The Management of Seafarer Fatigue: Linking research to regulation

Professor Mike Barnett
Assoc Professor Claire Pekcan
Warsash Maritime Academy
The Partners:

The Stress Research Institute

Warsaw Maritime Academy

Bureau Veritas

Stockholm University

Avancez 1829

Nautilus International

Chalmers University
Identical simulated voyages for 7 days using linked bridge, engine and cargo control simulators to study fatigue levels under different watch keeping patterns.

Fatigue measures included EEG of 4/8 and 6/6 bridge and engine watch keepers.
The measurement of sleepiness through changes in brain activity (EEG)
The micro sleep:

or “cat-napping”!
KSS - The Karolinska Sleepiness Scale

1. extremely alert
2. very alert
3. alert
4. quite alert
5. neither alert nor sleepy
6. some signs of sleepiness
7. sleepy, no effort to stay awake
8. sleepy, some effort to stay awake
9. very sleepy, great effort to keep awake, fighting sleep.
Summary of Conclusions

- More officers are falling asleep on night than day watches, confirming other research on Circadian theory.
- More officers are falling asleep on watch on 6/6 than 4/8.
- Highest reported subjective sleepiness for night watches and at the end of the watch.
- Reduced performance (as measured by reaction time) on night watches and by the end of the watch.
- Longer than expected delay of bedtime for night watches.
- 6/6 involves more reported sleepiness than 4/8 and less sleep off watch than 4/8.
Some observations on the “Naturalistic” Performance Evidence

- Some “events” were not as repeatable as others, e.g., collision avoidance situations and some performance criteria were more valid and reliable than others.
- Watch handovers were a significant source of data for checking alertness and the overall performance of watch keepers.
- Social interaction and levels of communication appeared to be related.
- There was significant variability in the competence displayed by watch keepers.
- Some procedural tasks (drills) seem more resilient to fatigue than novel situations requiring thought (cognitive skills).
- Some watch keepers were apparently more resilient to fatigue.
Main recommendations of “HORIZON” to shipping companies:

Take ownership of your fatigue risk:

1. Raise awareness of fatigue risk through cultural change programmes on “sleep hygiene” for seafarers and managers

2. Plan and monitor voyage workload by using a Fatigue Risk Management System (FRMS), which may include a fatigue prediction model for voyage planning
Fatigue Risk Management Systems (FRMS)

“The Safety Board continues to call for the development of fatigue management systems, which take a comprehensive approach to reducing fatigue-related risk. These systems should be based on empirical and scientific evidence and should include a methodology to continually assess their effectiveness.”

Source: NTSB Press Release 07 November, 2011
http://www.ntsb.gov/pressrel/pressrel.htm
Two Ways to Regulate the Fatigue Risk:

- “Hours of rest” - STCW and MLC
  - Prescriptive
  - Socio-economic contract
  - Compliance culture: minimum standards
- Reactive
- Control
- Inspection and audit

- FRMS within the ISM framework
  - Goal-based approach
  - Scientific basis
  - “Best practice”: aspiring to excellence
- Pro-active
- Empowerment
- Self-regulating
**MARTHA - a Fatigue Prediction model**

- The original model (ARTUR) was developed by the Stress Research Institute (SRI) in Stockholm, after years of research into shift working ashore and in aviation.

- Project HORIZON added novel information on off-watch sleep patterns and validated the fatigue prediction model for use in shipping operations (MARTHA).

- MARTHA is only a prototype - it requires user evaluation, feedback and development.

- MARTHA is a fatigue predictor based on a sleep/wake model and this version is designed for “average” watch keepers (not individuals).
The Three Factor Model of Alertness

MARTHA Proposal: Project Objectives

- To evaluate the effectiveness of Fatigue Risk Management Systems (FRMS) using a fatigue prediction model, in the context of marine operations.

- To enhance FRMS through an investigation of the psycho-social aspects of long-term fatigue.

- To evaluate the effectiveness of fatigue prediction tools within a FRMS.

- To evaluate the efficiency of FRMS through a shipboard study.
Thank You - Any Questions?

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