THE JOURNAL OF NAVIGATION (2020), **73**, 1146–1158.
doi:10.1017/S0373463320000235

Bridge Resource Management: Training for the Minimisation of Human Error in the Military Naval Context

Sandra Campaniço Cavaleiro[1,2], Catarina Gomes[3,4] and Miguel Pereira Lopes[2,5]

[1](*CINAV, Escola Naval Centro de Investigacao Naval, Almada, Portugal*)
[2](*Universidade de Lisboa Instituto Superior de Ciencias Sociais e Politicas, Lisbon, Portugal*)
[3](*CIPES, Centro de Investigação em Política, Economia e Sociedade, Universidade Lusófona de Humanidades e Tecnologias, Lisbon, Portugal*)
[4](*CICPSI, Universidade de Lisboa Centro de Investigacao em Ciencia Psicologica, Lisbon, Portugal*)
[5](*CAPP, Universidade de Lisboa Centro de Administracao e Politicas Publicas, Lisbon, Portugal*)
(E-mail: sandra.patricia.campanico@marinha.pt)

Naval maritime operations entail a permanent concern for safety, ensuring that all crew members receive the necessary information on time. This implies the existence of specific training for improving non-technical skills (NTS). This paper proposes that bridge resource management (BRM) may be determinant for the success of naval maritime operations. Through a literature review on NTS, maritime team training and BRM, the paper presents insights about the way the level of NTS, inherent to BRM, may be determinant for naval officers to operate in safety. We propose that human error may be minimised and safety maximised in military teams operating in the maritime environment through the implementation of an NTS training programme. The paper offers an insight into the importance of safety during maritime operations, focusing on recent international orientations about training requirements, proposing that implementing BRM will be pivotal for the future of the military navy context.

KEYWORDS

1. Bridge Resource Management. 2. Non-Technical Skills. 3. Team Training. 4. Human Error.

Submitted: 10 February 2019. Accepted: 2 April 2020. First published online: 27 May 2020.

1. INTRODUCTION. Performance in the military context is characterised by dynamic changes in information and resources (Swezey et al., 1998; Driskell et al., 2018). Consequently, it is necessary for military officers to use the available resources rapidly and efficiently in order to assess the situation in real time, diagnose and prioritise ways of

action, and identify and put into practice the right strategies in order to succeed (Grand and Kozlowski, 2013). Their performance may be taken to extreme conditions, in order to achieve the continuous improvement of their skills and the adequate level of perfection necessary for real missions, while training for operating with weapons systems, new tactical procedures and combat manoeuvres (Murphy and Duke, 2014). Operating in such dynamic environments implies that individuals must have the necessary skills to achieve their established goals (Goodwin et al., 2018). As such, it becomes indispensable that these individuals train in conditions that are as close to the reality that they will encounter as possible, allowing them to develop the essential skills for their actions (Grand and Kozlowski, 2013; McEwan et al., 2017).

Training naval officers implies developing their technical skills as well as their non-technical skills (NTS), both being the foundation for teamwork. On the one hand, technical skills (TS) refers to the skills needed to fulfil their future role on board, including cognitive and psychomotor skills for operating systems from a technical perspective (Nestel et al., 2011). On the other hand, NTS correspond to the social skills and personal resources, complementary to TS, that enable a safer and more efficient performance (Flin et al., 2013). Specifically, for the effective performance of military teams, it is necessary that their training allows them to develop their knowledge, skills and abilities (Grossman and Salas, 2011), their human factor. This development should occur at the interpersonal (e.g. conflict resolution) and self-management (e.g. planning and coordinating tasks) levels (Stevens and Campion, 1994).

In fact, the International Maritime Organisation (IMO), through its resolution A.850(20) 'Human Element Vision, Principles and Goals for the Organisation', attempts to draw attention to maritime safety and marine environment quality by calling upon the importance of addressing the human factor in order to improve maritime performance, particularly the reduction of human error. As such, safety in this context, whether referring to maritime safety or navigational safety, is essential for any ship when at sea (Formela et al., 2019).

Before we continue, and in order to clarify better the intent of this paper, it is important to distinguish between the concepts of maritime safety and maritime security, which can often be used interchangeably and which have undergone clear deviations in recent decades (Formela et al., 2019). Maritime safety refers to 'the safety of life and property at sea from the environmental and operational threats, as well as the safety of the maritime environment from pollution by ships' (Urbañski et al., 2009, p. 3). This kind of safety is achieved by countries through different capacities, such as ship classifications, search and rescue services or aids to navigation services (Urbañski et al., 2009). In turn, maritime security refers to 'the security from the terrorism, piracy and similar threats, as well as effective interdiction of all the illicit activities on [at] sea' (Urbañski et al., 2009, p. 3). In addition to these two concepts related to the maritime context, maritime defence can be defined as 'constituting part of the national military defense' that guarantees 'the defense of national territorial integrity; defense of the sea lines of communication and other national maritime assets; contribute to the peace and security in the different world's areas' (Urbañski et al., 2009, p. 3).

Having clarified the concept we intend to refer to in this paper, according to the IMO (IMO, 1997, p. 4), maritime safety may be achieved through training those who work 'at sea', by increasing 'their knowledge and awareness of the impact of human element issues on safe ship operations, to help them do the right thing'. Nevertheless, it should be borne in mind that although the IMO's regulations cannot be enforced on warships, some of

its orientations are already considered by the military navy as an organisation (Raffanelli et al., 2018). For example, warships follow IMO regulations regarding navigation, namely the International Regulations for Preventing Collision at Sea 1972 (COLREGS) and the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) (NSC, 2019a). The International Convention for the Safety of Life at Sea 2009 (SOLAS) also encourages government-owned warships to perform in a manner consistent with it, so far as is reasonable and practicable, as long as it does not conflict with the guarantee of the sovereignty and defence of the ship's country (SOLAS, 2009).

Following this logic, NATO has developed a naval version of SOLAS, named the Naval Ship Code (NSC). This regulation is also not fully mandatory for warships, allowing nations to choose whether to implement NSC as a whole or only part of it. Nevertheless, NATO and non-NATO warships worldwide have been using NSC as their naval ship safety orientations (Delpizzo and Valluri, 2017). The NSC aims for ships to be certified within a navy's safety management system. Under its requirements, a ship must be 'safe to operate and prevent injury of persons onboard' (NSC, 2019a, p. Part1-I-2), however, when under threatening conditions, safety must be guaranteed by the naval administration (NSC, 2019a). In other words, it does not address hazards resulting from 'external military operations (weapons attack)' but identifies when the naval administration should apply additional criteria (NSC, 2019a, p. XI). Whether in a situation of peace or threat, two things must be ensured: (1) that the ship has the requirements and conditions necessary to navigate safely (in peace) and be 'safe to fight' (in case of threat), and (2) that the ship's crew must have the necessary skills, whether technical or non-technical, to minimise any chance of human error (Grossman and Salas, 2011), which means that for this to happen a suitable training methodology is necessary so that these skills are developed.

NSC does not specify training requirements for embarked personnel. However, it states they must 'have an appropriate level of competence for the operation of the installed systems' (NSC, 2019b, Part3-IX-13). As such, NSC follows a goal-based standard philosophy that differs from IMO's prescriptive standards philosophy. NSC standards focus on describing what must be achieved, rather than what must specifically be done to successfully achieve it (Delpiszo and Valluri, 2017). For example, to overcome communication obstacles between vessels from different nations, English is used as the universal language for bridge-to-bridge and bridge-to-shore communications and between pilot and bridge watchkeeping personnel on board (NSC, 2019b). Using a universal language for navigation communications is a strategy that can optimise the communication process, a fundamental NTS in within- and between-teams task performance (Flin et al., 2013).

In short, when training military teams from the perspective of maritime safety, navies should take into consideration the navigation regulations (COLREGS), the performance improvement principles (STCW), and the safety standards for warships (NSC). These, but in particular NSC, are applied to NATO and non-NATO warships worldwide during peacetime (Delpiszo and Valluri, 2017).

Given this, and considering the importance of operating in a safe way at sea, this paper presents two theoretical propositions: one that addresses the NTS training needs of military navies, and a second that aims to clarify why the bridge resource management training methodology may be suitable for these military navy teams to minimise the human error during their operations at sea. Before continuing, it is important to note and reinforce that these propositions will be developed taking into account the concept of maritime safety, as it is applicable to all ships, whether merchant or war ships, and because safety is what it is

affected in a maritime accident situation (Yang et al., 2013). The discussion reflects on the aspects that contribute to minimising the effect of any factor that may threaten any element of the system in which the ship is integrated, be it the platform itself, the elements that are on board or the environment in which the ship operates (Formela et al., 2019).

2. TEAM TRAINING IN THE NAVAL MILITARY CONTEXT. The participation of embarked personnel implies performing tasks in a highly dynamic environment in which the only certainty is that the right solution may not always be the same, the possible or even the one that seems clear to all the crew members (Espevik and Olsen, 2013). In fact, it depends on factors such as personality, type of task or even individual development (Cordón et al., 2014). Thus, on the one hand, it is clear that organisational realities such as the armed forces are highly complex (Salas et al., 2009; Espevik and Olsen, 2013), and, on the other hand, it is crucial to identify which may be the best skills, technical and non-technical, that each crew member should have in order to overcome such factors.

The complexity associated with naval operations and the use of a variety of equipment on a ship, together with the evolution of the technology associated with military training, has put a growing importance on training of actual and future crew members (van den Bosch and Riemersma, 2004; Kerry, 2013; Freeman and Zachary, 2018). NSC states that crew members should 'have an excellent knowledge of the layout of the ship and its safety equipment' (NSC, 2019a, p. XX), as well as information concerning the foreseeable operations on which their vessel might be engaged (NSC, 2019a). As such, their training should achieve the understanding of common goals, flawless coordination and cooperation, as well as resource and constraint awareness regarding the performance of different tasks (Espevik and Olsen, 2013), while predicting errors and safety failures (Fjeld et al., 2018). Furthermore, this training should allow for the development of higher levels of situational awareness, improving the alertness of team members, while fine-tuning their communication and decision-making skills in order to achieve the best possible performance, even when in more complex situations (Graff and Clark, 2018; Kanki, 2019).

Onboard ship, each team is composed of two or more individuals performing interdependent tasks, as is the case of the bridge team (Espevik and Olsen, 2013). They must 'integrate, synthetize and share information as well as coordinate and cooperate to fulfil the missions as the tasks change' (Espevik and Olsen, 2013, p. 89), respecting the hierarchical military system (Hontvedt and Arnseth, 2013; Goodwin et al., 2018). This hierarchical system is dependent on the command function that is attributed to the commanding officers. These officers have the necessary authority to direct, coordinate and control military forces or units under their command (Arbuthnot and Flin, 2017). In practice, for them to perform this command function leadership is a fundamental skill (Arbuthnot and Flin, 2017). It implies different elements, like the use of authority, planning, prioritisation, workload management and resources allocation (Flin et al., 2013). However, it is important to clarify that, although in a military context all leadership elements may be delegated, an exception exists for the use of authority. The commanding officer will always be the authority onboard the ship. For example, the commanding officer may delegate to the officer of the watch (OOW) the 'responsibility for safe navigation' (NSC, 2019b, p. Part3-IX-15) but not his or her authority (Larken, 2017).

For success, improved safety and performance, it is necessary to train these teams continuously and prepare them for different operation scenarios (Bertram et al., 2015). Military

https://doi.org/10.1017/S0373463320000235 Published online by Cambridge University Press

training allows for the development of an individual's ability to apply skills efficiently in adverse situations of fatigue, fear, discomfort and urgency of action, allowing them to fulfil the tasks necessary to complete the mission while undergoing cognitive and behavioural changes (Grossman and Salas, 2011). These organisations must acknowledge that their workers' training, namely those that perform tasks in a dynamic environment such as onboard a warship, affects the level and development of their NTS (Nguyen et al., 2015).

Every organisation's training programmes are developed regarding the type of task performed so that it allows individuals to acquire the necessary skills and knowledge (Rico et al., 2017). Everyone must have the adequate set of skills that allow them and their teams to achieve their main goal, as well as assessing the present situation through the information gathered from the internal and/or the external environment (Frick et al., 2018). In order to achieve an effective solution, Wallace (2013) acknowledges that the development of a training programme must include the analysis of the training needs and the study of possible training options for meeting these needs. Effectiveness is obtained when, in the presence of enabling skills, task and team results are collaboratively achieved (Baninajarian and Abdullah, 2009). For effective teamwork, the following skills are needed and should be considered when training teams: knowledge/cognition, behaviour/skills, attitudes, and team coordination (Salas and Cannon-Bowers, 2001; Rico et al., 2018). All these skills can be considered NTS, as they allow teams to develop the ability to perform an assigned task adequately with a high level of proficiency (Salas and Cannon-Bowers, 2001). As such, and considering the complexity of the maritime context, training becomes even more essential for teams to achieve efficiency and safety in this context (e.g. Conceição et al., 2017; Fjeld et al., 2018; Conceição et al., 2019), as it contributes to the development of specific military NTS, like situational awareness, decision-making, teamwork or leadership (e.g. O'Connor, 2011; Hardison et al., 2015; Röttger et al., 2016; Sellberg, 2017).

It is important to recognise, however, that training that allows teams to perform in complex environments (e.g. scenarios where armed forces missions usually take place) implies alternative methodologies such as simulated context training. This type of training adds value as it 'provides opportunities to practice performance in simulated environments that faithfully replicate important features of the real world' (Salas et al., 2009, p. 329). Furthermore, training in a simulated context has proved to be beneficial for the acquisition and transfer of NTS from training to the actual job (Nguyen et al., 2015). Particularly, in the military naval context, simulation-based training has revealed a positive effect on NTS skills development and training of navy bridge officers (Conceição et al., 2017; Sellberg, 2017).

Given this, we propose that training that promotes the complementarity between TS and NTS is crucial in organisations where the need to replicate 'real world' conditions is a requirement for safety.

PROPOSITION 1: *In order to achieve a safe complementarity between TS and NTS, naval team training should follow a training methodology where environments that replicate 'real world' characteristics are created.*

3. BRIDGE RESOURCE MANAGEMENT AND THE MINIMISATION OF HUMAN ERROR.

Bridge resource management (BRM), considered by IMO as the most adequate way to train teams in maritime environments, has its origin in crew resource management

https://doi.org/10.1017/S0373463320000235 Published online by Cambridge University Press

(CRM). CRM was introduced by United Airlines in the early 1980s (Flin et al., 2013) and is mandatory for flight crew members worldwide (O'Connor et al., 2019). CRM has its roots in the premise that human error is inevitable, and that it is necessary to know how to manage such error. Because of this, CRM was developed aiming to improve crew members' effective communication and teamwork, and their ability to use all available resources (Fisher, 2000), through a process of experiential learning (Yousefi and Seyedjavadin, 2012). As such, CRM implied improving the crew teams' coordination and performance by training them to use all the available resources (e.g. people, equipment, information) (Salas et al., 2006). In order to do this, it required the application of well-tested training tools (e.g. performance measurements, exercises, feedback mechanisms) and appropriate training methods (e.g. simulators, speeches, videos) aiming at specific content (e.g. teamwork, knowledge, skills and attitudes) (Salas et al., 1999).

Nowadays CRM is one of the most widely used tools for team strategic training (O'Connor, 2011; Hefner et al., 2018). It aims to modify the individual's safety attitudes, by underlining the importance of NTS that may lead to the improvement of team development and decision-making and to higher safety levels (Noord et al., 2015). NTS, complementary to TS (Fjeld et al., 2018), include cognitive and social skills, personal resources that allow individuals to contribute with a safer and more efficient role when working in high-risk environments, such as the armed forces and the emergency services (Flin et al., 2013). Skills such as briefing, assertiveness related to the task, team adaptability and shared situational awareness (Salas et al., 2006), interpersonal relations, team coordination (Powell and Hill, 2006), decision making, communication, teamwork, leadership, stress and fatigue management (Flin et al., 2013) are classed as NTS.

Although initially CRM was only meant for training civil aviation personnel, its added value to safe working led to it being used in other areas, such as fire departments, nuclear power plants, health care, railways, offshore facilities and shipping (Flin et al., 2013; Hefner et al., 2017). Specifically, in the early 1990s, the maritime industry adopted BRM, a new training methodology adapted from CRM. BRM refers to the effective management and use of all human and technical resources available to the bridge team, so that the ship's mission is completed safely (Patraiko, 2014).

Initially, BRM was meant to enhance the relationship of the ship's captain and bar pilot, but it became more embracing and focused on the safety and performance of all crew members (O'Connor, 2011). As such, every crew member now had not only the right but also the responsibility of speaking whenever they considered necessary, with team leaders encouraging and rewarding this type of behaviour in their crew members (Ornato and Peberdy, 2014). Effective communication was found to be fundamental for task coordination, defining and accomplishing goals as well as improving safety operation in complex systems (Kanki, 2019), a key point for military naval operations. Enhancing communication between interdependent teams is achieved through the combined effect of what is communicated and how it is accomplished (Graff and Clark, 2018).

Given the changes introduced by the STCW Convention & Code 2010 Manila Amendments (IMO, 2010), new requirements arose for the training of maritime environmental awareness, leadership and teamwork, making the certification in BRM mandatory for the merchant marine since 2017. But what about the naval military context? There is still little evidence regarding the application of BRM in the military navy. O'Connor (2011) reports that this training methodology was introduced in the training programmes of the Surface Warfare Officers School (SWOS) of the U.S. Navy in 2006. In his study, results indicated

that the U.S Navy's BRM training was not having the impact on knowledge and attitudes that is typical of the CRM training reported in the literature. The author argued that the main reason for the programme's lack of effectiveness was that the content of the training did not consider the surface warfare community's needs assessment. More recently, Röttger et al. (2016), in line with the previous study, found that the linkage between attitude towards NTS and performance, during a real-world naval exercise by the German naval academy, was not linear. Behaviour and performance were less effective in officers with negative attitudes towards NTS and equally effective in officers with slightly positive and very positive attitudes towards NTS. In short, it can be said that both studies draw attention to the lack of NTS training needs assessment at the military navy level, when there is an intention to apply or even application of BRM training to a ship's crew. In this sense, it becomes clear that the feasibility of BRM training should be determined for its target population. That said, if we consider that, upon a proper assessment of the BRM training needs, BRM training, in line with the CRM literature, will increase individual NTS, and an individual's, and team's ability to respond to quick changes, then it can be presumed that BRM training is in itself a suitable form of training for navy teams. Further, there is reported evidence of the importance of BRM training for safe navigation. This evidence may be found in the accident report developed by the Accident Investigation Board of Norway (AIBN) and the Defense Accident Investigation Board of Norway (DAIBN), regarding the collision between the frigate HNoMS *Helge Ingstad* and the oil tanker *Sola* TS, which took place on 8 November 2018. Among the safety recommendations in this report were that the Royal Norwegian Navy should establish systematic BRM training in its bridge teams' training. By doing so the report highlights the relevance that BRM may have for navy teams (AIBN/DAIBN, 2019). However, how can this be done in practice?

Before proceeding with our reflection on the applicability of BRM training to navy teams, it should be clarified that although military tactical and operational training principles are confidential and cannot be discussed publicly, since they are the responsibility of the naval administration (NSC, 2019b, p. Part3-IX-14), BRM training principles are neither operational nor tactical, as such, if reflected upon, no nation would become vulnerable to enemy attacks. On the contrary, reflection and evidence regarding BRM training in the military navy context will contribute, as with CRM training in the air force context, to personal, team and organisational development. In fact, many researchers have demonstrated that NTS development, the basis for BRM, is important for warship crew members, particularly for navy bridge officers (e.g. O'Connor and Long, 2011; Sellberg, 2017; Conceição et al., 2019).

The military context is constantly evolving, quickly accumulating information from multiple sources that need to be integrated. To be successful regarding its performance in real time, a navy team must have the ability to act fast and effectively, using the available resources and being able to analyse the situation. For this, prioritisation is necessary by identifying and performing the best strategies for task execution (Grand and Kozlowski, 2013). Cross-functional operating on warships (Rico et al., 2018) is possible when self-reliant teams function effectively (Mathieu et al., 2017), with coordination being vital for team success (Rico et al., 2018). An example might elucidate these arguments.

For example, the warship's commanding officer is responsible for leading the bridge team (in some navigation conditions) and the operations room team, contributing to safety and efficient ship operation (Wahl, 2019). Working with these teams, in highly dynamic conditions, implies that the commanding officer, in order to achieve a safe and efficient

https://doi.org/10.1017/S0373463320000235 Published online by Cambridge University Press

level of teamwork (Wahl, 2019), must develop incident command skills (Arbuthnot, 2017), grounded on NTS which in turn are developed through BRM training. It is through development of these skills that the commanding officer can better achieve the necessary command and control essential for the authority and direction of the assigned forces (DoD, 2008). Nevertheless, he must do so using the available technology and control function inherent to his hierarchical position (McCann and Pigeau, 1996). Although the obligation to act is inherent to the command function of a commanding officer, the responsibility associated with team tasks is not shared between team members; they are supporting structures for the leader's decision-making process (Vogel-Walcutt et al., 2010; Ornato and Peberdy, 2014). The OOW and the navigation officer support their commanding officer, while performing specific navigation procedures (O'Connor and Long, 2011). Knowing what each team member can do, and each member's level of expertise, can be achieved through BRM training and through the development of a transactive memory system (Marques-Quinteiro et al., 2019). Shared responsibility, expertise and knowledge can lead to the emergence of shared mental models that allow teams to better understand the situation they are facing, enhancing their perception, interpretation and response to new conditions (Gardner et al., 2016; Frick et al., 2018; Uitdewilligen et al., 2018).

Given this, is becomes clear that BRM training not only allows the development of teamwork skills – technical and non-technical – but also allows their cross-functional operation for safe performance (Tvedt et al., 2018; Saeed et al., 2019). According to the NSC, BRM corresponds to 'the process of co-ordinating and directing all the available assets of the bridge and its staff for the safe and efficient conduct of navigation' (NSC, 2019a, p. XIV). These arguments add up, justifying that BRM certification is important for organisations operating in the maritime domain given their focus towards the reduction of human error, occurrence of accidents and collisions (Yousefi and Seyedjavadin, 2012). Furthermore, it is important to remember that human errors occur as a result of a lack of NTS. Weak NTS contribute to the increase of errors; good NTS reduce the probability of error and adverse events (Flint et al., 2013; Flin and Maran, 2015). Several accidents that have occurred in recent decades (e.g. the failure to respond to the fire in the Channel Tunnel in 1996, the shipwreck of Costa Concordia in 2012, the collision between HNOMS *Helge Ingstad* and oil tanker *Sola* TS in 2018), have demonstrated that addressing safety problems in the maritime environment cannot be achieved only by using technology or investing on TS development (Flin et al., 2013). Events classified as foreseeable damage by the NSC, such as navigation errors (e.g. collision) or mal-operation (NSC, 2019a) can arise because of the navigation bridge team's weak NTS, which will affect the correct use of TS. As such, BRM certification should consider the lessons learned from any incident/accident, that are widely communicated, after its investigation (NSC, 2019a). Having information on incident reports, near misses or operational failures, as well as the importance of human factors in their occurrence, is pivotal for designing new training approaches and new regulations (Psarros et al., 2010). Because of such situations, and for increasing safety levels, operating in the maritime environment has recently been subject to the introduction of new regulations as well as new forms of training (Eliopoulou et al., 2016; Kececi and Arslan, 2017). These new regulations cover different areas, from the ship's construction to its operation focusing especially on navigation (Nilsson et al., 2009).

In sum, it can be assumed that, when both the training need and the training option are acknowledged (Wallace, 2013), BRM allows the development of NTS (Flin et al., 2013) which are fundamental to safe operations. These skills are responsible for better

performance, between-subject relations (Salas and Cannon-Bowers, 2001) and are the 'glue' that sustains teams through time (Hedlund and Österberg, 2013). A well-designed BRM training programme can contribute to better technical performance through time by postponing the decay of TS. But how can we do this? Through the edification of BRM training. This training programme should be adapted to the naval military context and, should be organised at the same time and in line with its technical training. This new training will allow crewmembers, individually and collectively, to develop high levels of TS, as well as the necessary NTS for achieving their assigned mission (Flin et al., 2013). Furthermore, a cautious design of BRM training, adapted to the naval military context, as developed by Röttger et al. (2016) for the German Naval Academy, through an input-process-outcome approach, can have a positive effect on navy officers' training. Developing a global behaviour based on NTS inputs (e.g. team leadership, adaptability, team orientation) contributes to team processes (e.g. shared mental models, transactive memory system) which lead to appropriate outcomes, and success of the assigned mission (Tvedt et al., 2018). Also, BRM training should assume goal-based standards, such as those from NSC: this training design would 'set tiered layers of goals that allow alternative and creative means to be compliant' (Delpizzo and Valluri, 2017, p. 76).

In short, BRM training should not be understood as a prescriptive solution for all navy officers, but instead, it should rather be considered as a tool that allows them to develop and increase their individual and collective performance, when considering their individual and collective specificities. Consequently, BRM training would optimise the use of TS by delaying their decay and promoting NTS.

Based on these arguments and keeping in mind that military naval teams have to operate in a safe way in the maritime environment, we propose that BRM is an essential part of military naval team training.

PROPOSITION 2: *The application of BRM in a military naval context constitutes an adequate form of training of teams to operate in a maritime environment by allowing the development of NTS that are fundamental to the success and safety of the assigned missions.*

4. CONCLUSIONS. Due to the importance of maritime commerce at a global level and the role that the military navies play in safety in the maritime environment, this paper reflected upon the importance that BRM may have in the navy military context. The naval military context implies constant and adequate training appropriate to the reality that one expects to find (Bertram et al., 2015). Training must not be restricted only to TS but also go further, allowing it to act on NTS performance as well (Salas and Cannon-Bowers, 2001). Specifically, we propose that safer maritime operations by warships presupposes the existence of BRM training. This methodology contributes to the increase in the level of proficiency in NTS such as leadership, communication, decision making and situational awareness (Flin et al., 2013) postponing decay of TS. As such, the naval military context should replicate the positive aspects of BRM training and adapt them to the restrictions and specifications of military operations. In line with this, we proposed that in order to achieve a safe complementarity between TS and NTS, team naval training should follow a training methodology where environments that replicate 'real world' characteristics are created. Following this, we also proposed that the application of BRM in a military naval context constitutes an adequate form of training for teams to operate in a maritime environment, because it allows the development of NTS that are fundamental to the success and safety of

the assigned missions. These propositions gain more strength if we consider that BRM is nowadays a determinant and mandatory way for team training in the maritime environment worldwide (IMO, 2010), having a clear impact on the way these teams perform, particularly in terms of safer performance. Even more so, we argue that it should not be restricted to the certification of the existing merchant navies since January 2017 (IMO, 2010), but that it should be extended to the military navies, although not on a mandatory way.

Nevertheless, despite the existing literature on CRM, investigation of BRM, whether in the military or merchant navy, still represents a gap in the literature, both at the theoretical and empirical level. Hence, the contribution of this paper is showing to the academic community the importance of developing theoretical arguments that sustain the implementation and development of BRM in organisations that have teams operating in the maritime environment.

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