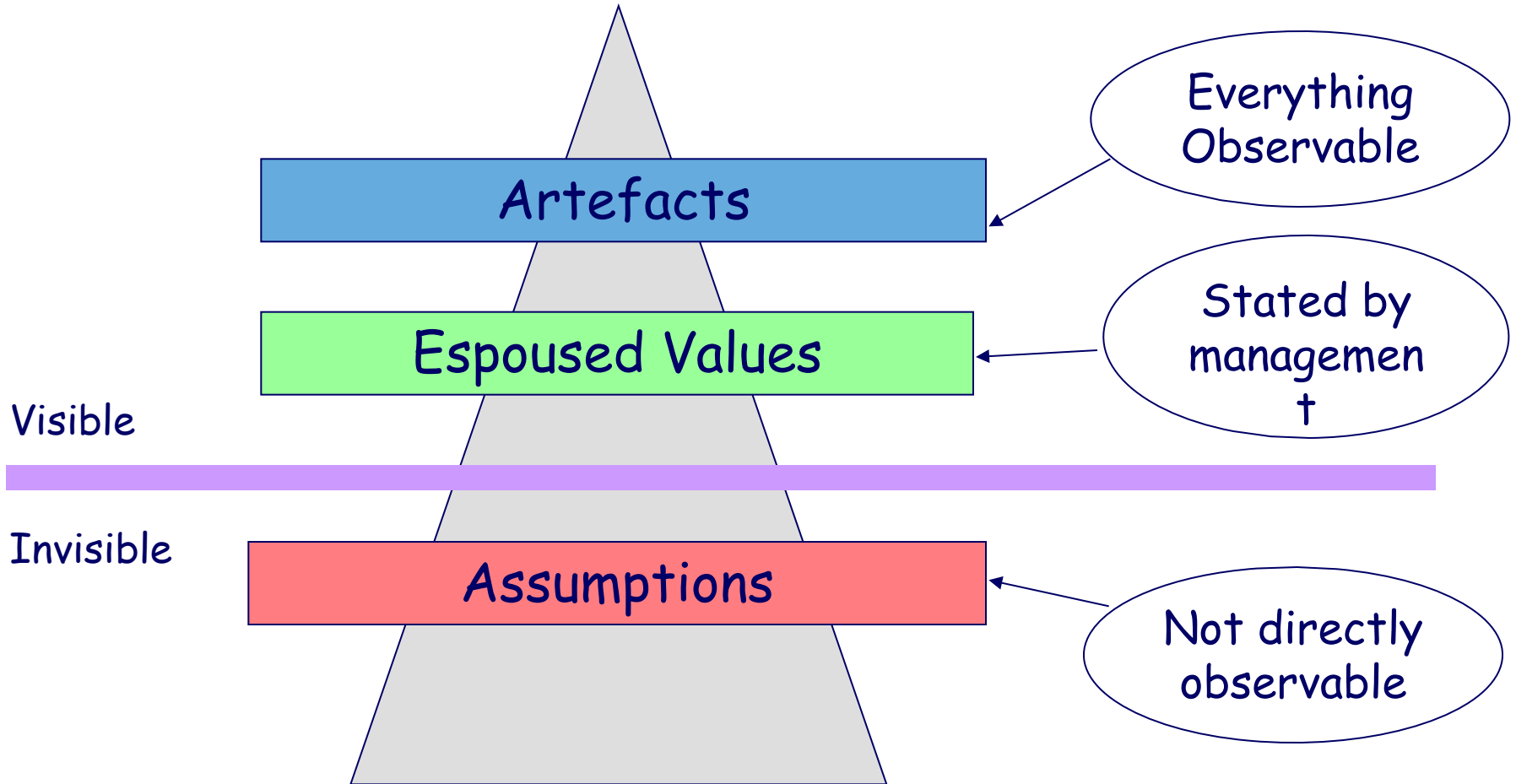
Beliefs given for granted. Main source of values and human behaviour

Unconscious

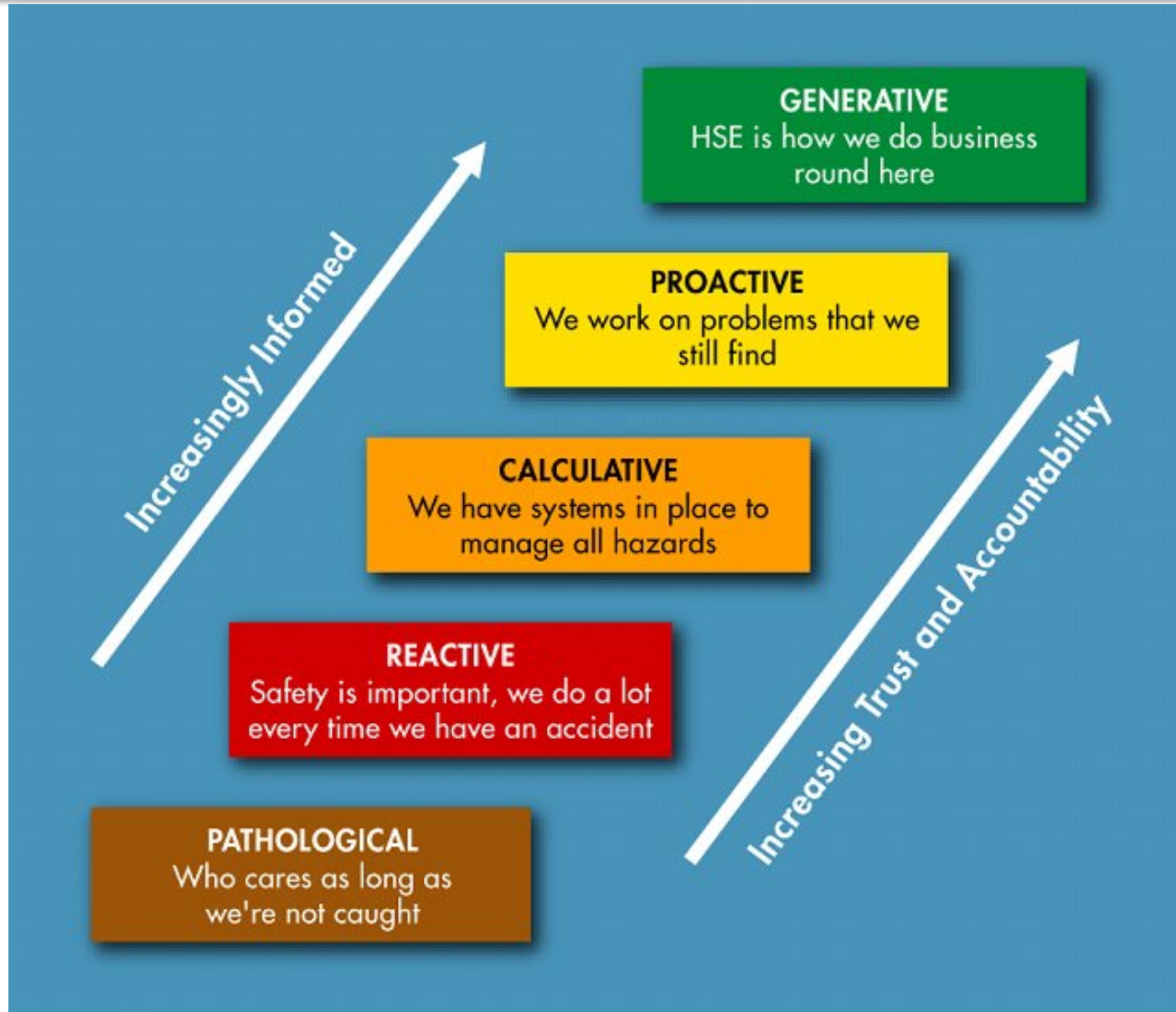
E. Schein

# Model of Schein

Edgar Schein suggests that culture can be considered in THREE LAYERS



# Safety Culture - Development



# Safety Culture - Development

**GENERATIVE**

chronic unease  
 safety seen as a profit centre  
 new ideas are welcomed

**PROACTIVE**

resources are available to fix things before an accident  
 management is open but still obsessed with statistics  
 procedures are "owned" by the workforce

**CALCULATIVE**

we cracked it!  
 lots and lots of audits  
 HSE advisers chasing statistics

**REACTIVE**

we are serious, but why don't they do what they're told?  
 endless discussions to re-classify accidents  
 Safety is high on the agenda after an accident

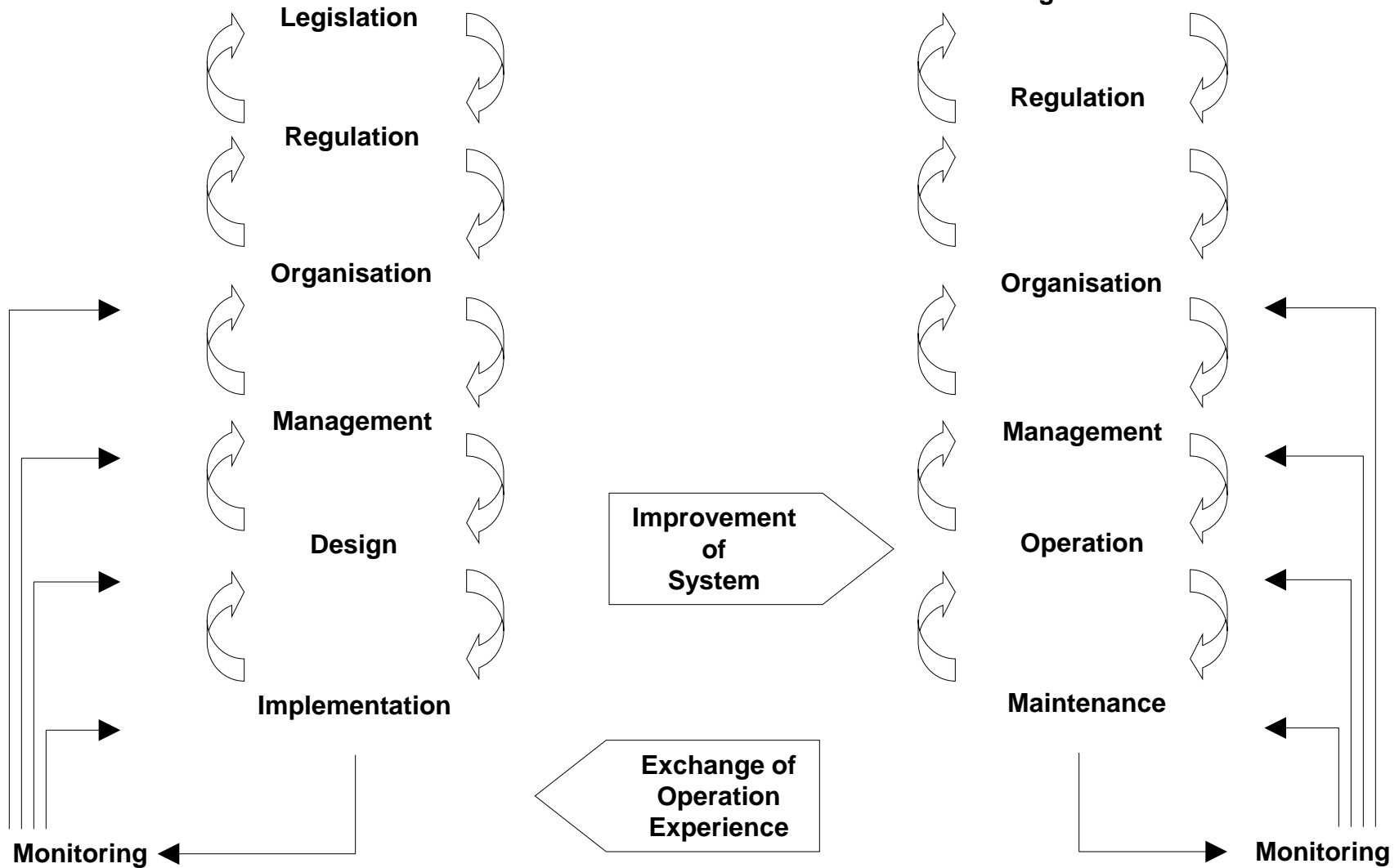
**PATHOLOGICAL**

the lawyers said it was OK  
 of course we have accidents, it's a dangerous business  
 sack the idiot who had the accident

# Arbeitsebenen einer Sicherheitskultur nach Levenson

## System Development

## System Operation





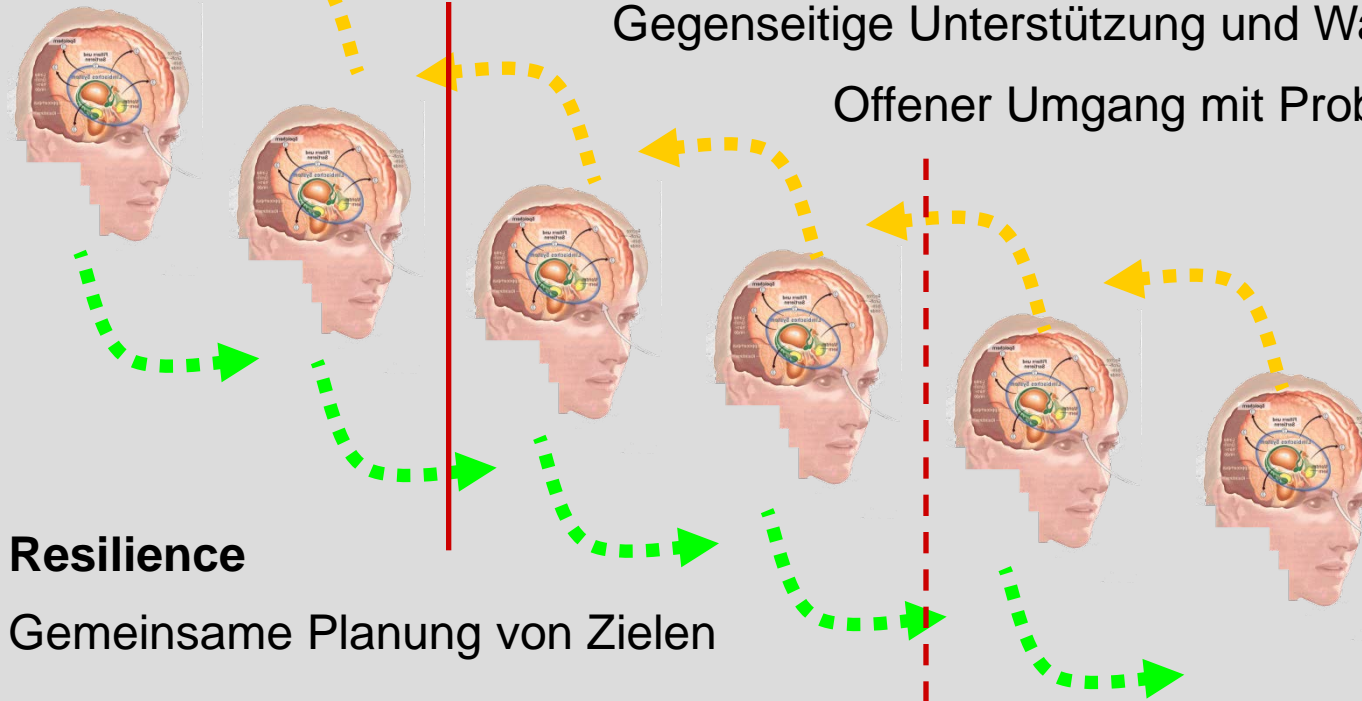
# Kognitive Systeme auf allen Arbeitsebenen

## Sicherheitskultur

Gemeinsame Einstellung auf Betriebsebenen

## Fehlermanagement

Gegenseitige Unterstützung und Warnung  
Offener Umgang mit Problemen



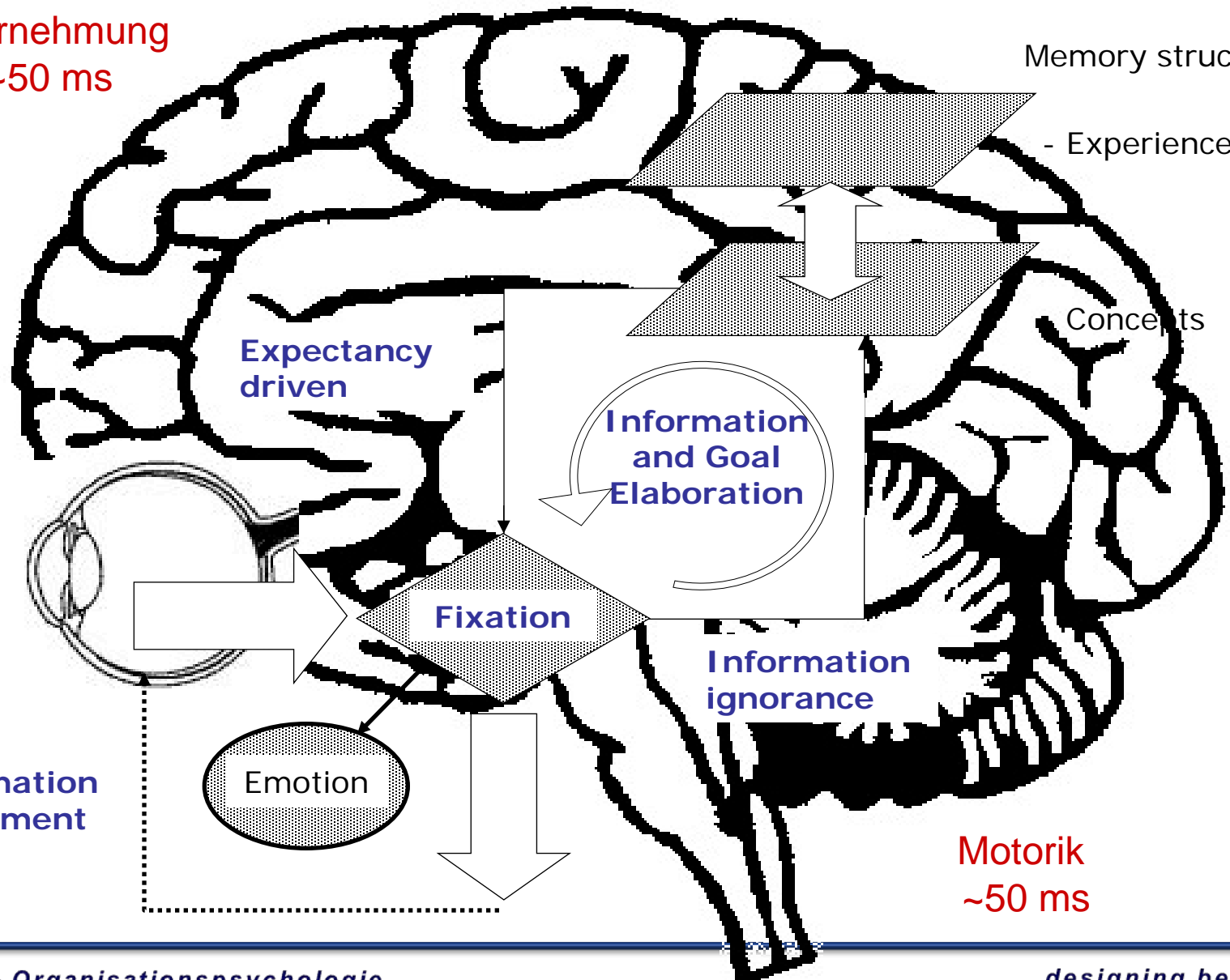
## Resilience

Gemeinsame Planung von Zielen  
Effektive Beteiligung  
Toleranz / Flexibilität

Safety  
Performance

# The Cognitive Processing Cycle

Wahrnehmung  
~50 ms



Memory structure

- Experiences

Zyklus  
~100 ms

Concepts

Expectancy driven

Information and Goal Elaboration

Information ignorance

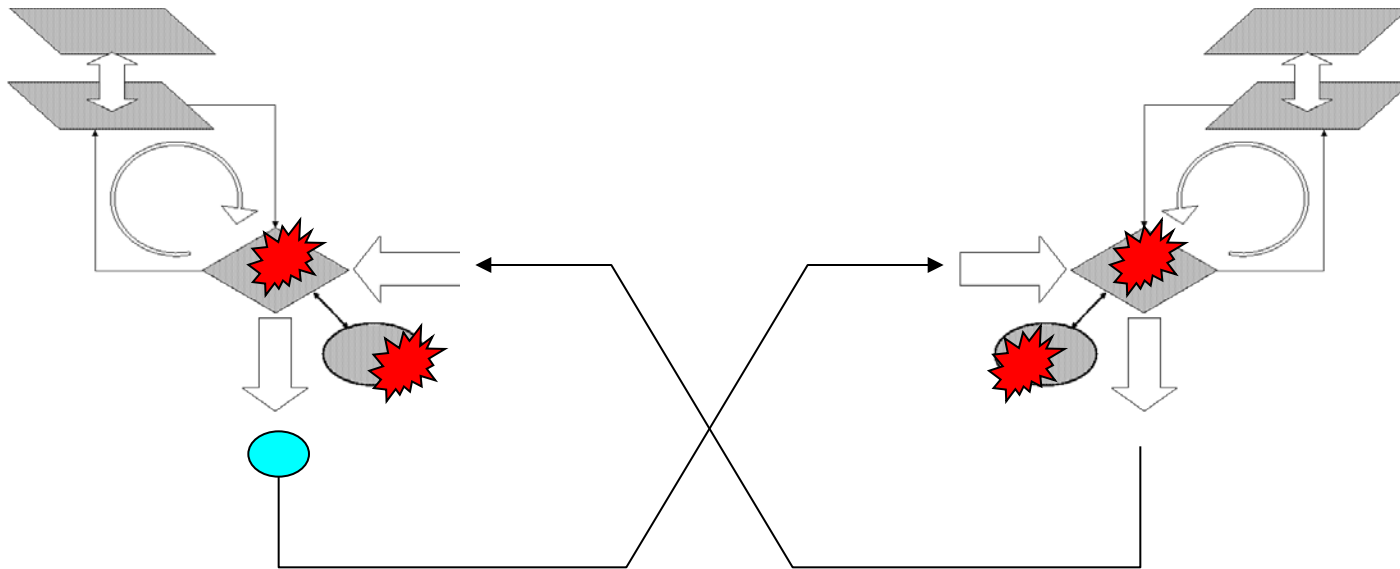
Fixation

Emotion

Information enrichment

Motorik  
~50 ms

# Typical Cognitive Mechanism: Negative Feedback



- A Self-reinforcing System
- Usual negative feedback

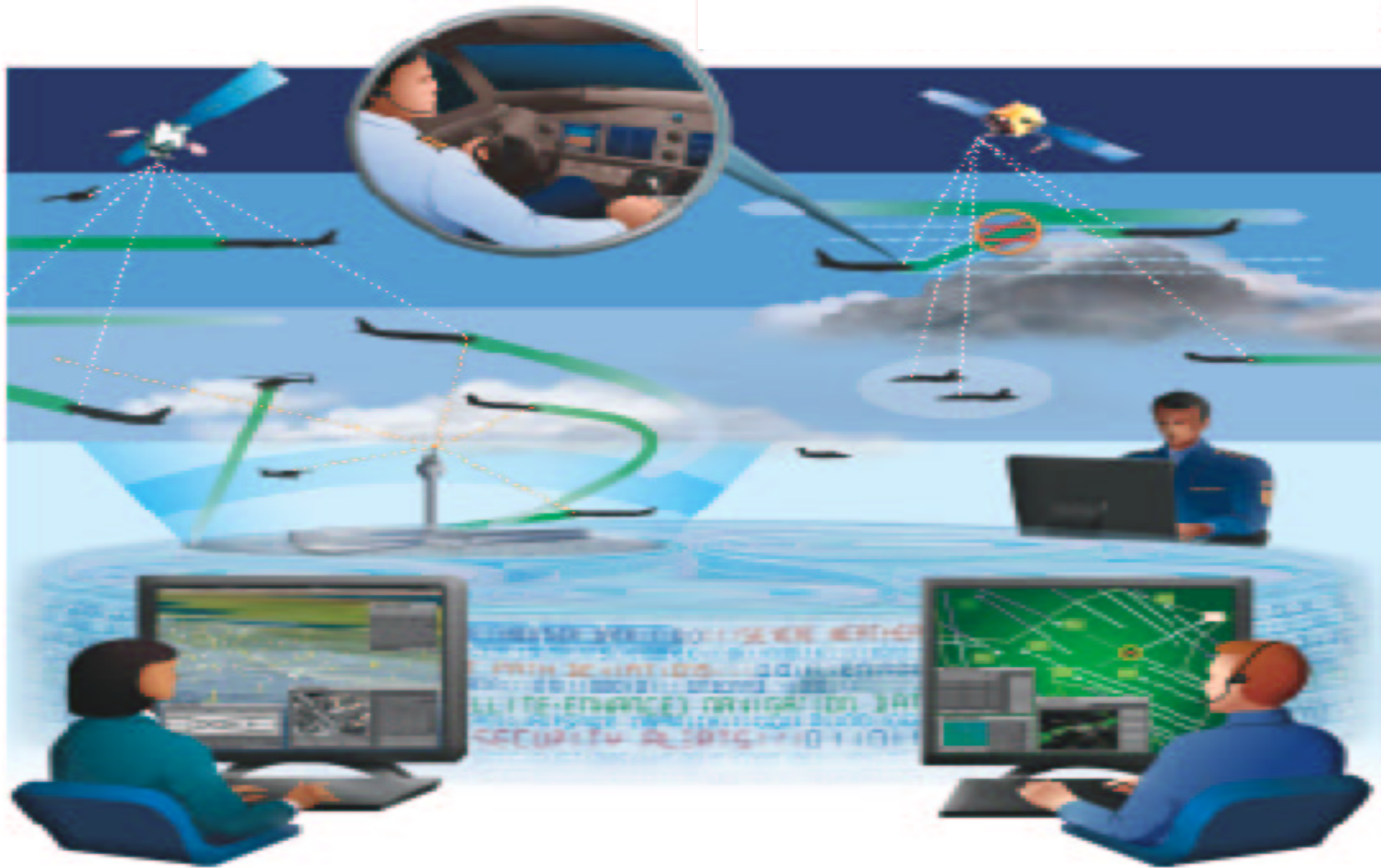
# Effects of negative feedback – Lack of Information flow

- Information is not being distributed effectively throughout the critical units or persons involved with the task
  
- Consequences
  - Not having a clear picture of the system state
  - Being unaware of important data or events
  - Lack of Knowledge to perform the task safely
  - Dropping or reworking activities
  - Unwarranted shift in goals, decisions, plans , priorities

- Erosion of defences due to production reasons
- Past success as a reason for confidence vs. Trying to understand and anticipate the changing potential of failure
- Fragmented distribution of problem-solving processes
- Failure to revise assessments as new evidence accumulates
- Brakedowns in communication and coordination within the organization due to rigid unit boundaries

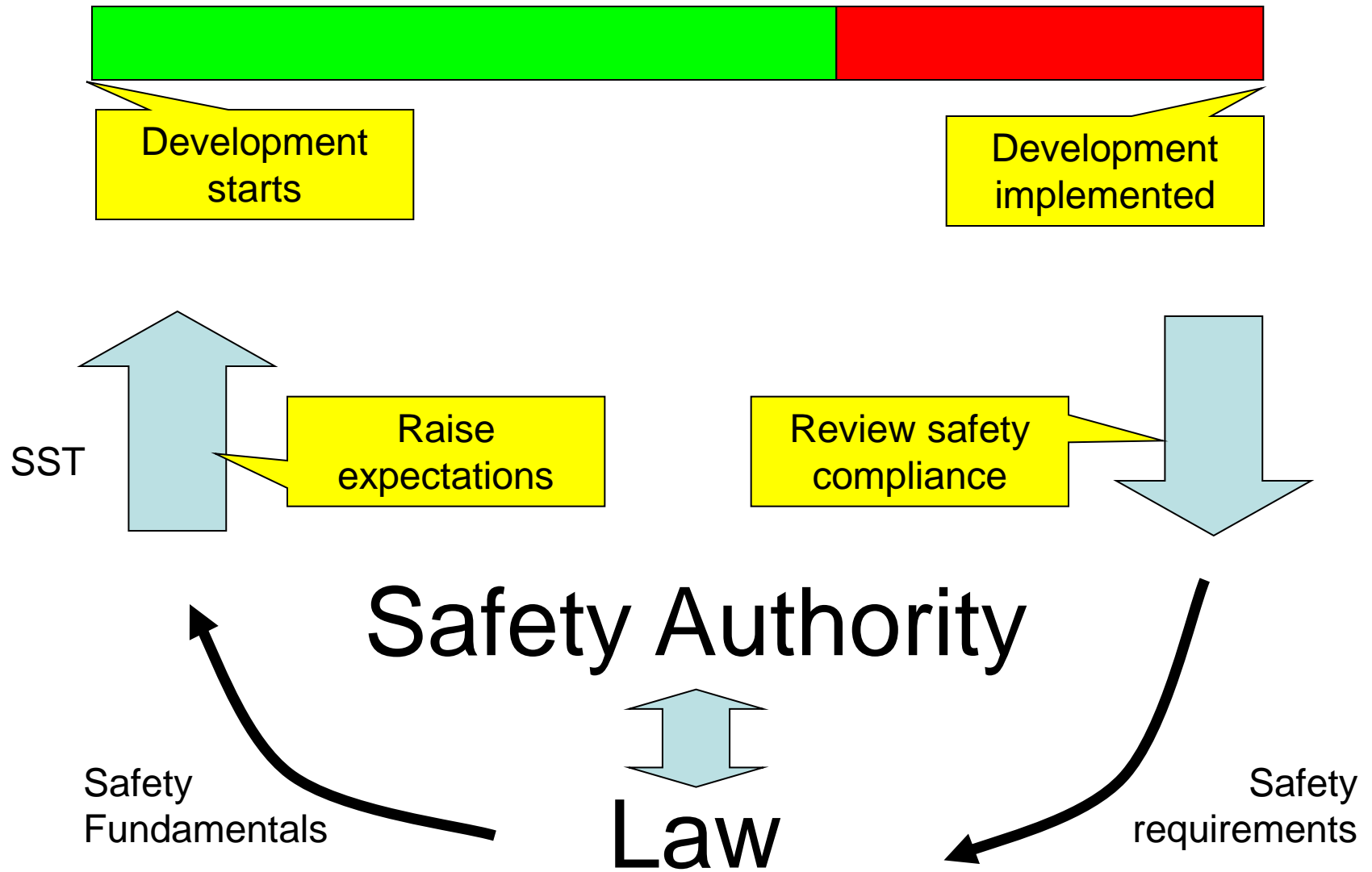
# Safety Scanning

# Impact of Regulatory Level on Safety - SES



- **Generates a systematic dialogue between Regulator and Stakeholder**
  - Regulatory Impact analysis
  - Classification of the change and amount of change
  - Role and responsibilities of actors
  
- **Supports Planning process of Licensee**
  - Means to early review of compliance of a change
  - Safety related planning information
  - Weaknesses a early stages to save budget





# Safety Scanning – The Regulatory Basis

## Layer

The global layer

- ICAO
- ISO
- (other UN organisations & OECD)

The European layer

- EU law, SES
- CEN
- (ongoing activities)

The National layer

- National Regulations
- Engineering associations
- (scientific booklets)

## Considered (examples)

ICAO SMM

IAEA Safety Standards

OECD best practices

ISO Chemical

ISO Rail

ISO / CEN 60300

SES regulations

ESARRs

American Standards

EU Regulations (DGTren WS)

Industrial norms

(HSE, VDI, NUREG)

Safety Booklets

# Safety Fundamentals represent

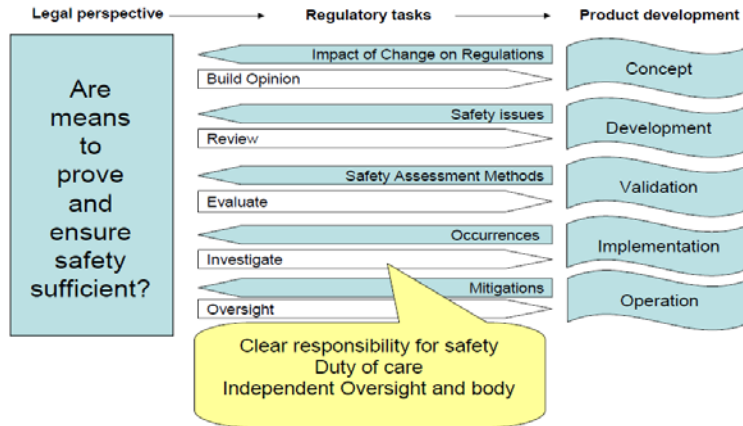
## ... essential ATM Regulations Example: Independence

- **Interdependence is defined as the degree to which the Subject interacts in an unintended manner with other operational elements, including human elements (which may result e.g., in common cause failures or propagation of errors into adjacent systems or highly coupled systems).**
- **European Regulation 1035/2011 (Section 3.2.1):**  
**Within the operation of the SMS, a provider of air traffic services shall ensure that hazard identification as well as risk assessment and mitigation are systematically conducted for any changes to those parts of the ATM functional system and supporting arrangements within his managerial control, in a manner which addresses:- the equipment, procedures and human resources of the ATM functional system, the interactions between these elements and the interactions between the constituent part under consideration and the remainder of the ATM functional System.**
- **European Regulation 1034/2011 (Article 10):**  
**Reviews shall be conducted in a manner commensurate with the level of risk posed by the new functional systems or by the proposed changes to existing functional systems.**

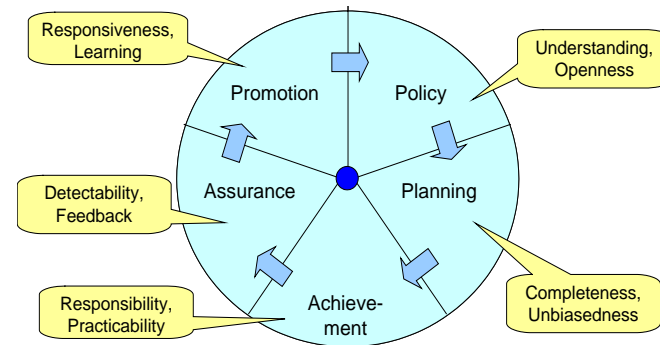
(further reading in the Scan TF deliverables)

- **A comprehensive method for scanning a change in a multi actor setting**
  - A tool (questionnaire on the basis of the Safety Fundamentals)
- **Guidance for use**
  - Guidance for the safety analyst
  - Guidance for the moderator
  - Guidance for the process
- **A method for reviewing a safety method for a specific change**
  - A tool (questionnaire on the basis of the SAFMAC quality indicators)
  - Guidance for Regulatory Tasks
  - Proof of consistency with EC and ICAO requirements and principles

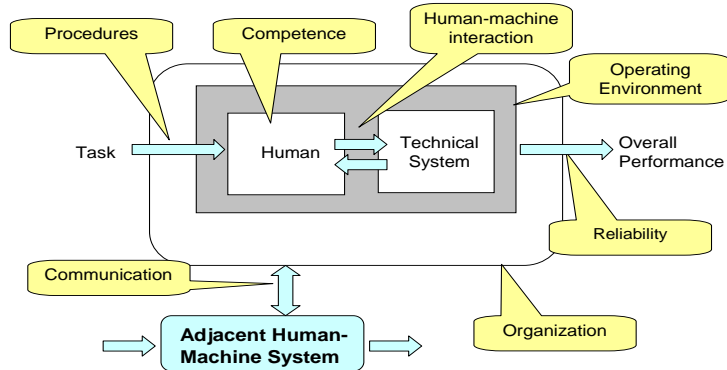
## Regulations / Standards



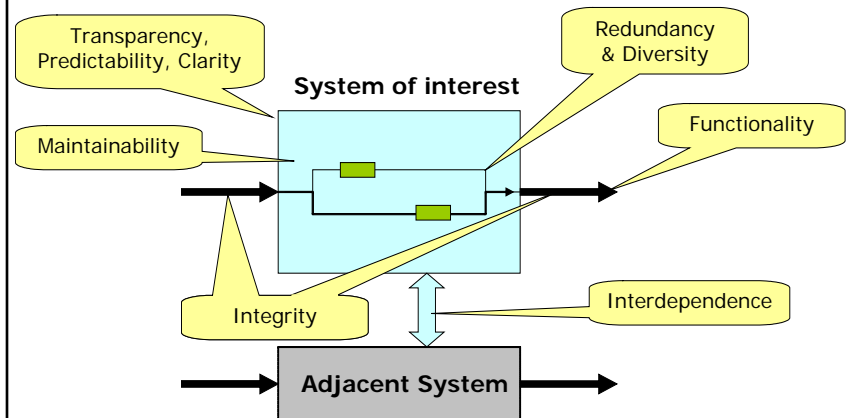
## Safety Management

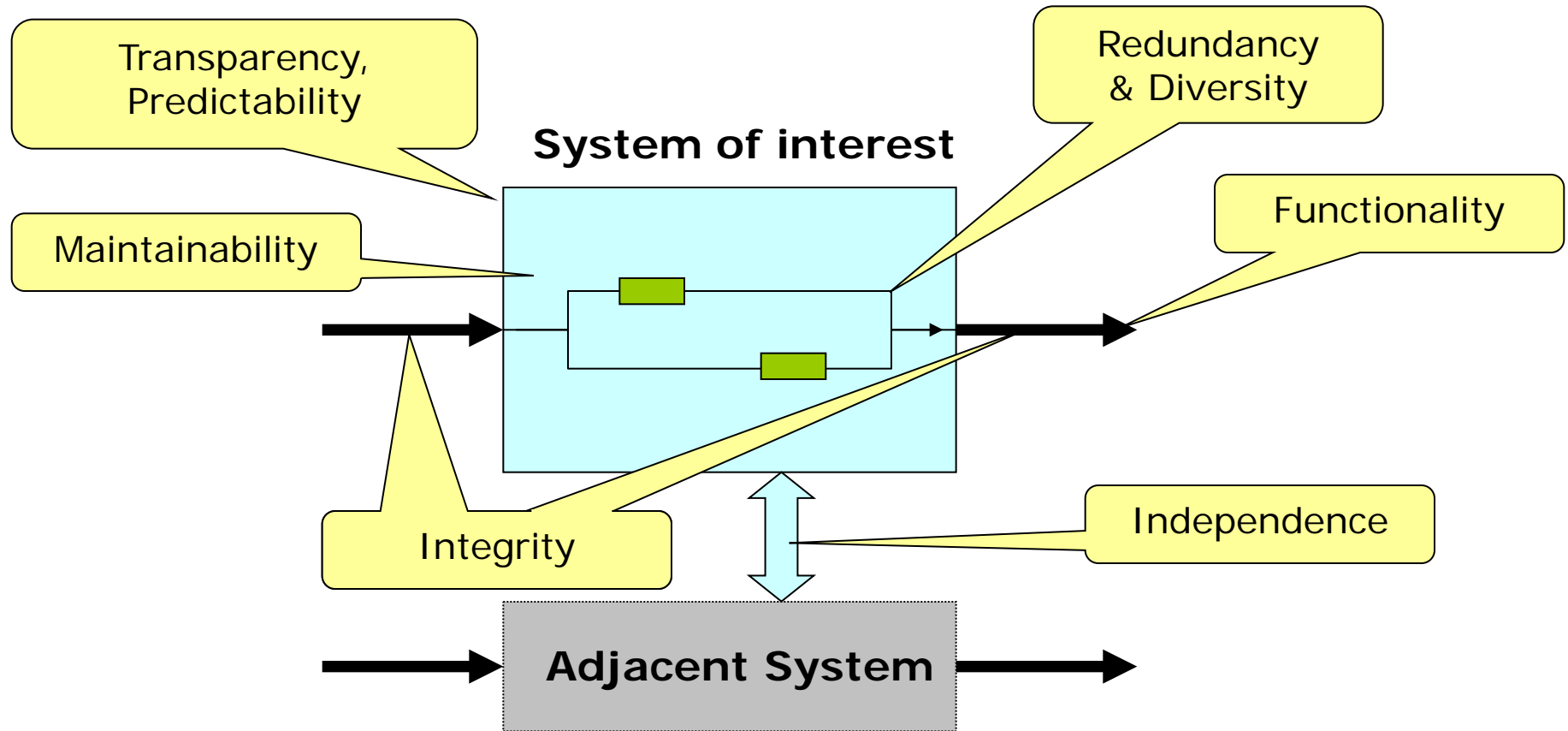


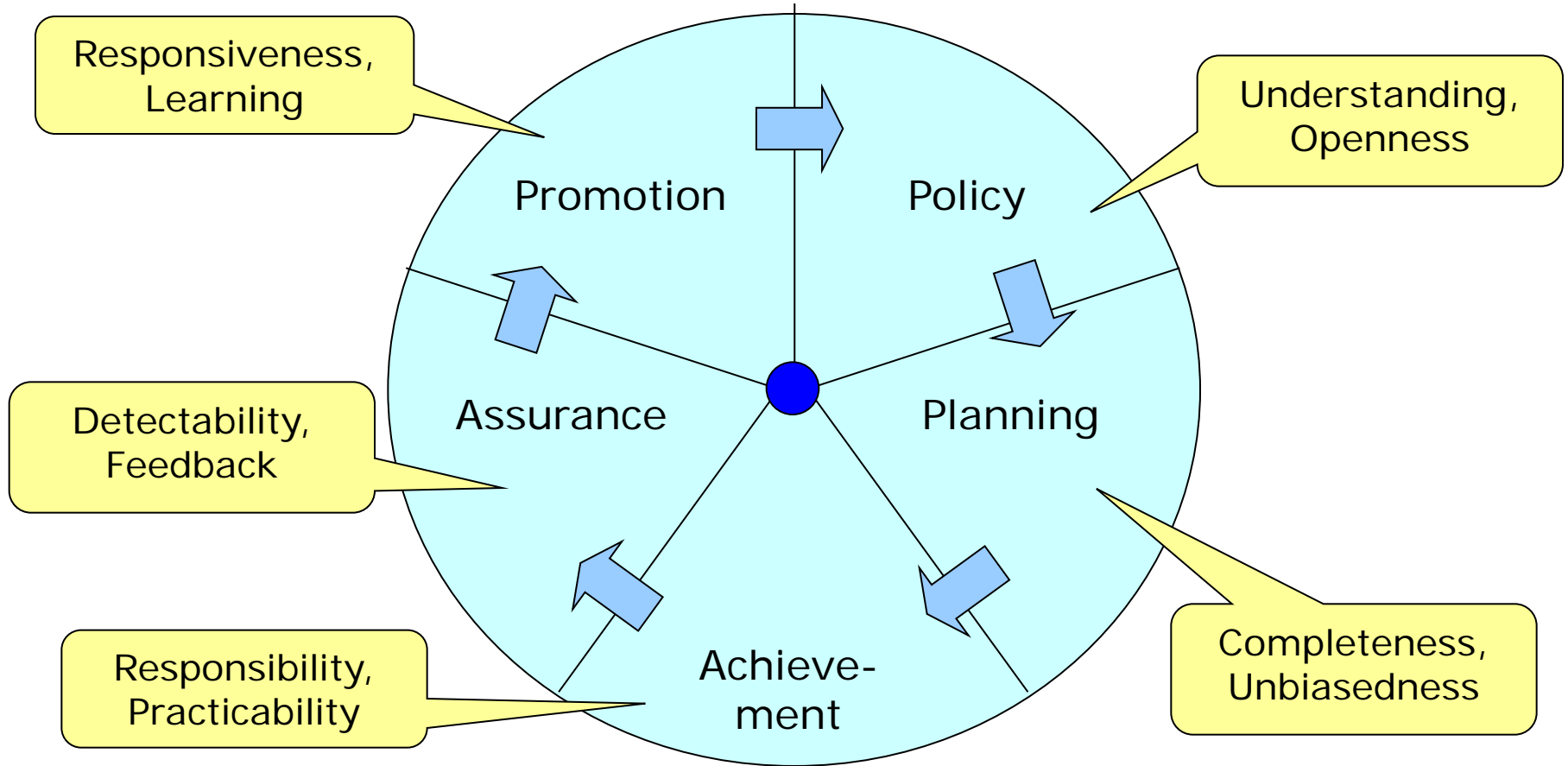
## Operational Safety

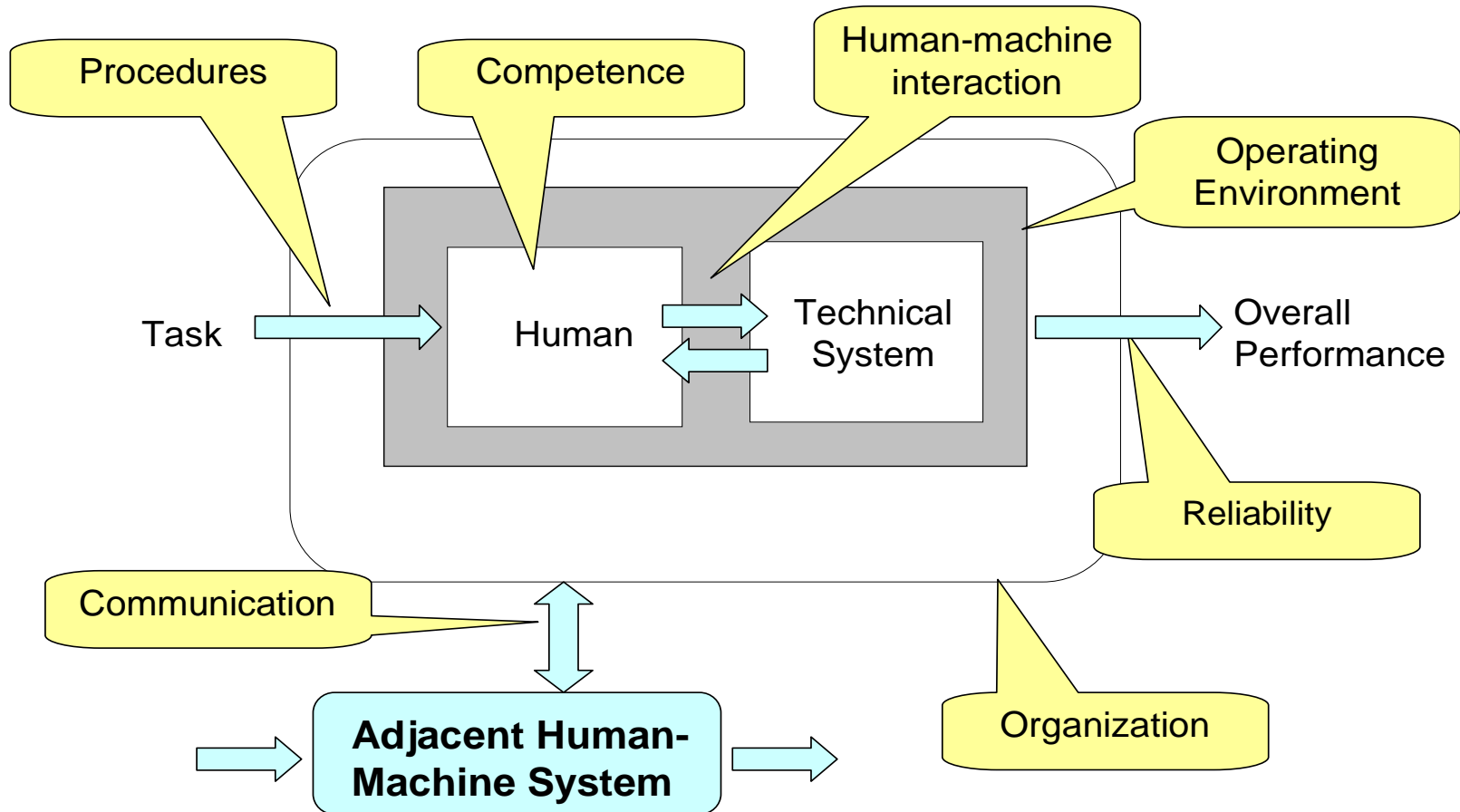


## Safety Architecture



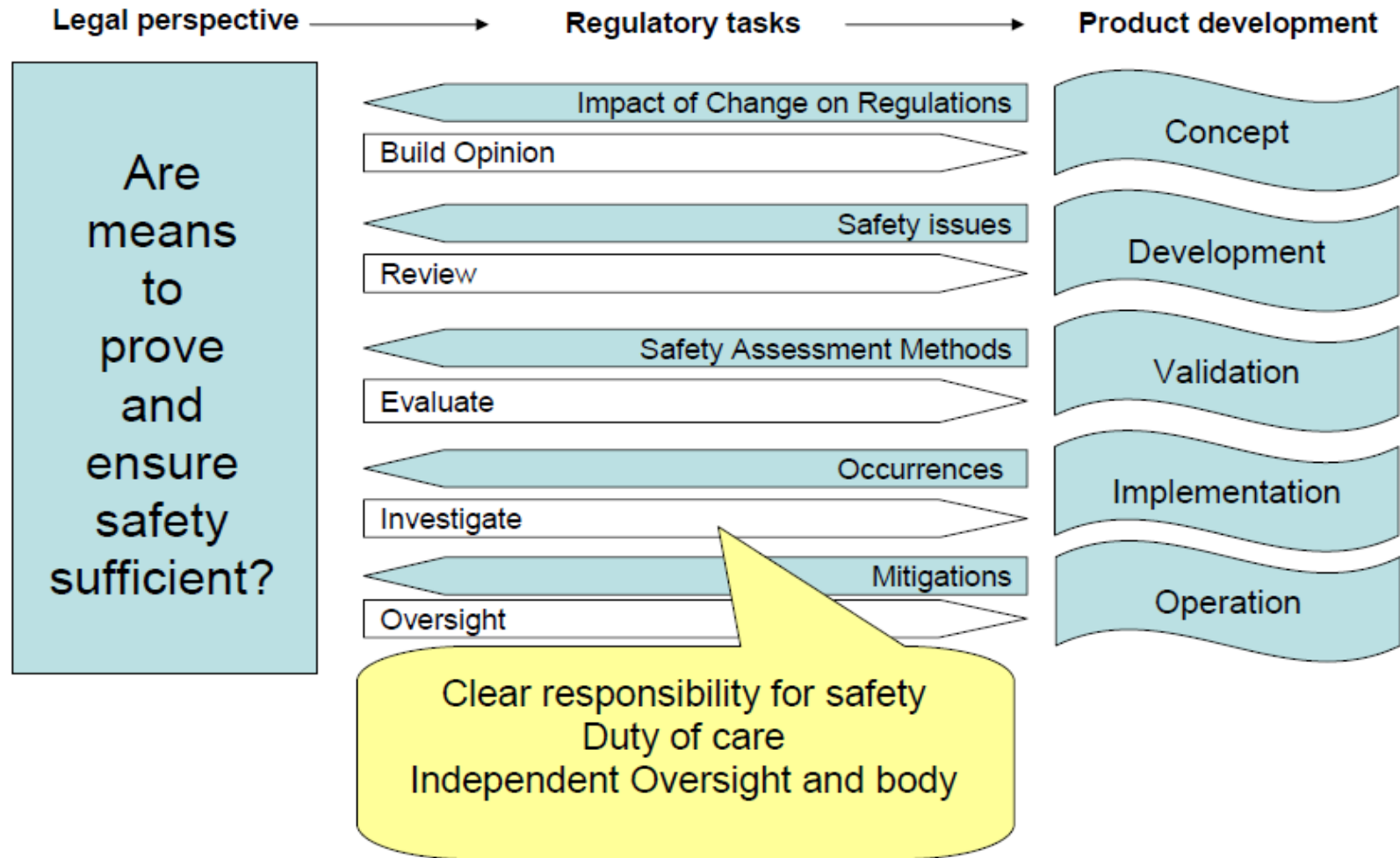








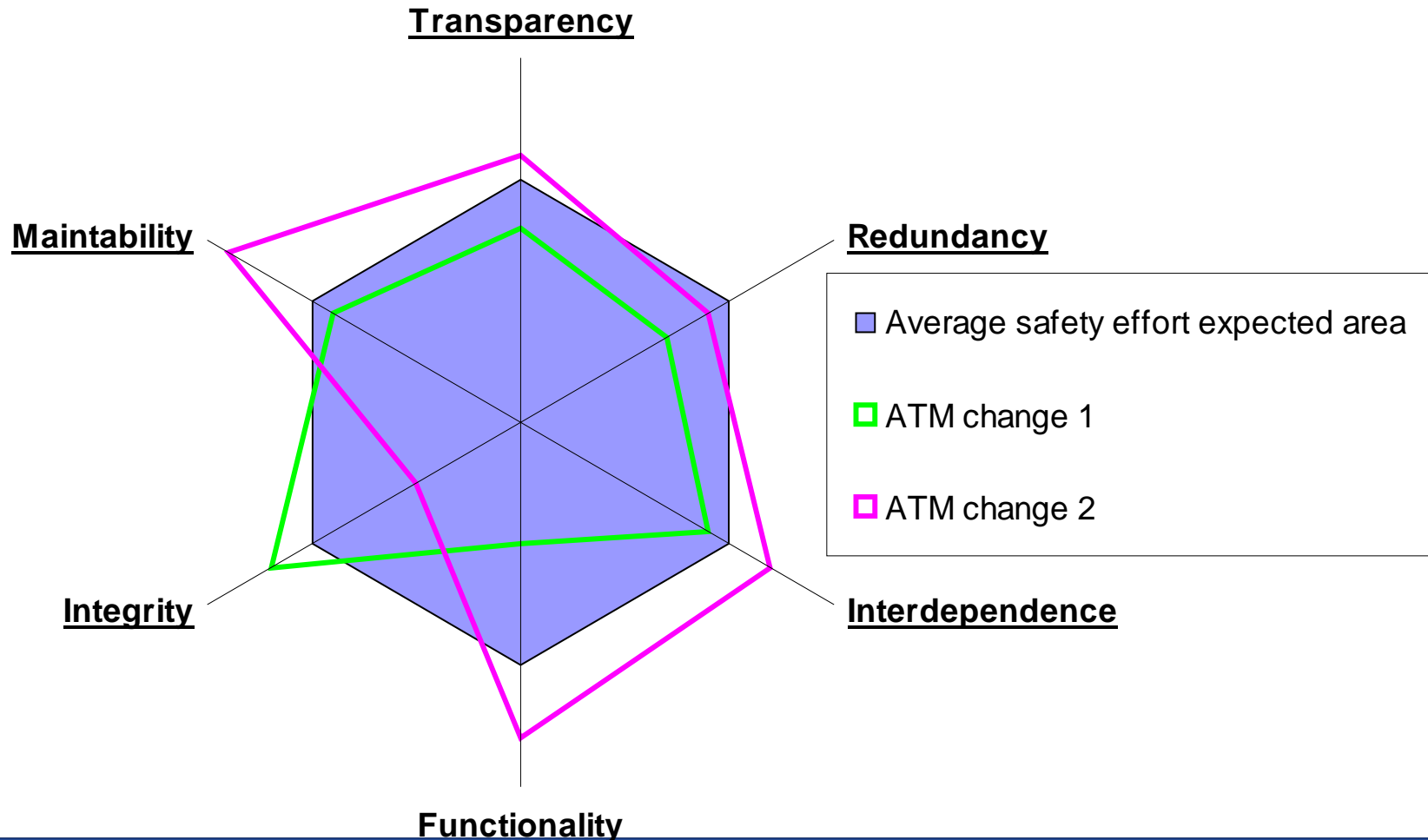
# Fundamentals on Regulation / Standards



# The Safety Scanning Tool

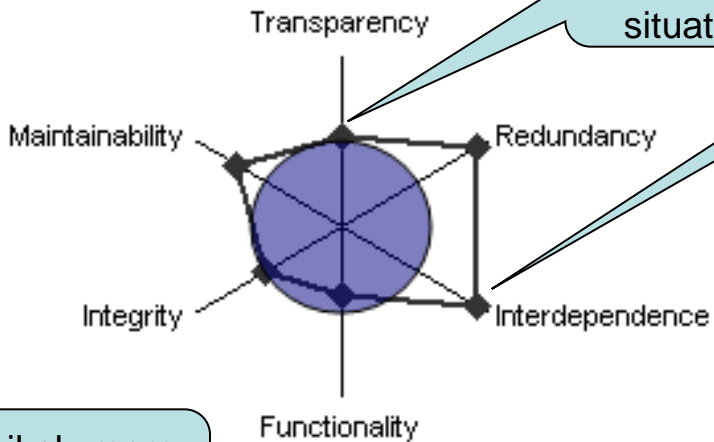
# Hypothetical example of result

(Safety Architecture and Technology perspective)



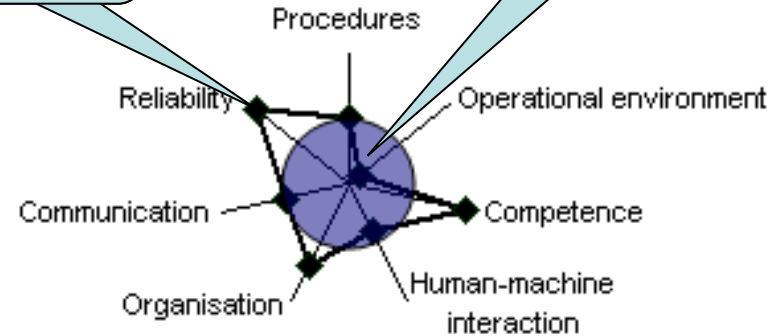
# Example: A/G Data link connectivity

## Safety Architecture



Likely equal to today's situation

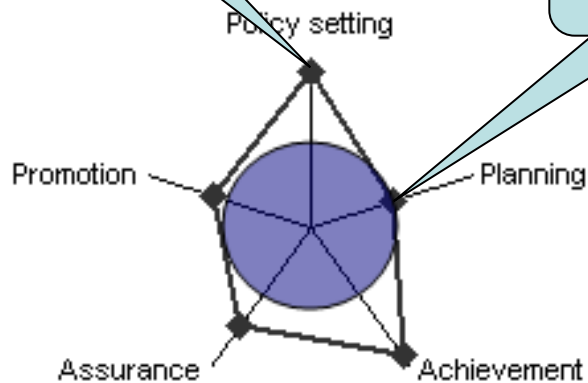
## Operational Safety



Issues to expect and resolve

Likely improved safety

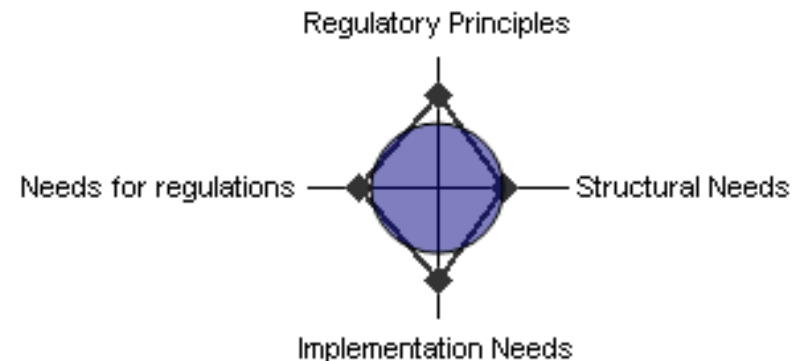
## Safety Management



Likely more complicated

Likely equal to today's situation

## Regulation Framework



## Safety Screening

- to provide a proactive safety approach
- to show whether a certain change (e.g., ATM, Traffic,..) will lead to a safety issue (safety feasibility)
- to give a general answer on the safety measures required for future ATM (no detailed quantitative assessment)
- to prepare later stages of safety assessment (scope, issues)
- to be applicable as a minimum to the current level of description of the proposed changes
- to be applicable to any change and any ATM subsystem (technical, human, organizational = managerial/procedural/institutional)