Review of human factor implications of the Costa Concordia accident

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Overview about this presentation

- Human factor analysis in the accident investigation report
- The Costa Concordia accident in a historical perspective
- Deficiencies of the accident investigation
- Discussion
Human factor analysis in the accident investigation (I)

Report submitted to MSC 92

- Human factor related key findings
  - “the Master’s unconventional behaviour ... represents the main cause of the shipwreck.” (p. 9)

- Contributing from a human factor perspective
  - BRM related issues
    - No clear handover between Master and C/O
    - Inattention of Master due to other persons on the bridge
    - Inattentive bridge team
    - “… passive attitude of the Bridge Staff. Nobody seemed to have urged the Master ... ot to give warning ...”
Human factor analysis in the accident investigation (II)

Report submitted to MSC 92

- Contributing from a human factor perspective
  - Emergency management
    - Unfamiliarity with the procedures to abandon the ship
    - Lack of leadership from the bridge
    - Dissoriented crew
  - Shipping company involvement
    - No questioning of the decisions of the Master
    - In appropriate cooperation with the SAR services
    - Qualification of the crew – e.g. communication problems
100 years in between ...

Titanic (1912) vs. Costa Concordia (2012)

Pictures: www.titanicuniverse.com; www.shipfriends.gr
Human factors reviewed

Technology and regulations have changed, but human factors ...

- Possible Titanic factors
  - Authority gradient
  - Group think and the desire for harmony
  - Cognitive hysteresis
  - Efficiency thoroughness trade-offs (ETTO)
  - Organizational factors

- Additional Non-Titanic factors
  - Communication
Authority gradient

USCG CUYAHOGA (1978)

The ability to challenge decisions taken on a higher level of authority
Authority gradient

BOW MARINER (2004)
GREEN LILY (1997)
...
Group think or the desire for harmony ...

BÖHLEN (1976)

Are critical comments appreciated ...?
Group think or the desire for harmony ...

... were they all in agreement?
Cognitive hysteresis

What do you see and what does it require to change this?
Efficiency thoroughness trade-offs (ETTOs)

TORREY CANYON (1967)

How to balance operational priorities and safety concerns ...
Communication problems

SCANDINAVIAN STAR (1990)

... not the first and not the last time communication problems on board were noticed ...
How were human factors treated?

Human factors in the maritime sector

- Often accidents were attributed to single causes
- Reactive approaches in follow-up to an accident rather than proactive approaches in ship safety
- Preferred way following accidents were technical regulations until the end of the 1990s (double hull in case of the EXXON VALDEZ)
- Changes in design, new regulations or training were suggested
- A few examples only where the system as such was changed (HERALD OF FREE ENTERPRISE – ISM Code)
How were human factors treated?

Human factors in the maritime sector

- Bridge Resource Management / Bridge Team Management
Bridge Resource Management

STCW 2010 Manila Amendments

- Competence: Maintain a safe navigational watch

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<thead>
<tr>
<th>Column 2</th>
<th>Column 3</th>
<th>Column 4</th>
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<tbody>
<tr>
<td>Knowledge, understanding and proficiency</td>
<td>Methods for demonstrating competence</td>
<td>Criteria for evaluating competence</td>
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<tr>
<td><strong>Bridge resource management</strong></td>
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<td>Knowledge of bridge resource management</td>
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<tr>
<td>principles, including:</td>
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<tr>
<td>.1 allocation, assignment, and prioritization</td>
<td>Assessment of evidence obtained from one or</td>
<td>Resources are allocated and assigned as</td>
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<tr>
<td>of resources</td>
<td>more of the following:</td>
<td>needed in correct priority to perform</td>
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<td>.1 approved training</td>
<td>necessary tasks</td>
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<td></td>
<td>.2 approved in-service experience</td>
<td>Communication is clearly and unambiguously</td>
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<td></td>
<td>.3 approved simulator training</td>
<td>given and received Questionable decisions</td>
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<td>and/or actions result in appropriate</td>
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<td>challenge and response</td>
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<td>.2 effective communication</td>
<td></td>
<td>Effective leadership behaviours are</td>
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<td>.3 assertiveness and leadership</td>
<td></td>
<td>identified</td>
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<td>.4 obtaining and maintaining situational</td>
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<tr>
<td>awareness</td>
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<td>.5 consideration of team experience</td>
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The search for single causes is often too simple

A systemic view is required

- Functional resonance

Problem issue – accident investigation & follow-up

What safety problems are identified during accident investigation? (Schröder-Hinrichs et al. (2011))

- Flag State influences
- Organizational influences
- Unsafe supervision
- Preconditions for unsafe acts
- Unsafe acts

Contributing factors to accidents

- 56.5%
- 20.4%
- 5.7%
- 13.9%
- 3.5%
Problem issue – accident investigation & follow-up

Some of the issues not questioned by the investigators

- Earlier passages
- Training and qualifications of the crew
- Emergency training
- Working language
- ...
Problem issue – organizational culture in shipping

Types of organizational cultures in shipping companies (Mathiesen, 1994)

<table>
<thead>
<tr>
<th>Evasion culture</th>
<th>Compliance culture</th>
<th>Safety culture</th>
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<tbody>
<tr>
<td>“When costs of complying with the Rules and Regulations is considered to be high, so are the benefits of evading them”</td>
<td>“a situation where the shipowners strive to comply with Rules and Regulations as this is the ‘Ticket to Trade’”</td>
<td>“a situation where owners are engaged in a continuous process to improve safety and see this as their management philosophy and operational mode to reduce losses”</td>
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<td>“focus on the entire management chain; from the boardroom to the ship”</td>
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Conclusions

Is the focus on technology the best focus in the follow-up to accidents

- Remember the objectives of accident investigation
- Increase the number of reported accidents into public data bases
- Discuss what data gaps exist and how they can be closed
- Remember it is (so far) always a human operator handling the ships and the installed technology
Further information

For more information regarding the issues addressed in this presentation, refer to


Thank you!

Many thanks to Erik Hollnagel for stimulating discussions related to the topic.

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