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HBV

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A human factors perspective on human error and near-misses in dynamic positioning

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Contents of presentation

- Short presentation of Buskerud and Vestfold University College, Norway
  - Faculty of Technology and Maritime Sciences
  - Department of Maritime Technology and Innovation
  - Maritime Human Factors Research Group
    - Research on Human Factors in Socio-technical systems

Buskerud and Vestfold University College (HBV)

- HBV was formed the 1st of January 2014 by the merging of Vestfold University College and Buskerud University College
  - Ca. 8000 students
  - Ca. 800 employees
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Faculty of Technology and Maritime Sciences

The oldest technology education in Norway

Part of two Norwegian Centres of Expertise

About 1100 students, 30 phd-candidates and ca 180 employees in 7 departments.

- Department of Natural Sciences (Kongsberg)
- Kongsberg department of Engineering (Kongsberg)
- Norwegian institute of Systems Engineering (Kongsberg)
- Department for Maritime Studies (Vestfold)
- Department of Maritime Technology and Innovation (Vestfold)
- Department of Technology (Vestfold)
- Department of Micro and Nano Systems Technology (Vestfold)

Budget: Government funding: ca 65 mill NOK ; External financing from research grants and regional industry: ca 30mill NOK.

Human Factors: A brief introduction

- **Human Factors: What is it?**
  - HF is a cross-disciplinary research domain that starts out with *knowledge of human and system capabilities* and seeks to improve safety, efficiency and health.

- **Human Factors: Why is it important?**
  - Building safe and efficient systems require an understanding and appreciation of all factors that can influence the system´s performance
    - Humans are vital components in all socio-technical system

Human Error and accidents: common assumptions

- Common assumptions that humans are a cause of accidents/incidents – a short search gave a couple of indications
  - "*Most of the preventable incidents involved human error (82 per cent)*" (Cooper et al., 1978, p. 399)
  - "*About 75-96% of marine casualties are caused, at least in part, by some form of human error*" (Rothblum, 2000).
- In other words: humans are often seen as a liability (Hollnagel, 2012) and as a cause of a majority of accidents.

Human errors: answers to the common (and false) assumptions

- There are (at least) four problems with the claims that humans are involved in accidents:

First: Selection bias

First, the data sets is selected on the *independent variable* (accidents) and hence show *selection bias*.

		Human Error?	
		Yes	No
Accident?	Yes	8/10	2/10

Second: Unknown base rate

Second, we know nothing of the number of successes per error/accident

i.e. the base rate of given behaviors are unknown,

Hence: we cannot say anything about causation

		Human Error?	
		Yes	No
Accident?	Yes	8/10	2/10
	No	??	??

Third: Errors are not independent entities

Third, "human error" do not exist independently of the standards used to evaluate performance.

To name something as an "error" we need also to name the standard to which the act is seen as an error.

Claiming that an act is erroneous *because* it precedes an accident is therefore tautological

Rules? Standards of Performance?		Human Error? Yes	Human Error? No
Accident?	Yes	8/10	2/10
	No	??	??

Fourth: Hindsight and errors

Fourth: Labeling of acts as "errors" are often done with the benefit of hindsight.

- *Claim:* If an act is not seen as an error before an accident (in a similar situation) it is not an error during an accident.
- i.e. acts do not become errors because they are antecedent to accidents

Rules? Standards of Performance?		Human Error?	
		Yes	No
Accident?	Yes	8/10	2/10
	No	??	??

Human Error: A way out

A methods for evaluating human error: “The five whys”

1) Ask why the error occurred
2) Then ask why the ‘cause’ of the error occurred
3) Repeat 5 times (why? why? why? why? why?)

Focus on successes and on improving chance for success – rather than focussing on errors

Facts about humans in socio-technical systems

- Humans are the most adaptable part of socio-technical systems
  - Humans alter interface design to better fit with work tasks
  - Can evaluate the meaning of information
  - Can adapt to changing goals
  - Can adapt to system variability and cope with complexity
- Hence, humans are just as much a reason for the successes of system.

- We should also investigate human involvement in successes and identify why they manage to ensure successful operation in demanding environments (Hollnagel, 2012).

Human Factors research at HBV

- Research domain: *Characteristics of human decision making and situation awareness during critical incidents in work with highly automated systems*.

- **Background:** Work with highly automated systems do not make the work task simpler (as was intended), but:
  - Work becomes more passive, based on supervising the machine, rather than actively being in control.
  - The human operator must react to exceptions form normal operation
    - But the limits of when something is abnormal is open for interpretation
    - "Damned if you do, damned if you don't".

The maritime domain

- Challenges for maritime socio-technical systems relative to other socio-technical systems (Øvergård et al., accepted).
  - *Lack of standardization of interfaces and technology.*
  - *Complex team compositions*
    - Large teams with multi-cultural and cross-disciplinary teams
  - *Team compositions may change* (during Piloting)
  - *Teams are geographically distributed*
  - *High complexity of operations* (multi-vessel operations both over- and under the sea surface).
  - *Highly dynamical environment*

Critical incidents in Dynamic positioning

- DP control systems maintain floating structures in fixed position or pre-determined track for marine operation purposes exclusively by means of active thrusters (Sørensen, 2011)
  - This allows for a number of operations that require a stationary position, such as:
    - Drilling
    - Diving support
    - Operations with Remote-operated vehicles (ROV)
  - Is much used in off-shore work and accidents involving DP-operations has a huge potential for losses.

Critical incidents as opposed to accidents

- Critical incidents was so-called ‘near-misses’ with no damages incurred, e.g. situations which under different circumstances could have led to an accident.
- Critical incidents are instances of ‘successes’ or recovery form abnormal incidents – due to the human operator´s actions.

Incidents vs. accidents

- Why not just read accident reports – there must be lots of them?
  - There are much more 'near-misses' than there are accidents (estimated ratio ≈ 600 incidents to 1 accident; Rothblum et al., 2002).
  - Near misses are instances of successes – we can see *how* accidents are avoided rather than seeing what went wrong.
  - Allows a focus of human operators as *safety assets* rather than safety liability.

Results

- So, we interviewed 13 DP-operators using the Critical Decision Method. Each informant was asked two critical incidents.

- We obtained information about 24 incidents.

- The information flow and decision making was normalized for each case with the onset of the critical incident as the center point.

Results: Base events vs. consequences

		Consequence of Incident					Total
		Drive Off	Drift Off	Force Off	Collision Course	Keep Position	
Base Event	PMS/DP	1	4	0	0	1	6
	Human Error	2	2	1	1	0	6
	DP Reference System	2	0	0	0	0	2
	DP Software	1	0	0	0	0	1
	Environmental Impact	0	0	7	0	0	7
	Component Failure	0	0	0	0	2	2
Total		6	6	8	1	3	24

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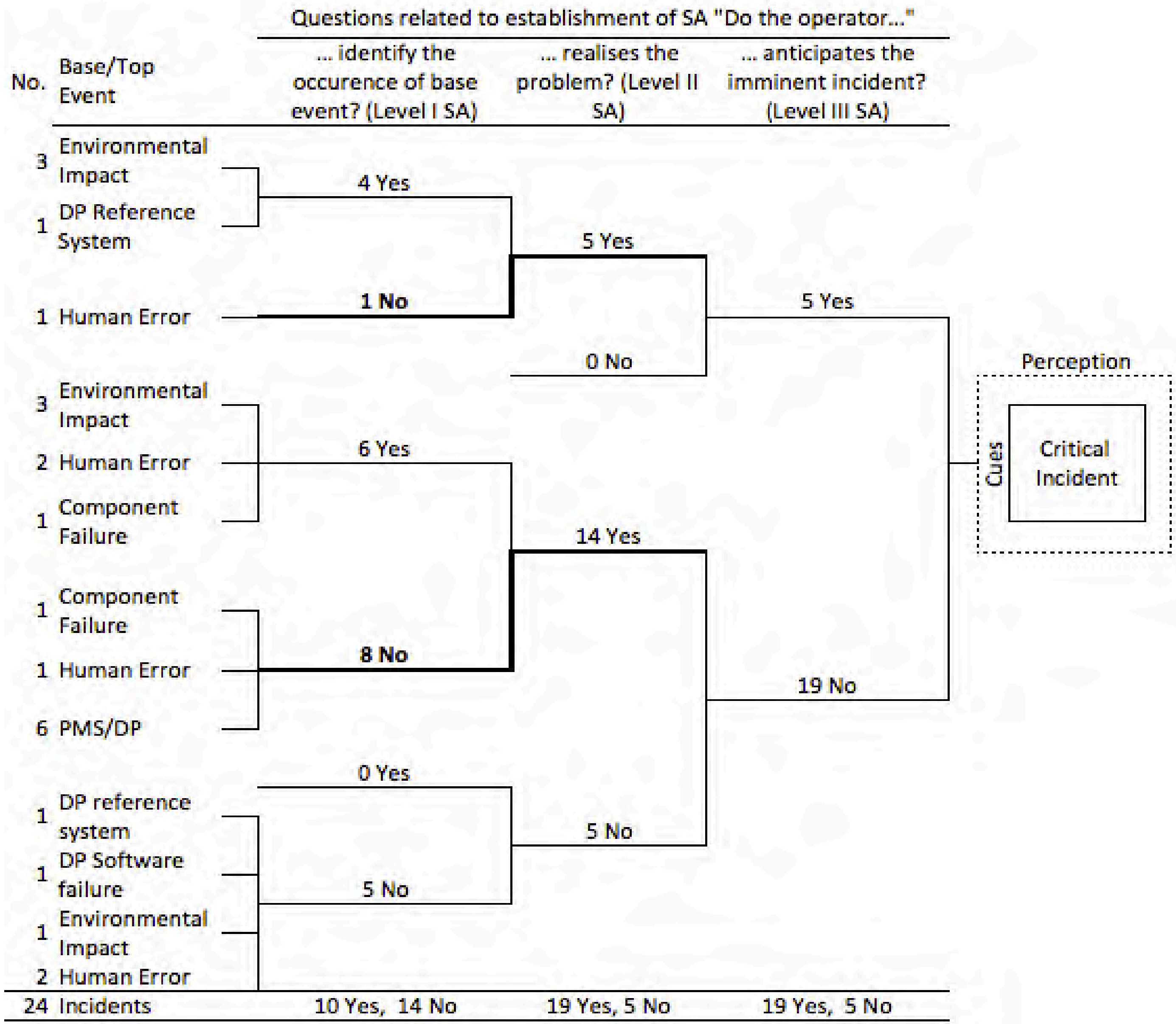
Failure three involving information use



Procedures and expectancies

	Expected	Unexpected
Follow procedure	5	13
Improve procedure		3
Break procedure		3
Sum	5	19

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