Characteristics of Critical Incidents in DP

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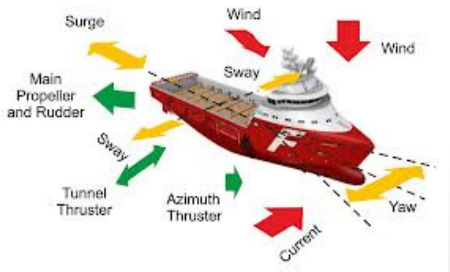
Dynamic Positioning

- What is it?

- DP is an automated system for vessel station keeping. A computer control system automatically maintains a vessel's position and heading by controlling machinery power, propellers and thrusters. Position reference sensors, along with wind sensors, motion sensors and gyro compasses provide input to the computer in order to maintain the vessel's position, making allowances for the size and direction of environmental forces (Sørensen, 2011).
- Keep position



Background

- Humans working with automated systems is a challenge.
- DP has been described as 99% boredom and 1% panic.
- This presentation is about how DP operators deal with the unexpected.

Background

- A lot of accidents are avoided.
- They must be doing something right.

- And that is interesting to know something about
- Proactive

- Accidents
- Routines
- Critical incidents

Background

- New training demands on ship officers. STCW, Manila 2010
- Require ship officers to have the knowledge and ability to apply the following decision-making techniques: *situation and risk assessment, identifying and generating options, selection of course of action and evaluation of outcome effectiveness* (IMO, revised STCW, 2010).
- And ship officers should obtain and maintain situation awareness
- Is this a step in the right direction?

Research Questions

- What characterizes critical incident in DP?
- What characterizes human operator decision-making in critical incidents in DP ?

Method

- Purposive sampling
  DP operators had to be experts.
  Critical incidents had to be personally experienced.
- Informants
  13 DP operators
  24 Critical incident reports
- Data collection
  - Demographic questionnaire
  - Semi structures interviews
    questions based on Critical Decison Method with the intent of eliciting specific information (Klein, Calderwood & McGregor, 1989)
- Data analysis
  - Thematic analysis

Characteristics of informants

- 13 informants
- Age from 29 to 69 years (mean = 44,3, σ = 12,1)
- Seagoing experience from 5 to 40 years (mean = 20,2;σ = 11,4)
- DP experience from 4,5 to 33 years (mean = 12,9; σ = 8,1)
- Experience from an average of 4,3 DP vessel types. (σ = 2,3)

Characteristics of critical incidents

- 8 types of DP operations
  (Accommodation, Construction/support, Drilling, Anchor handling, Sea trial, Offloading, Supply and Diving/ROV survey)
- 5 categories of outcomes
  (Drive off, Force off, Drift off, Collision course, Keep position)
- 5 categories of base events
  (Power management system/DP, Human error, DP reference system, DP software, Environmental impact, Component failure.

Characteristics of critical incidents

Table 2: *Relationship Between Type of Operation and Base Event*

		Base Event						Total
		PMS/DP	Human Error	DP Reference System	DP Software	Environmental Impact	Component Failure	
Type of Operation	Accommodation	2	0	1	0	1	0	4
	Construction/Support	2	2	1	0	0	0	5
	Drilling	0	0	0	0	2	0	2
	Sea Trial	0	0	0	0	1	0	1
	Anchor Handling	0	1	0	0	0	0	1
	Offloading	0	1	0	1	0	0	2
	Supply	2	1	0	0	0	1	4
	Diving	0	0	0	0	3	0	3
	ROC Survey	0	1	0	0	0	1	2
Total		6	6	2	1	7	2	24

Note. The table displays the incident frequency distribution of the relationship between categories of operations and base events.(PMS/DP = Power Management System/Dynamic Positioning).

Characteristics of critical incidents

Table 3: *Relationship Between Consequence of Incident and Types of Operation*

		Consequence of Incident					Total
		Drive Off	Drift Off	Force Off	Collision Course	Keep Position	
Type of Operation	Accommodation	1	2	1	0	0	4
	Construction/Support	3	1	0	0	1	5
	Drilling	0	0	2	0	0	2
	Sea Trial	0	0	1	0	0	1
	Anchor Handling	0	1	0	0	0	1
	Offloading	1	0	1	0	0	2
	Supply	1	1	0	1	1	4
	Diving	0	0	3	0	0	3
	ROC Survey	0	1	0	0	1	2
Total		6	6	8	1	3	24

Note. The table displays the incident frequency distribution of the relationship between categories of operations and consequences. (PMS/DP=Power Management System/Dynamic Positioning).

Characteristics of critical incidents

Table 4: *Relationship Between Base Event and Consequence of Incident*

		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

Note. The table displays the incident frequency distribution of the relationship between categories of base events and consequences. (PMS/DP = Power Management System/Dynamic Positioning).

What characterize critical incidents

- DP operators have to deal with the unexpected.
- Time is limited and affect decisions.
- Consequence prediction enable DP operators to take control.
- DP operators fight to stay in the loop.
- Critical incidents are recovered by lowering the level of automation and following safety procedures.

What characterizes decision-making in critical incidents?

- Very few decision choices are produced.
- DP operators recognize patterns of experiences.
- DP operators match information to past experiences. (19 of 24)
- Mental simulation of ”what if” scenarios.
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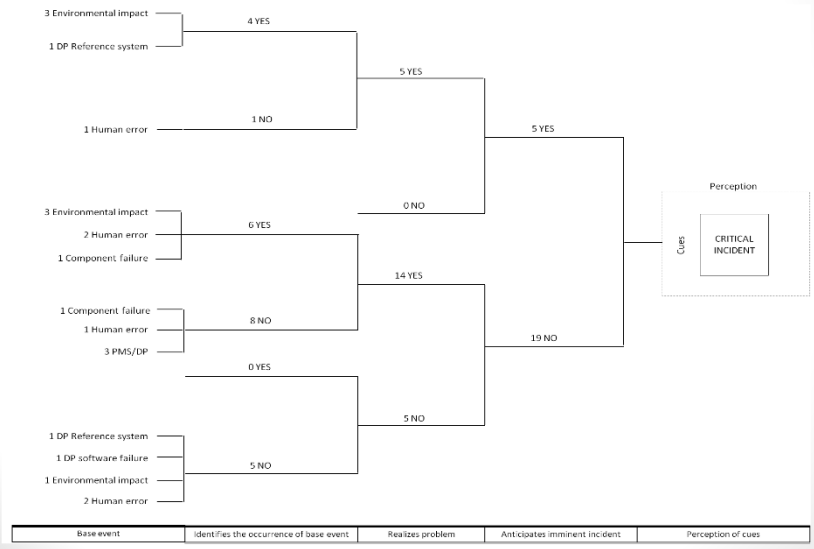
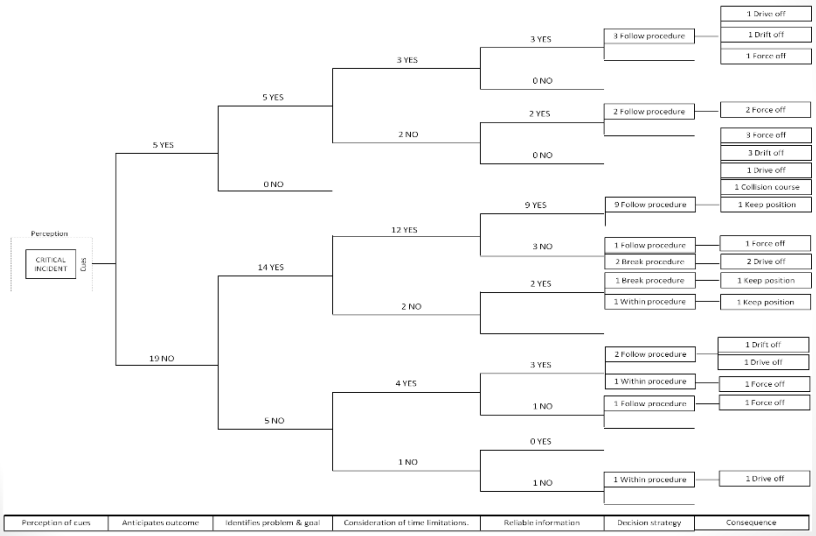
- Situation assessment process form decisions.

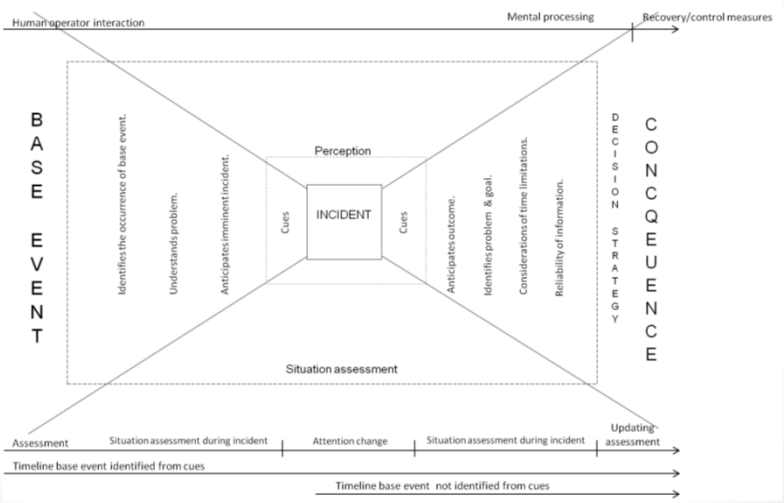
Base Event Recognition



Consequence Prediction



Overview of Findings



Summing up

- Decision-making in critical incidents in DP is not rational, but more recognition primed.
- Situation awareness is not always a sequential process that only has to do with the human operator. There are indications that in DP high level SA is not dependent on first obtaining low level SA.

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