

## CROSSING Project

**Title: *Fatigue and team performance in maritime environment***

**Approval Date: Feb. 19<sup>th</sup> 2021**

### Summary

Key data is missing on how teams operate in 24/7 environments and how team performance can be improved under conditions of sustained workload and active fatigue. The research project will address two main areas:

**1: EXAMINE THE EFFECT OF FATIGUE ON TEAM PERFORMANCE.** The aim is to experimentally evaluate the effect of fatigue on different dimensions of Team Performance (cohesion, communication loops typology and quality, supportive behaviour), in line with previous studies exploring the influence of various factors on the quality of Team Processes (Salas et al., 1992, Marks et al., 2001, Turner et al., 2014). A laboratory-based sleep deprivation study at UniSA will be conducted.

- 1) To define a model of teamwork
- 2) To analyze the effect of fatigue on team performance

**2: MONITORING/TRACKING OF TEAM PERFORMANCE WHILE FATIGUED.** At present, there are a lack of studies that combine the investigation of sleep and circadian rhythms with task-related fatigue and mental workload (Gupta et al., 2019). This second axis will therefore contribute to distinguish and combine short-term (task-related) and long-term (sleep quality and rhythms) factors driving fatigue, to improve the team diagnosis and the design of ad-hoc countermeasures. Data from the field study and data from the laboratory study at UniSA will be examined to develop candidates for tracking and monitoring of individual and team states and performance.

Relying on a combination of methods and expertise from Naval Group on naval operators and submariners activities and environment, from Lab-STICC on operator states (Kostenko et al., 2016, Rauffet et al., 2017) and team performance (Jouanne et al., 2017), and from UniSA on sleep and circadian rhythms (Banks et al., 2007, Banks et al., 2019), the collaboration will allow for innovative and enhanced ways of quantifying operator and team fatigue states, whilst taking time of day and fatigue into account. Given the constraints of the maritime environment, the use of sensors and simulators are necessary to fully elucidate in detail the effect of fatigue on teams.

Banks, S. (2007). Behavioral and physiological consequences of sleep restriction. *Journal of clinical sleep medicine*, 3(05), 519-528.

Banks, S., Landon, L.B., Dorrian, J., Waggoner, L.B., Centofanti, S.A., Roma, P.G. and Van Dongen, H.P., 2019. Effects of fatigue on teams and their role in 24/7 operations. *Sleep medicine reviews*, 48, p.101216.

Gupta C., Centofanti S., Rauffet P., Banks S., Coppin G., Chauvin C. (2019). Framework and Metrics for Online Fatigue Monitoring Within Submarine Teams Working in 24/7 Environments. IFAC HMS symposium, Tallinn, Sep., 2019

Jouanne, E., Charron, C., Chauvin, C., and Morel, G. (2017). Correlates of team effectiveness: An exploratory study of Firefighter's operations during emergency situations. *Applied ergonomics*, 61, 69-77.

Kostenko A., Rauffet P., Chauvin C., Coppin G. (2016). A dynamic closed-looped and multidimensional model for Mental Workload evaluation, HMS 2016: 13th IFAC/IFIP/IFORS/IEA Symposium on Analysis, Design, and Evaluation of Human-MaChina Systems, september 2016, Kyoto (Japan).

### Related roadmap thrusts and axis

- Thrust 1: Enhance the on-line understanding of humans within the hybrid team
  - o Axis 1 (Capture of Human Physiological, Cognitive Performance and Emotional State)
  - o Axis 3 (Human Activity, Capability and Performance Understanding)

### Project Members

Name	Organisation	Role
Ms. Bailey Hadlum	University of South Australia	PhD student
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Prof. Christine Chauvin,	Université Bretagne Sud	Secondary PhD Advisor
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### Project Funding

- Funded by Naval Group

**Start / Duration** May 2021 / 42 months