Training Package

Understanding Human Error in context.
Learning from accidents and incidents

SAFEMODE-CBHF-M1

Presentation contents

1. How many errors do you make every day/week/month/year?

2. How many errors do you make at work?

3. How many times have your errors contributed to a near-miss?

4. How many times have your errors contributed to an accident?

5. How many times have you contributed to avoid an error to become an accident? To contribute to resolve an error?

"Average" Error distribution

SAFEMODE

- Engineering perspective

Human error refers to something having been done that was "not intended by the actor; not desired by a set of rules or an external observer; or that led the task or system outside its acceptable limits" (Kletz, 2020)

Set of causes that need to be tackled to avoid accidents

- Organizational and networks perspective

Human error is a symptom or consequence rather than a cause and this approach focuses on those organizational and network processes that influence human errors (Kletz, 2020)
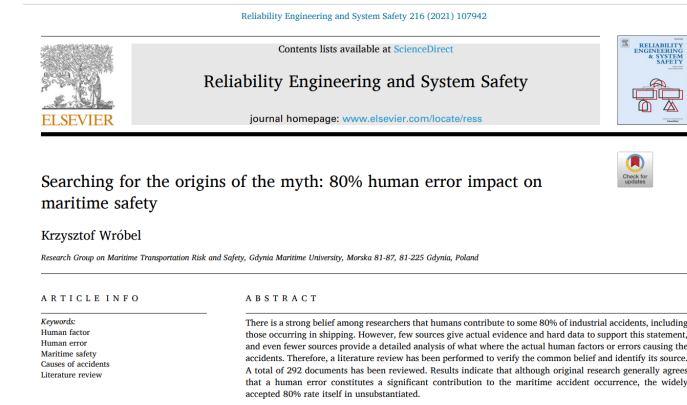
Troubles deeper inside organizations are the result of complicated interdependences of systems and subsystems

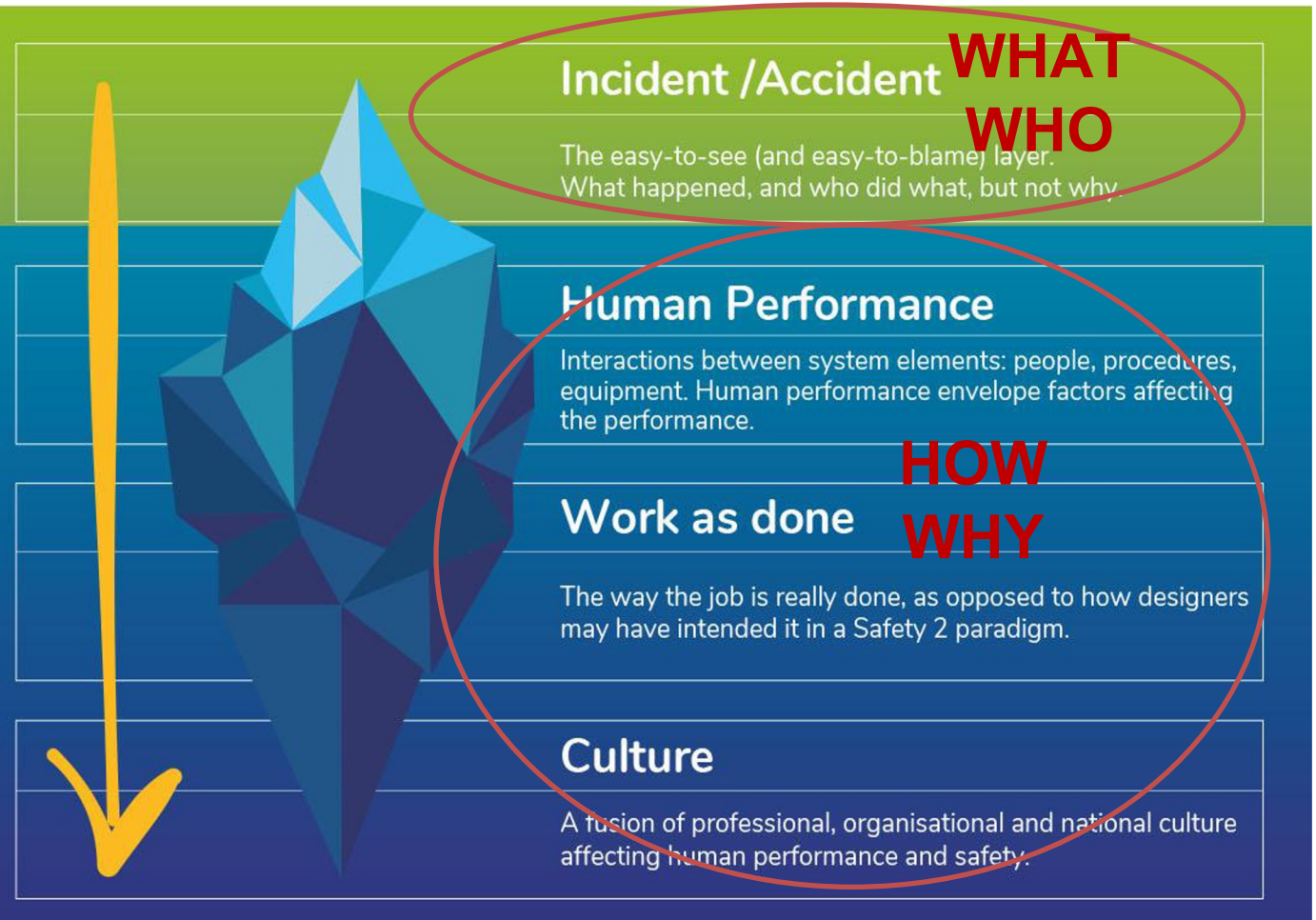From emphasis on **individuals** towards **organizational** failures and **safety** in **design**

"Human Errors are **unsubstantiated** of maritime/aviation/other safety critical industries accidents"

"For a long time, people were saying that most accidents were due to human error and this is true in a sense, but it's not very helpful. It's a bit like saying that falls are due to gravity."
Professor Trevor Kletz

Reliability Engineering and System Safety 216 (2021) 107942

Contents lists available at ScienceDirect

Reliability Engineering and System Safety

journal homepage: www.elsevier.com/locate/ress

Searching for the origins of the myth: 80% human error impact on maritime safety

Krzysztof Wróbel

Research Group on Maritime Transportation Risk and Safety, Gdynia Maritime University, Morska 81-87, 81-225 Gdynia, Poland

ABSTRACT

There is a strong belief among researchers that humans contribute to some 80% of industrial accidents, including those occurring in shipping. However, few sources give actual evidence and hard data to support this statement, and even fewer sources provide a detailed analysis of what where the actual human factors or errors causing the accidents. Therefore, a literature review has been performed to verify the common belief and identify its source. A total of 292 documents has been reviewed. Results indicate that although original research generally agrees that a human error constitutes a significant contribution to the maritime accident occurrence, the widely accepted 80% rate itself in unsubstantiated.

SAFEMODE

Human error: not intended/desired action, which fails to produce the expected outcome leading to unwanted consequences

Human factors (human element): Factors and characteristics which influence behaviour and performance, which possibly affects health and safety

Incident /Accident **WHAT** **WHO**

The easy-to-see (and easy-to-blame) layer. What happened, and who did what, but not why.

Human Performance

Interactions between system elements: people, procedures, equipment. Human performance envelope factors affecting the performance.

HOW **WHY**

Work as done

The way the job is really done, as opposed to how designers may have intended it in a Safety 2 paradigm.

Culture

A fusion of professional, organisational and national culture affecting human performance and safety.

- **MARITIME**

  The focus is on the **Human Element** at the centre of the event, the person(s) at the sharp end.

  There is talk of causality, and there is blame, and even criminal proceedings.

  If the human can be labelled as bad, why change the system? Why to look at complexity?

- **AVIATION**

  The focus is on **Human Factors,** that affect performance (positively or negatively), including organisational factors.

  There is talk of <u>contributory factors</u> and <u>context or operation</u>.

  Recommendations concern the factors, not the human.

Human Element

Human Factors

(Towards a Safety Learning Culture for the Shipping Industry: A White Paper. SAFEMODE, 2022)

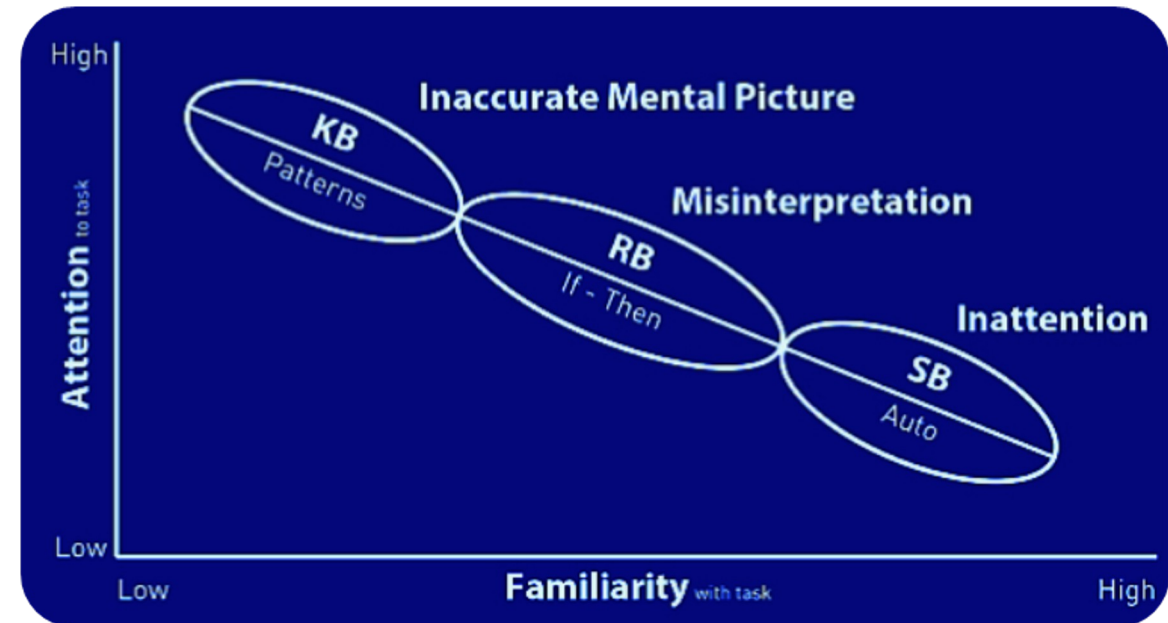| Knowledge based **behavior**	Knowledge based **mistakes**
Rule based **behavior**	Rule based **mistakes**
Skill based **behavior**	Skill based **mistakes**

(Rassmussen, 1979, Reason 1990)

SAFEMODE

Think of an example where an Skill (S)-, Rule (R)-, Knowledge (K) based error occurred to you or in your surrounding.

"Knowledge and error flow from the same mental sources, only success can tell the one from the other"
(Mach, 1905)

You are driving to work, and someone cuts you off. What is your first thought associated with this person?

SAFEMODE

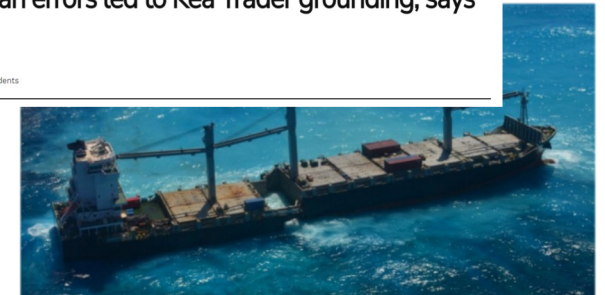People are quick to attribute the behavior of others to personality traits instead of the situation.

Open this link to see the video: https://www.youtube.com/watch?v=Y8IcYSrcaaA&t=2s

- Causality = an event, process, state or object (a cause) contributes to another event, process, state or object (an effect). The cause is partly responsible for the effect, and the effect is partly dependent on the cause (Pearl, 2009).

- Various models exist about accident causation

- The "cause" of an accident…

A course of human errors led to Kea Trader grounding, says official report

by The Editorial Team — July 23, 2018 in Accidents

Human errors led to ships collision in Corsica

by The Editorial Team — January 8, 2019 in Accidents

Businessweek | The Big Take

Boeing Built an Unsafe Plane, and Blamed the Pilots When It Crashed

Cost-cutting, corporate arrogance, and a new plane that was supposed to be easy to fly. An exclusive excerpt from *Flying Blind: The 737 Max Tragedy and the Fall of Boeing*.

By Peter Robison
November 16, 2021, 6:01 AM GMT+1

INDY/LIFE
BOEING 737 MAX: 'PILOTS LED THEIR PASSENGERS OVER AN AERODYNAMIC EDGE INTO OBLIVION,' SAYS FORMER PILOT

Pilot-turned-writer blames poor training and airmanship for the tragedies that claimed 346 lives

Report: String of Human Errors Caused Collision between Ulysse and CSL Virginia

January 9, 2019

A series of human errors caused the collision between the Tunisian Ro-Ro ship Ulysse and Cyprus-flagged containership CSL Virginia that took place in October 2018, approximately 28 kilometres north-west of Cape Corsica, according to preliminary findings of a joint inquiry into the case.

The container ship 'CSL Virginia' collided with the ferry 'Ulysse' near Cor

The cause of the Connecticut submarine accident in the South China Sea has been revealed

November 2, 2021

Multiple factors-each necessary and only jointly sufficient-are needed to push a complex system over the edge of breakdown
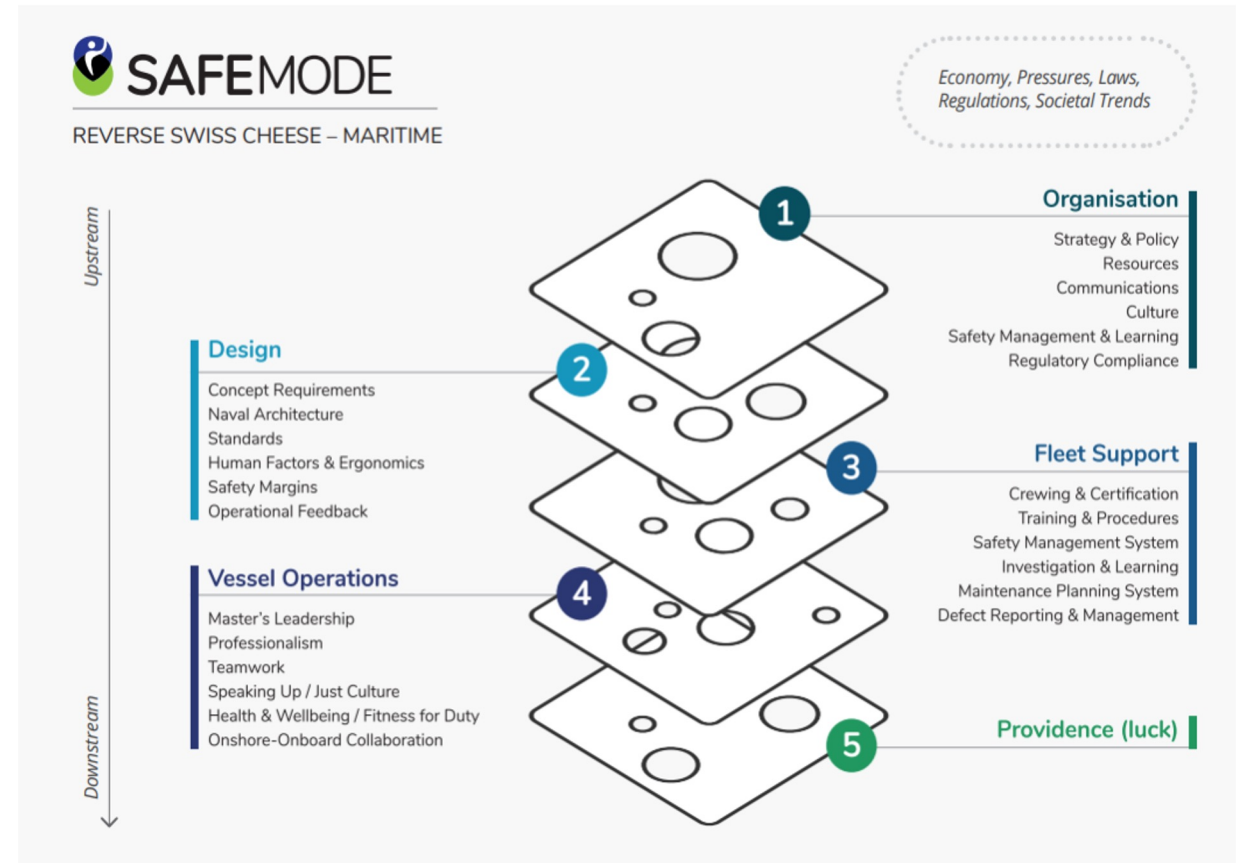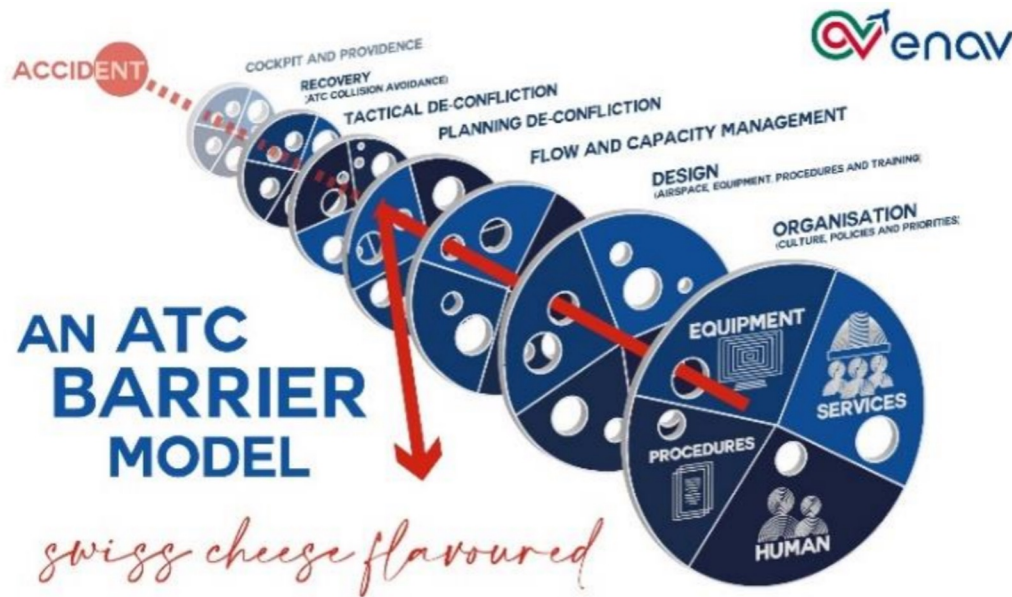(Dekker, 2002)

- "Causal factor" vs. "contributor"

  There is not single cause that causes accidents.

  It is one of a multiple influences. The event could still occur again or would have happened without the causal factor (Schölkopf, 2019)

- The reverse Swiss-Cheese model for aviation and maritime accidents causation.

(Towards a Safety Learning Culture for the Shipping Industry: A White Paper. SAFEMODE, 2022)

This project has received funding from European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement N°814961.

17

Old View	New View
Human error is the cause of many accidents.	Human error is a symptom of trouble deeper inside the system.
The system in which people work is basically safe; success is intrinsic. The chief threat to safety comes from the inherent unreliability of people.	Safety is not inherent in systems. The systems themselves are contradictions between multiple goals that people must pursue simultaneously. People have to create safety.
Progress on safety can be made by protecting the system from unreliable humans through selection, proceduralization, automation, training and discipline.	Human error is systematically connected to features of peoples tools, tasks and operating environment. Progress on safety comes from understanding and influencing these connections.

Dekker, 2002

EXAMPLE - Aviation

Charges are brought against the **pilots** who flew a VIP jet with a malfunction in its pitch control system (which makes the plane go up or down). Severe oscillations during descent **killed seven of their unstrapped passengers** in the back. Significant in the sequence of events was that the **pilots "ignored" the relevant alert light** in the cockpit as a **false alarm**, and that they had **not switched on the fasten seatbelt sign** from the top of descent, as recommended by jet's procedures. The pilot oversights were captured on video, shot by one of the passengers who died not much later. The **pilots, wearing seatbelts, survived the upset**.

Dekker, 2002

EXAMPLE - Maritime

The collision on 7 October at 7.02 am is the **consequence of a major lack of look-out on board** ULYSSE, combined with legal but an **unwise anchoring posit**ion and a **lack of attentive traffic monitoring** from CSL VIRGINIA. On board ULYSSE, the lack of look-out was caused by the **lack of involvement of the officer of the watch** before the collision. **The human component was the major factor causing the accident**, with a **lack of appreciation of the responsibilities** related to the officer of the watch position. **A boredom factor**, related to the length of sea-going periods, has certainly had an effect on the involvement of the officers of the watch on board both vessels. On board both vessels, **the use of mobile phone for personal concerns took precedence over the officer of the watch duties**, leading to a lack of surface situation monitoring.

Marine Accident Investigation (BEAmer, 2019)

SAFEMODE

EXAMPLE – Maritime

MAIB
MARINE ACCIDENT INVESTIGATION BRANCH

Produce clear and informative reports, with well-founded analyses and conclusions, which **explain the circumstances** and **where possible** identify the causal and contributing factors, without apportioning blame

MAIB Business Plan
2021-22

Treat **the survivors** and the relatives of victims of marine accidents with **consideration, empathy and honesty.**

MAIB | FIRST FLOOR, SPRING PLACE, 105 COMMERCIAL ROAD, SOUTHAMPTON, SO15 1GH

Marine Accident Investigation Branch

- Human error is not the conclusion of an investigation, it is the beginning.

- Human error is not random. It is systematically connected to features of people's tools, tasks and operating environment.

- To explain failure, do not try to find where people went wrong. Instead, find how people's assessments and actions made sense at the time, given the circumstances that surrounded them.

(Dekker, 2014)

- "Safety culture refers to the enduring value, priority and commitment placed on safety by every individual and every group at every level of the organisation. Safety culture reflects the individual, group and organisational attitudes, norms and behaviours related to the safe provision of air navigation services."
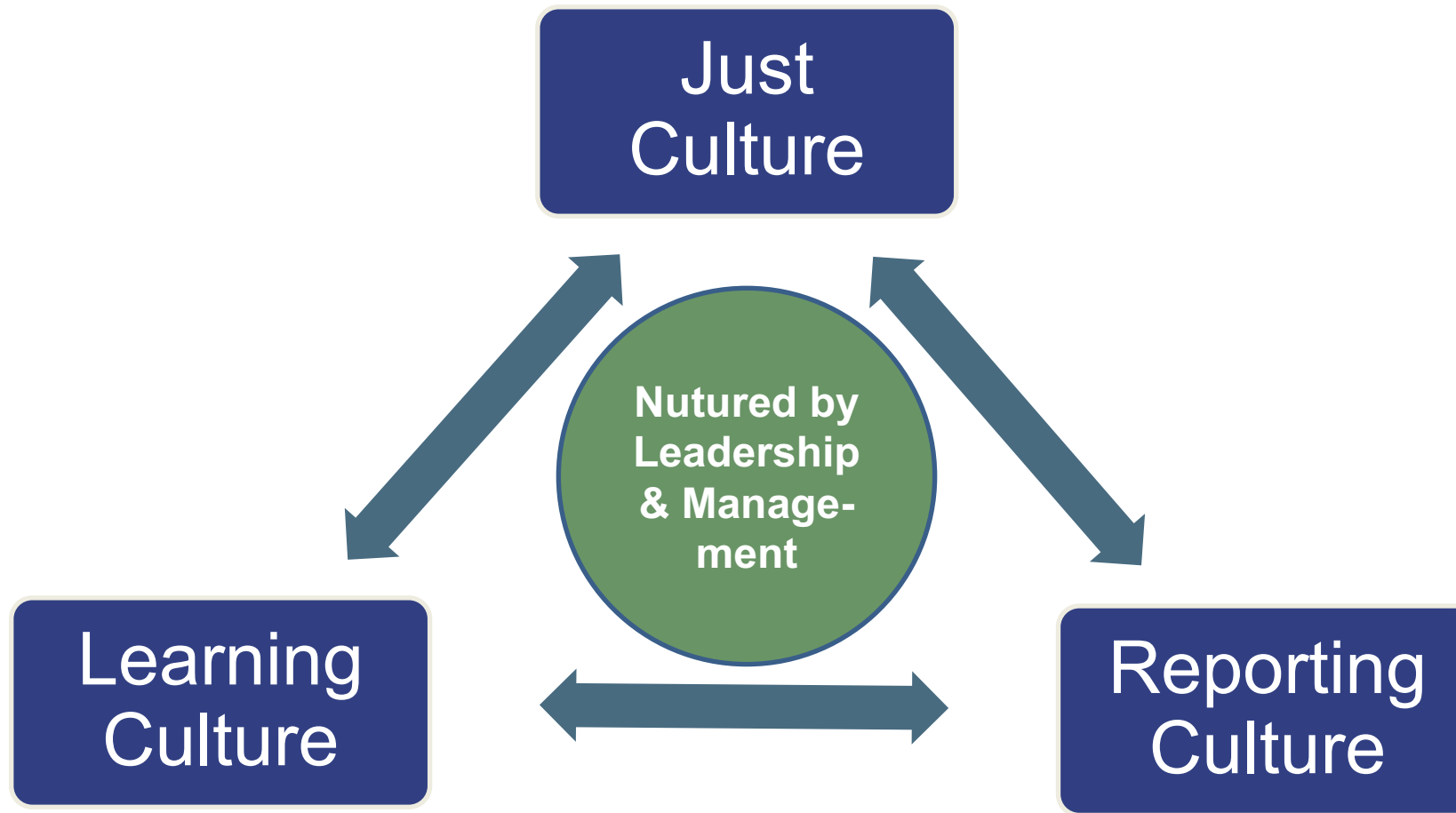
Is …
one that allows
the boss to
hear bad news

Is…about
how things
are done
around here

Is…demonstrated
through attitudes,
accepted norms
and behaviours

People make
safety

A Safety Culture

Safety Related Behavior
Risk Perception
Attitudes to Safety

- Learning Culture
- Informed Culture
- Just Culture
- Flexible Culture
- Reporting Culture

©Copyright CANSO 2008

- What factors compromise learning? And why do the same accidents happen even when organizations state to incorporate learning?

Tendency to blame and punish

Over-focus on procedural compliance without fully questioning the fitness-for-purpose of those procedures
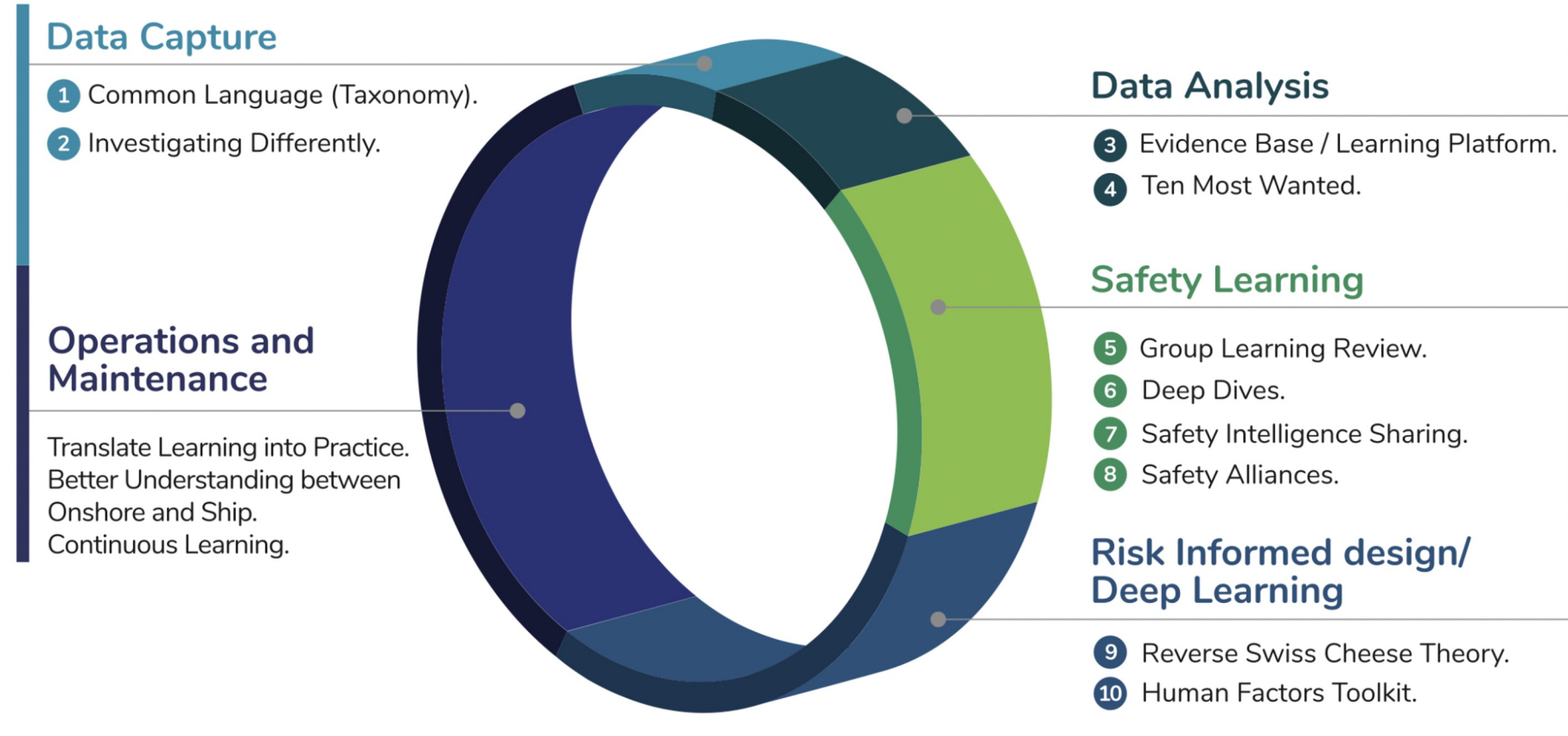
Lack of focus on 'upstream' or distant factors as contributors of accidents

Similar factors are reported in different ways (Tower of Babel)

learning will remain at the surface level, and incidents and accidents are doomed to recur

SAFEMODE

"To err is human" : Although it is a forgiving stance to take, organizations that suggest that "to err is simply human" may normalize error to the point where it is no longer interpreted as a sign of deeper trouble.

"IS THAT YOUR PLEA ... TO ERR IS HUMAN ?"

Data Capture
1. Common Language (Taxonomy).
2. Investigating Differently.

Operations and Maintenance

Translate Learning into Practice.
Better Understanding between Onshore and Ship.
Continuous Learning.

Data Analysis
3. Evidence Base / Learning Platform.
4. Ten Most Wanted.

Safety Learning
5. Group Learning Review.
6. Deep Dives.
7. Safety Intelligence Sharing.
8. Safety Alliances.

Risk Informed design/ Deep Learning
9. Reverse Swiss Cheese Theory.
10. Human Factors Toolkit.

(Towards a Safety Learning Culture for the Shipping Industry: A White Paper. SAFEMODE 2022)

- Human error is an ad hoc mechanism, an attribution after the fact, stopping the analysis too soon, thus preventing us from learning.

- Human error and human factor have different perpective. While human error is not intended/desired action, which fails to produce the expected outcome leading to unwanted consequences; human factor states factors and characteristics which influence behaviour and performance.

- Skill (S), rule (R), and knowledge (K) based framework help to understand the degree of conscious control exercised by the individual over his/her activities, depending on the degree of familiarity with the task and the environment.

- The reverse Swiss-Cheese model is a good model to understand causation for aviation and maritime accidents: looking into distant factors first.

- (New View) of human error highligts the statement that people make the system safe NOT that the system is inherently safe and needs to be secured from people's mistakes (Old View).

- Promoting Just Culture, Reporting and Learning poses significant aspect in term of safety within an organization.
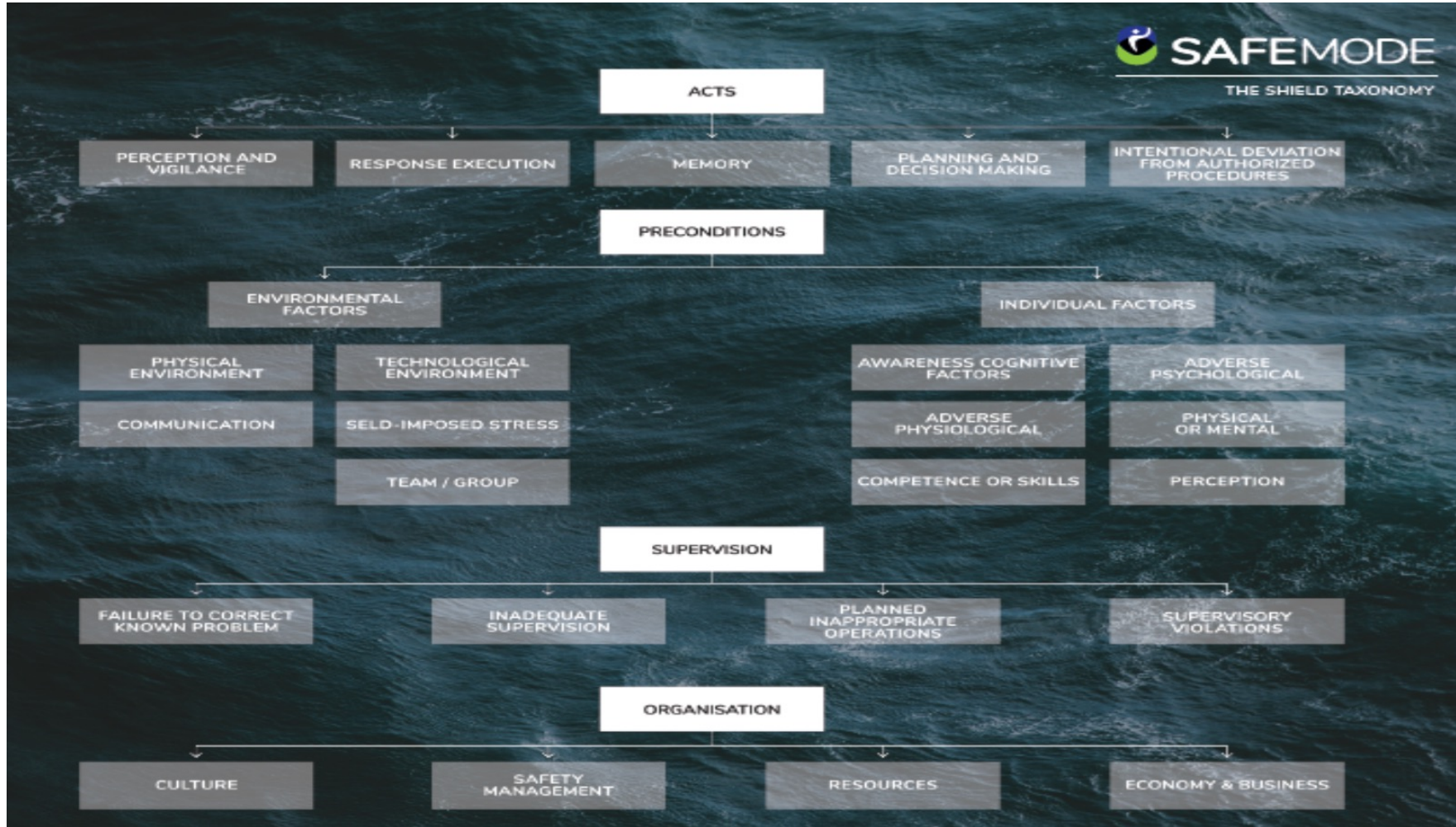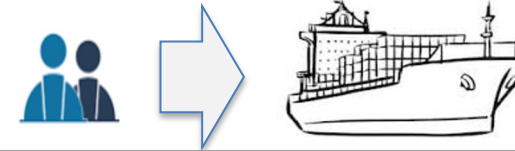
(Towards a Safety Learning Culture for the Shipping Industry: A White Paper, SAFEMODE 2022)

Collision at Dover Strait

- Collision occurred between bulk carrier and general cargo ship in Dover Strait,

- Night time, sea is moderate, visibility is good and VTS is on duty

- Minor environment pollution and extensive shell plate damages occured,
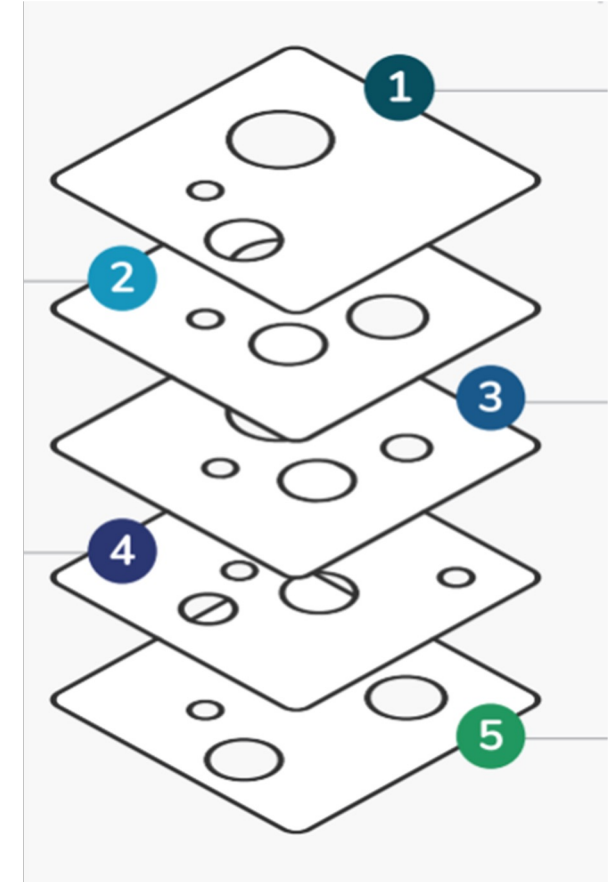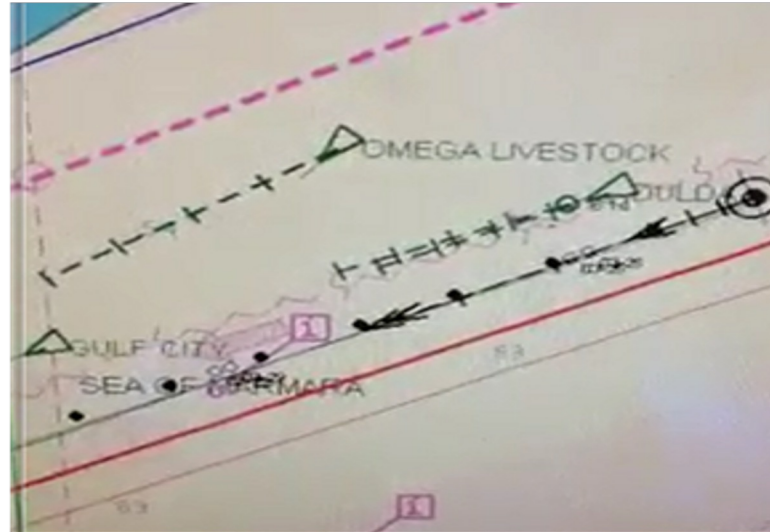
SAFEMODE

Collision at Dover Strait

Layer	Category	Sub-category	Descriptor	Contributing factors
ACTS	PLANNING AND DECISION MAKING	- No decision or plan	The operator fails to elaborate any action plan or decision to manage the situation.	The rapid closing speed demanded an early assessment so that effective avoiding action could be taken to ensure a safe passing.
ACTS	PERCEPTION AND VIGILANCE	-No/wrong/late visual detection	The operator does not detect (or detects too late or inaccurately) a visual signal necessary to formulate a proper action plan or make a correct decision.	The VHF call was unlikely to have resulted in an immediate response from the other vessel and was contrary to the advice given in MGN 167 (M+F). A signal light or searchlight, shown astern, as suggested by Rule 34(d), would have been more likely to have made the approaching vessel aware of presence
ACTS	PERCEPTION AND VIGILANCE	-No/wrong/late visual detection	The operator does not detect (or detects too late or inaccurately) a visual signal necessary to formulate a proper action plan or make a correct decision.	The master had the conduct of the navigation throughout, with the second officer and a helmsman/lookout making up the rest of the bridge team. However, none of the three persons on ship's saw the other vessel before the collision.
PRECONDITIONS	ENVIRONMENTAL FACTORS - COMMUNICATION	-Inadequate communication due to team members' rank or position	Differences in rank or position within team limit or jeopardize team communication.	There was no routine interaction between him and his dedicated lookout, who, in any case, had been allowed to leave the bridge over 10 minutes before the collision. Lookout reported to the lights to the chf off but he did not acknowledge
PRECONDITIONS	ENVIRONMENTAL FACTORS - COMMUNICATION	-Failure to use standard terminology	Failure to use clear and concise terms, phrases, hand signals, etc. as defined in standard terminology and training contributes to operator error.	The VHF call made by Master just before the collision was not heard by those on the bridge, and, so, was not answered.

Collision at Dover Strait

Layer	Category	Sub-category	Descriptor	Contributing factors
PRECONDITIONS	INDIVIDUAL FACTORS - PERCEPTION	- Motion illusion	Erroneous physical sensation of orientation, motion or acceleration by the operator.	OOW remaid seated throughout He had become complacent in his approach to watchkeeping
SUPERVISION	KNOWN PROBLEM NOT CORRECTED	- Inadequate operations management	A supervisor does not correct known unsafe practices, conditions, guidance or procedure, which allows hazardous practices within the scope of his / her authority.	There were no night orders left by the master to alert the watchkeeper to the risks of the passage across the TSS and the requirement to be extra vigilant.
SUPERVISION	KNOWN PROBLEM NOT CORRECTED	- Inadequate personnel management	A supervisor does not identify an operator who exhibits recognizable risky behaviours or does not institute the necessary remedial actions.	No lookout was present on either bridge at the time of the collision, and the vessels' radars and other bridge equipment were not used effectively.
SUPERVISION	INADEQUATE SUPERVISION	- Inadequate leadership, supervision or oversight	Availability, competency, quality or timeliness of leadership, supervision or oversight does not meet task demands and creates an unsafe situation.	At 0400, the vessel was 4 miles from the SW traffic lane of the Dover Strait TSS, when the chief officer took over as the bridge watchkeeping officer. He adjusted the set up of the starboard radar, which was equipped with an Automatic Radar Plotting Aid (ARPA), to the 6 mile range scale, ship's head up, relative motion. He offset the center of the radar display to provide a range of about 9 miles ahead. The port radar was not in use.
ORGANISATION	INDIVIDUAL FACTORS - ADVERSE PHYSIOLOGICAL	- Mental fatigue	Diminished mental capability due to restricted or shortened sleep, mental activity during prolonged wakefulness or disturbance of circadian rhythm leads to degraded task performance by the operator.	The master was suffering from a headache and, although he had slept the previous night and in the afternoon, it was over 8 hours since his last rest.

Collision of ships at Dardanelle Strait

- Collision occurred between tanker and cargo ship at Dardanelle Strait,

- Night time, weather is calm, visibility is good, VTS is on duty

- Minor shall plate damages occurred

Collision of ships at Dardanelle Strait

Layer	Category	Descriptor	Definition	Contributing factors
ACTS	RESPONSE EXECUTION	- Incorrect/unclear transmission of information	The operator transmits to other actors information which is incorrect or unclear, e.g. use of wrong callsign	The lookout by the bridge team, in particular by radar, was ineffective.
ACTS	PLANNING AND DECISION MAKING	- Incorrect decision or plan	The operator does not elaborate an action plan or make a decision which is sufficiently accurate to manage the specified situation.	The speed of ship was probably too fast for the conditions
ACTS	RESPONSE EXECUTION	- Wrong action on the right object	The operator selects the correct object (e.g. lever, knob, button, HMI element), but performs an action that is not the correct one.	The concentration on an appropriate level of alertness in watchkeeping appears to have lapsed as the vessel left the restrictions of approach starit.
ACTS	RESPONSE EXECUTION	- No action executed	The operator does not take an action which is necessary in the given situation.	The decision to discontinue the fog whistle signal was not made on sound navigational observations
ACTS	PLANNING AND DECISION MAKING	- Incorrect decision or plan	The operator does not elaborate an action plan or make a decision which is sufficiently accurate to manage the specified situation.	The range setting of the Master's radar at 0.75 miles was inappropriate for the speed of advance of the vessel on the sea passage.

Collision of ships at Dardanelle Strait

Layer	Category	Descriptor	Definition	Contributing factors
ACTS	RESPONSE EXECUTION	- Incorrect/unclear transmission of information	The operator transmits to other actors information which is incorrect or unclear, e.g. use of wrong callsign	The lookout by the bridge team, in particular by radar, was ineffective.
PRECONDITIONS	ENVIRONMENTAL FACTORS - ENVIRONMENT PHYSICAL	- Vision affected by environment	Environmental conditions affect the operator's vision.	The visibility was poor and time is night.
ORGANIZATION	CULTURE / CLIMATE	- Company safety climate / morale	Low company morale leads to a poor attitude to safety and organisational safety. Those working in the organisation don't believe the organisation 'cares' for them and likewise they do not 'care' about the organisation.	The bridge management regime appears to have so relaxed

What messages will you take home from this presentation?

- Saying that accidents are caused by Human Error is like saying that falls are due to gravity.

- Human Errors are rooted in useful psychological processes, which give us the great ability to simplify informationally complex tasks. Errors are the flip side of these abilities.

- There is no single cause of an accident but multiple contributors. Blaming it on Human Error is only the beginning of understanding what happened.

- The <u>New View</u> of Human Error focuses on the statement that people make the system safe NOT that the system is inherently safe and needs to be secured from people's mistakes (<u>Old View</u>).

- Promoting Just Culture, Reporting and Learning can fundamentally impact the safety within an organization.

- Learning from accidents involves identifying the systemic causes of accidents, but also ensuring lessons learned are effectively promulgated across organizations and industries.

Thank you for your attention

Session contributors

Tatjana Beuker | tatjana.beuker@dblue.it

Maria Carrera | mca@wmu.se

Emre Akyüz | eakyuz@itu.edu.tr

Esma Uflaz | uflaz16@itu.edu.tr

Ozcan Arslan | arslano@itu.edu.tr

SAFEMODE