Miscommunication in Maritime Contexts: Insights from Phase 1 and 2

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Acronym List

BRM	Bridge Resource Management	SIRC	Seafarer's International Research Centre
ESP	English for Specific Purposes	SMCP	Standard Marine Communication Phrases
FTC	Failure to Communicate	SME	Specialized Maritime English
GME	General Maritime English	SMNV	Standard Marine Navigational Vocabulary
IMO	International Maritime Organization	STCW	Standards of Training, Certification & Watchkeeping
L2	Second Language	TBLT	Task-Based Language Teaching
ME	Maritime English	VHF	Very High Frequency
NTSB	National Transportation Safety Board	VTS	Vessel Traffic Service

Abstract

As the global fleet has become increasingly more linguistically and culturally diverse, communication practices have become critical to maintaining safety, with research demonstrating that miscommunication is one of the leading causes of accidents and incidents at sea (Li et al, 2023; Oraith et al., 2021). Despite international efforts to improve communication, such as the use of Maritime English as a lingua franca and the establishment of standardized phraseologies, accidents continue to occur. Although research has sought to better understand the contexts in which miscommunication may occur, a number of scholars have highlighted the need for a thorough analysis of accident and incident reports to identify the underlying causes (e.g., Acar & Varsami, 2021; Oraith et al., 2021; Hasanphahić et al., 2021; Pyne & Koester, 2005; Tzannatos & Kokotos, 2009).

Addressing these gaps, this report synthesizes the findings from Phase 1 and Phase 2, providing a comprehensive overview of the existing research exploring miscommunication at sea and the results of a thematic analysis of National Transportation Safety Board (NTSB) accident reports and semi-structured interviews with domain experts for validation and triangulation. The findings from Phase 2 provide insight into the underlying linguistic, socio-cultural, and pragmatic causes of miscommunication, highlighting possible directions for future training and educational programs. Taken together, results illustrate the role that power and social distance, face-saving and politeness strategies, English proficiency, the use of plain language, and cultural misunderstandings play in communication failures. Drawing on these findings, general recommendations are provided.

Executive Summary

Background: The ability of mariners to communicate efficiently and effectively in ship-to-ship, ship-to-shore, and onboard interactions is crucial to supporting safety at sea. Over 90% of mariners today are from different cultural and linguistic backgrounds, with many mariners speaking English as a second or foreign language. With these diverse crews, miscommunication has become the leading human-caused factor of accidents and incidents at sea. Despite efforts to improve communication through Maritime English, misunderstandings continue to happen.

Phase 1: This white paper provides a comprehensive review of the existing research exploring the linguistic, social, and cultural causes of miscommunication in maritime contexts. In addition, an overview of teaching practices in Maritime English Teaching (MET) programs worldwide and recommendations for improvement are included.

Findings demonstrate that cultural differences can contribute to negative effects on communication, such as isolation and unwillingness to admit misunderstandings. In addition, maritime students feel unprepared to handle these intercultural differences with other crew members or pilots. Research also suggests that traditional hierarchies and perceived power differentials contribute to miscommunication, highlighting the need for improving teaching practices to help address both language and culture related problems. Furthermore, many international mariners reported not having enough speaking and communication opportunities during their education. International teachers shared this perspective as well, with studies demonstrating the need to provide more training for teachers in terms of meeting students' communicative needs. Lastly, miscommunication also occurred when there were mismatches in terms of what a speaker intended and what the hearer understood.

Phase 2: Building on the results of the first phase, this phase provides an analysis of the underlying causes of miscommunication. Sixty National Transportation Safety Board (NTSB) accident reports were thematically analyzed for the context and source(s) of miscommunication. Semi-structured interviews with maritime experts were also conducted for validation.

Results demonstrate that 75% of miscommunication was related to poor bridge team management, with 13% related specifically to the pilot/master exchange. Major causes of miscommunication included failures to communicate intentions, such as making passing

arrangements, and language proficiency issues. For example, international crew often communicated in a language other than English, which prevented the pilot and/or other crew members from understanding important information. Pragmatic factors, such as power dynamics and politeness strategies, also played a significant role in misunderstandings. For instance, indirectness and ambiguity caused miscommunication, including between native English-speaking mariners. Findings from the thematic analysis were further supported by interview data.

Conclusions: Miscommunication remains a leading source of accidents, with research identifying numerous linguistic, cultural, and pragmatic sources of miscommunication. For example, Phase 2 demonstrated that power, politeness, and English proficiency were primary factors in causing miscommunication. Together, these phases highlight the need for improved teaching and training materials drawing on tasks and real-world use for both international and domestic mariners, as native English speakers also contribute to miscommunication.

Recommendations: Drawing on the findings of Phase 1 and 2, the following recommendations are suggested:

- Raise awareness of where communication failures are likely to occur (pilot/master exchange, bridge resource management, etc.)
- Raise awareness of role of politeness/indirectness (for both international and English-speaking mariners)
- Raise awareness of cultural beliefs and their impact on communication (particularly important for English-speaking mariners)
- Possible training for native English speakers for standardized language/plain English
- Improve MET to support L2 proficiency and linguistic/communicative competence
- Highlight the importance of fostering cohesion onboard to support communication

Introduction: Miscommunication in Maritime Contexts

The commercial shipping industry currently accounts for more than 90% of all global trade (SSR 2021), with the majority of the world fleet consisting of multilingual and multicultural crew. Nearly 90% of modern crew are multinational, with the native language of most of the crew unlikely to be the language spoken on board for communication (Fan et al., 2016). Although a wide variety of factors impact the overall safety and success of maritime operations, such as weather and fatigue, human error remains one of the leading causes of accidents at sea. Accounting for 80-85% of accidents and incidents (Acejo et al., 2018; Galieriková, 2019), human error plays a substantial role in safe operations, and as the linguistic and cultural diversity of crew have increased over the past three decades, miscommunication has been identified as a key factor in maritime accidents (e.g., Pyne & Koester, 2005; Sampson & Zhao, 2003; Trenkner, 2007; Ziarati, 2009).

In an effort to standardize the language used on board and in ship-to-ship communication, the maritime industry developed the Standard Marine Navigational Vocabulary (SMNV). Initially created in 1977 and subsequently updated in 1985, this collection of key lexical items was insufficient to support communication for the modern seafarer (Short, 2006). Building on these early efforts, Maritime English (ME) was included in the 1995 amendments to the Standards of Training, Certification & Watchkeeping (STCW 78/95) requirements, maintained by the International Maritime Organization (IMO). ME is designed to provide a simplified and technical operational language for watchkeepers of all linguistic backgrounds, and is considered a variety of English for Specific Purposes (ESP), in which the unique grammatical, lexical, and pragmatic features of a specific context are designed to supporting learners in terms of their professional or vocational needs. ME is formulated for use in ship-to-ship, ship-to-shore, and onboard communication (Jurkovič, 2015) and can be defined as the "the entirety of all those means of the English language which, being used as a device for communication within the international maritime community, contribute to the safety of navigation and the facilitation of the seaborne trade" (Trenker, 2000, p.7). Mariners are required to be able to use ME at an oral and written proficiency level that supports reading and interpreting of navigational and meteorological information.

More recently, the IMO developed the SMCP (Standard Marine Communication Phrases), a revised and expanded sequel to the SMNV, in 2001. This collection of 3,000 phrases is designed to provide a simplified and standardized linguistic resource to improve communication, as mariners are able to use this prescriptive phraseology in a wide range of setting and situations. For example, the SMCP draws on less complex grammar and vocabulary to provide an efficient and functional format for communication. In addition, phrases from the SMCP are designed to be preceded by Message Markers (*Instruction, Advice, Warning, Information, Question, Answer, Request,* and *Intention*), which are intended to provide direct information regarding the speakers' intent and the hearers' interpretation.

Although the IMO has provided language related guidelines in the 1995 amendments to the STCW 78/95, and resources in the form of the SMCP, there is no clearly articulated and defined proficiency requirement for English (Ziarati, 2009). This has led to extensive variation in terms of the quality and focus of preparatory professional programs worldwide, particularly in terms of English proficiency for non-native English-speaking mariners. In an effort to address this variation and improve communication and English proficiency through more targeted training, a number of educational programs have been developed. For example, the PraC-MARENG research project drew on survey results from maritime stakeholders in Northern and Eastern Europe to identify causes of miscommunication and develop a subsequent online course to facilitate use of the SMCP, thereby highlighting "the importance of English as the language of the sea," (Acar & Varsami, 2021, p. 602).

However, despite the development of these guidelines and resources, insufficient or poor training and overall problems with English proficiency remain substantial issues that have continued to contribute to miscommunication (Bocanegra-Valle, 2011, 2012; Ziarati et al., 2009). For example, Oraith et al. (2021) found that second language (L2) English proficiency was negatively correlated to accident rate, with numerous studies highlighting the greater occurrence of miscommunication between mariners from different linguistic backgrounds (e.g., Mitroussi & Notteboom, 2014; Trenkner, 2007; Ziarati, 2006; Ziarati et al., 2011). Difficulties using the SMCP, such as inconsistency and lack of familiarity (Short, 2006), as well as the use of 'plain language' by native English speakers, have also been identified as contributing causes to miscommunication (Uchida & Takagi, 2012). Furthermore, findings suggest that cultural and pragmatic misunderstandings also play a substantial role in miscommunication, with language problems further exacerbated by cultural tensions or conflicts (Sampson & Zhao, 2003). For example, research suggests that maritime students feel unprepared to handle intercultural differences and the possible effects these differences may have on communication (e.g., Fan et al., 2017).

Given the critical role of clear and effective communication at sea, there is a clear need to better understand the sources and causes of miscommunication and how they might be addressed through targeted linguistic, cultural, and pragmatic training. This report synthesizes the findings from Phases 1 and 2, providing a comprehensive overview of the current research exploring maritime miscommunication, including teaching practices and challenges. In addition, this report will address how native English speakers contribute to miscommunication and the role of cultural backgrounds and expectations. Next, this paper will describe the methods and key findings of a thematic analysis of NTSB reports and interviews, focusing on the linguistic, pragmatic, and socio-cultural factors that cause or contribute to miscommunication at sea. Finally, this report will provide suggestions and recommendations for the development of future training materials to improve communication and pragmatic competence for non-native and native English-speaking mariners.

Phase 1: Key Findings

Miscommunication and the Human Factor

Human error has been identified as the primary cause of accidents and incidents at sea (e.g., Chauvin et al., 2013; Hasanphahić et al., 2021; Ziarati et al., 2009), with research suggesting that up to 85% of these human-error related incidents are due to communication issues or failures (e.g., Chauvin et al., 2013; John et al., 2013; Li et al, 2023; Mockel et al., 2014; Qiao et al., 2020a, 2020b). For example, Acejo et al. (2018) found that 23.5% of accidents were caused by miscommunication, with the findings of Yıldırım et al. (2017) demonstrating that communication was a leading factor in 26.10% of collisions. In particular, bridge resource management (BRM) has been identified as a common context for miscommunication, with most accidents occurring when the captain, officers, and/or pilot are present (Hasanphahić et al. 2021; Macrae, 2009; Uğurlu et al., 2015a, 2015b). Oraith et al.'s (2021) analysis of pilot operations found that language proficiency and cultural misunderstandings between crew were a leading cause of miscommunication, with poor communication and proficiency issues, failure to exchange information accurately and efficiency, and lack of teamwork identified as the leading causes of accidents during pilotage.

Many of these issues are further aggravated by the unique challenges associated with maritime environments, which are often high risk and high stress. For example, fatigue, loud and physically challenging environments, isolation, and social pressure all further complicate the linguistic and cultural issues that multinational crew may be experiencing (Oldenburg et al., 2009; Poyrazli et al., 2002; Zhang, 2016). In addition, high turnover in crew (ranging up to 75-100%) further negatively affects cohesion and social relationships (Mitroussi & Notteboom, 2014; Robert & Moulin, 2000). When low English proficiency is common amongst crew, this contributes to overall poor communication, increased isolation, and a greater likelihood of loss of face during professional communication (Ćorović and Djurovic, 2013; Seafarer's International Research Centre (SIRC), 2001). Conversely, as English proficiency increases, so too does the communication around safety and problems, highlighting the important role that language and culture play in promoting a safe and efficient working environment (Noble et al., 2011; Pauksztat, 2021).

In addition, communication issues are impacted by occupational and culturally specific beliefs related to hierarchies (Fan et al., 2016; Sampson & Zhao, 2003). For example, the amount of power that senior mariners may hold over other members of the crew is heightened due to certain cultural beliefs that some mariners may have. Research suggests that mariners from societies rooted in Confucian perspectives, such as China, may be more concerned with issues related to saving face, or more fearful of reporting errors or problems (Hassel et al., 2011; Kwek & Lee, 2015; Lappalainen et al., 2011). Findings also demonstrate that mariners feel largely unprepared to handle these cultural differences

(Fan et al., 2017). Although some courses have been developed to address these issues, researchers suggest that these training modules may focus too narrowly on oversimplifications or may even reinforce cultural stereotypes (Brenker et al., 2017; Kahveci et al., 2002; Knudsen & Froholdt, 2009). More direct, open discussion and training is needed to help raise mariners' cultural awareness, including promoting intercultural understanding and open-mindedness, to help improve communication issues (Wang & Gu, 2005). Encouraging the master and crew to remain attentive and involved in decision making when a pilot is on board, rather than adhering to hierarchically-informed passivity, may also help to reduce miscommunication, particularly on the bridge (Yıldırım et al., 2017). Overall, researchers have suggested that "the most important thing the shipping industry can do for its own sake is to employ trained seamen who have at least the abilities to understand English used in maritime environment if not the communication skills in Maritime English" (Apostol-Mates and Barbu, 2015, p. 543), underscoring the need for improved linguistic and cultural competence.

Maritime English Training

ME is a form of ESP, which can be defined as "the teaching and learning of English as a second or foreign language where the goal of the learners is to use English in a particular domain" (Paltridge & Starfield, 2014, pp. 23). Given that ME is informed by the specific genres and skills related to the domain of the maritime industry, with ME users generally consisting of adult learners with similar linguistic goals, this variety of English meets the characteristics of an ESP (Čulić-Viskota & Kalebota, 2013). In addition to being proficient in ME, mariners are also expected to have sufficient proficiency in general English (IMO, 1995). These requirements have been criticized for the lack of clarity in standards and competencies (Ziarati et al., 2009), with teaching practices often relying on outdated or irrelevant frameworks, or techniques that fail to provide learners with the linguistic skills needed for communication at sea (e.g., Agustina, 2018; Ahmmed, 2021; Demydenko, 2012; James et al., 2018; Khosiyono et al., 2019; Schriever, 2008). Further complicating these proficiency standards is the lack of consistency across international training institutions, as each program may have its own methods for instruction and assessment (Acar & Versami, 2021; James et al., 2018).

In an effort to provide more targeted educational resources, the IMO has provided "Model Course 3.17, Maritime English," which includes a genre-based approach to General Maritime English (GME) and Specialized Maritime English (SME). General vocabulary, grammar, reading, writing, listening, and speaking skills, as well as pronunciation, are the focus of the GME module, which is designed to build a linguistic foundation for beginning and intermediate level learners. Following the development of these foundational skills, learners would transition to the SME, where the focus is on technical language and domain specific needs. Although this genre-based approach is formulated for learners to focus on "getting maritime-specific things done" (Zhang & Cole, 2018, pp. 155), many global programs continue to focus on grammar and assessment rather than promoting

communicative competence. For example, research suggests that China trains the largest proportion of modern mariners (Wu & Winchester, 2005). However, much of the educational focus is on performing well on tests rather than building functional or practical skills (Shi & Fan, 2021; Zhang et al., 2008), with little time dedicated to building interactional competence. Indeed, Chinese instructors felt that overall communication skills had decreased in their students (Fan et al., 2017), with instructors and students highlighting the need for more authentic, real-world examples of language use to improve learners' proficiency and communication (Fan et al., 2017; Kang et al., 2013; Tang et al., 2016).

These findings illustrate the mismatch between learners' needs and the instructional practices of their training programs, demonstrating the need for more communicative or interactional approaches (Agustina, 2018), such as task-based language teaching (TBLT) and the use of more authentic materials that are relevant to mariners' professional and personal contexts (e.g., Ahmmed, 2018; James et al., 2018; Muirhead, 2004). TBLT is an empirically supported pedagogical approach that focuses on learning-by-doing and authentic, real-world interactional opportunities, providing learners with opportunities to focus on meaning rather than solely grammar or structure (Long, 2015). The efficacy of this teaching approach is supported by a large body of literature (e.g., Chong & Reinders, 2020; Keck et al., 2006; Mackey & Goo, 2007; Ziegler, 2016), with TBLT offering an evidence-based framework for training and instruction.

Needs Analyses in Maritime English

In ESP settings, in which language is learned for a unique academic or occupational environment, the need for language skills to be directly applicable to authentic real-world situations is crucial (Ahmmed, 2018; Kaewpet, 2009; James et al., 2018; Moder, 2014). Numerous needs analyses have been conducted to better understand the unique pedagogical and professional needs of non-native English-speaking mariners, with findings often demonstrating a mismatch between learners' training and their real-world linguistic and interactional needs. For example, Zhang and Cole (2018) found that industry stakeholders felt international mariners' English skills were generally inadequate, with issues ranging from pronunciation issues to culturally-related failures. Additional research yielded similar results, finding clear gaps between learners' needs and their training, particularly in terms of speaking proficiency and interactional abilities (Aeni et al., 2018; Ahmmed et al., 2020; Kourieos, 2015; Saray et al., 2021; Widyalankara, 2017). Multiple studies also mentioned that learners experienced anxiety during speaking (e.g., Mokhtari & Maouche, 2023; Widyalankara, 2017), underscoring the need for more opportunities for learners to practice and develop their oral communication skills in a controlled low-stakes environment like the classroom.

Research has also explored the challenges faced by ME instructors, with results demonstrating that instructors often lack domain specific knowledge (Basturkmen, 2017; Bullock & Westbrook, 2021; Demkydenko, 2012; Zhang & Cole, 2018), leading to potential

failures in meeting learners' need as well as potentially impacting learners' motivation (Aeni et al, 2018). Instructors also reported feeling demotivated and stressed, indicating that they received little support in terms of improving their teaching practices through training or collaborative teaching practices (Mokhtari & Maouche, 2023). Teachers' experience and knowledge play a crucial role in the overall success of their students beyond the classroom, highlighting the need for high-quality instructor training and classroom support.

Native English Speakers and Miscommunication

Although much of the focus in maritime research has been on learners of ME, native English-speaking crew can also contribute to communication failures. For example, native English-speaking mariners may refuse to use or be unaware of standardized language, such as the SMCP, instead choosing to use plain English and expecting learners to understand this non-standardized vocabulary or grammar (Uchida & Takahi, 2012b). One Japanese Vessel Traffic Service (VTS) officer stated, "Native speakers use expressions that are intelligible only in their community" (pp.174), while another remarked "Americans' speech is too fast and too long with redundant and unfamiliar expressions" (pp. 175). Another stated, "Americans appear to take it for granted that their language should be understood since it is a common language. Even asked to say again, they just repeat the same expressions and never slow down. They are very uncooperative." Although the SMCP is designed to reduce such instances of miscommunication, it is only successful if used by all parties. However, native English speakers may have received little to no training on using such phrases (Short, 2006) and thus rely on plain language to communicate.

Speech Acts and Miscommunication

Speech acts can be defined as "the locutionary act (the basic literal meaning of an utterance), the illocutionary act (what the speaker intends by the utterance) and the perlocutionary act (the actual effect the utterance has on the hearer)" (Davies, 2005, pp. 122). This may sometimes result in mismatches between what the speaker intended and what the hearer interpreted, leading to misunderstandings. In addition, intentions may not always be clear, further leading to confusion or miscomprehension. This is particularly problematic for non-native English speakers, as they may be slower to recognize a speech act than a native speaker (Garcia, 2004; Holtgraves, 2007). In addition, there may be mismatches in terms of urgency or importance, with hearers misinterpreting what the speaker may have intended. For example, if a speaker were to use the Message Markers with a phrase from the SMCP, it still may not be clear to the hearer how urgent the situation may be as there may be differences across speakers in terms of when to use "warning" as opposed to "advice." Furthermore, a speaker's cultural beliefs or the occupational power structure may influence their choices in communicating urgency, potentially causing ambiguity or misunderstandings (Zhang & Cole, 2018).

Socio-Cultural Influence and Miscommunication

In order to successfully communicate, learners need more than grammar and vocabulary. In other words, it is critical for learners to not only have a knowledge of language, but also of how to use language and the overall cultural context in which the language occurs. For example, given the highly stressful and pressured nature of many maritime interactions, it is important for learners to have an understanding of how pragmatic and socio-cultural beliefs impact the overall success of the interaction (e.g., Gass & Varonis, 1991; Philp & Mackey, 2010). For example, mariners' cultural beliefs and background will mediate their use of different face saving or politeness strategies. In addition, culture may play a role in how hierarchies are perceived and the impact of the power structure on board, particularly during communication on the bridge. Social distance is an influencing factor, as the speakers' choice of language may be influenced in terms of how great the distance might be between the speaker and the hearer in terms of power and rank. These power differentials and intercultural misunderstandings have been identified as a factor in a number of accidents, with research highlighting the tendency of Chinese crew to respond affirmatively regardless of whether the true answer is negative or positive (Pyne & Koester, 2005; Uchida & Takagi, 2012b; Ziarati et al., 2009). Fan et al. (2017) also suggest that these power differentials have an impact on safety, as Chinese crew may be less likely to report problems or issues to a superior. Given that China produces a large number of crew for the global market, these cultural preferences are important information for mixed nationality crew and their overall communicative success.

Issues related to power and social distance are not specific to one culture or language, however, with research illustrating socially-driven communication failures across different cultures and practices. For example, numerous accidents and incidents, including the grounding of the Costa Concordia and the sinking of the El Faro, were partially caused by crew members failing to question the decisions of higher-ranking officers. Subordinate speakers often err on the side of indirectness and politeness in an effort to maintain face and support order. However, Linde (1998) found that, in aviation, such indirectness was often ignored by superior officers. These findings overall underscore the need for more attention to raising awareness of cultural differences, or direct training to help mariners better predict and resolve communication issues related to language and culture.

Phase 2

Objective

Previous research, including Phase 1 of the current project, has established the crucial role of communication in maritime contexts. As the global fleet has become increasingly more culturally and linguistically diverse, there have been a number of targeted efforts to

improve communication, with studies exploring the causes of accidents at sea in the United Kingdom (e.g., Chauvin et al., 2013; Hasanphahić et al., 2021), Europe (e.g., Acejo et al., 2018; Tzannatos, 2010; Tzannatos & Kokotos, 2009), and Australia and New Zealand (e.g., Acejo et al., 2018; Darbra et al., 2007; Macrae, 2009) as well as during pilotage operations (e.g., Oraith et al., 2021). Previous studies have primarily focused on identifying the overarching causes of accidents rather than a narrower focus on the underlying causes of miscommunication (John et al., 2018). In other words, the findings of Phase 1 demonstrated that accidents often result from miscommunication on the bridge. However, the causes of that miscommunication are not well documented or understood (Hasanphahić et al., 2021).

Acejo et al. (2018) point out that although 'failure in communication' or 'poor judgment' have been recognized as causal factors, the underlying causes of these failures are challenging to identify, although they suggest they may be due to linguistic or hierarchical issues. Numerous scholars have called for a comprehensive analysis of accident reports and associated dockets to identify these underlying issues (e.g., Acar & Varsami, 2021; Oraith et al., 2021; Hasanphahić et al., 2021; Pyne & Koester, 2005; Tzannatos & Kokotos, 2009). Seeking to address this gap and provide a more holistic, multiple methods approach grounded in applied linguistics research, this phase focused on identifying the linguistic, pragmatic, and social sources of miscomprehension and misunderstandings. Through a systematic analysis of NTSB reports, as well as semi-structured interviews with domain experts for triangulation and validation purposes, this project explored the foundational causes of miscommunication at sea.

Methods

Although the human element has been identified a key factor in terms of causing or contributing to accidents (e.g., Chauvin et al., 2013; Hasanphahić et al., 2021; Ziarati et al., 2009), little attention has been directed towards the socio-cultural or pragmatic factors that may impact human behavior. The following mixed method approach was used to explore these underlying causal and contributing factors.

Identification and Retrieval

National Transportation Safety Board Reports

NTSB reports were the focus of this research due to the targeted interest in exploring situations where native and non-native English-speaking mariners were involved in communication. During the initial search and retrieval phase, reports were obtained from the NTSB using keywords (e.g., *miscommunication, communication, bridge resource management, language, misunderstanding)* to identify reports relevant to the research question. All reports initially identified were manually reviewed for inclusion, and were included only if communication, miscommunication, or language was identified as a direct

or indirect cause or contributing factor. The final sample consisted of 60 reports from 1995-2022.

Thematic analysis, a flexible and iterative approach that allows for the identification, analysis, and interpretation of themes within a data set (Clarke & Braun, 2015), was adopted as the primary analytical approach for identifying any patterns related to the linguistic, pragmatic, and/or sociocultural sources of miscommunication. In addition, this research method provides a framework for exploring quantitative and qualitative data sets, such as considering the interviewees' "lived experience, views and perspectives, and behavior and practices." (p. 2) as described in the semi-structured interviews. Using this approach, reports were analyzed for features potentially relevant to communication, including the context of the accident (e.g., environment, participants, type of accident), the source of the miscommunication (e.g., type of linguistic and/or pragmatic source), and other causes that contributed to the miscommunication (e.g., failure to use all available communication opportunities). In addition, reports were coded for context (e.g., ship-to-ship, ship-to-shore, on board), environment (e.g., bridge, very high frequency radio or VHF), whether tugboats were involved, and interlocutor (e.g., pilot, master) as well as participant characteristics (e.g., native language), and financial and environmental damages.

Secondary coding was also conducted to provide further information about the possible causes of miscommunication. Thus, thematic analysis was applied to the data obtained from the NTSB reports and dockets to identify not only the linguistic factors, such as insufficient English proficiency, but also the pragmatic and socio-cultural factors, such as politeness, indirectness, mismatches in speech acts, cultural mismatches or misunderstandings, and power differentials.

Semi-Structured Interviews

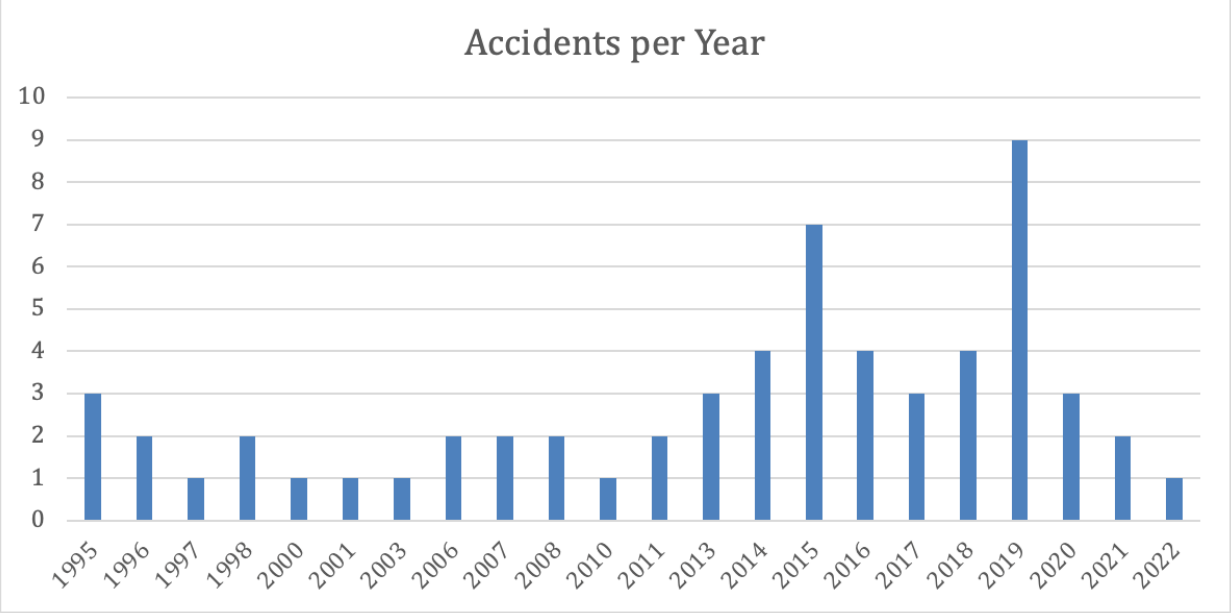
Semi-structured interviews were conducted with domain experts, including active and retired Alaska marine pilots (N = 3) and captains (N = 2). Due to the critical role that pilots and captains play in safe and successful communication, the experiences and perspectives of these participants were crucial in understanding the complexities associated with miscommunication. Convenience and snowball sampling was used for recruitment, and all interviews were recorded and transcribed using Otter.ai. All participants had worked extensively in Alaska, including in western Alaska, the Kenai Peninsula, and Prince William Sound. Multiple participants had also worked in international contexts throughout their careers. Interview data was then thematically analyzed for factors related to miscommunication.

Findings

Accidents over Time

The 60 NSTB reports in the final sample examined accidents and incidents taking place from 1995-2022. Figure 1 illustrates the number of accidents and the years in which they occurred.

Figure 1. Number of accidents per year from 1995-2022



Of the 60 reports in this sample, 62% were collisions, 18% were allisions, and 12% were groundings. Additionally, 5% involved fires and 2% involved capsizing. Oil spills were reported in 12% of the accidents, while 17% included injuries or casualties. Pilots were involved in 65% of accidents, while masters were involved in 55%, providing support for previous research (e.g., Gill & Wahner, 2012; Hasanphahić et al., 2021; Oraith et al., 2021). Tugboats were involved in 18% of miscommunication caused accidents and incidents. The majority of miscommunication took place on board (58%), with 42% occurring in ship-to-ship interactions. Similar to previous studies (Graziano et al., 2016; Macrae, 2009; Hasanphahić et al., 2021; Uğurlu et al., 2015), the majority of miscommunication occurred on the bridge (76%), with 23% of miscommunication taking place on the bridge and using VHF combined, and 8% occurring solely using VHF. Importantly, BRM was identified as an environment in which communication failures occurred in 75% of the reports, with 13% of miscommunications due to the master/pilot exchange.

Primary Sources of Miscommunication

Failure to Communicate

Following the secondary analysis of NTSB reports and semi-structured interview data, results identified failure to communicate (FTC) as the leading underlying source of miscommunication. FTC, which accounted for 62% of the miscommunication caused accidents, includes instances in which pilots or masters failed to discuss or share their plans or intentions with each other, the bridge team, or other vessels as well as instances in which an interlocutor failed to share plans or intended actions, such as making passing arrangements. In addition, FTC also includes instances when pilots, masters, and/or crew failed to seek clarification or confirmation regarding the other party's plans and intentions. Thus, this category is multifaceted in terms of responsibilities for communication failures and breakdowns. Importantly, this category also includes instances where languages other than English were used and no translation/clarification was sought, as these issues regarding the use of non-English for communication further complicated or exacerbated existing issues.

An illustrative example of FTC is the communication failure in the collision of the containerships St. Louis Express and Hammersmith Bridge in the Western Scheldt River. During bridge communication, the Belgian pilot failed to share his plans for safe passing, and although they could not understand the content of communication between the Belgian pilots and the shore-based VTS, the English-speaking crew and master did not seek clarification or confirmation of the pilot's plans. Following the accident, the master stated that pilots usually translated "important" information, and although the second mate noticed the Hammersmith Bridge approaching, he assumed others were aware of the developing situation. In addition, the bosun on watch noted the approaching vessel, and also assumed that the bridge team was aware. These multiples failures to communicate in terms of clarifying or confirming actions and plans were the underlying cause of the collision, which resulted in over $500,000 of damages and repairs. This example also illustrates the multidimensional nature of this communication breakdown, as multiple stakeholders fail to share intentions or fail to confirm or clarify information, thus severely limiting the abilities of others to take action in the face of evolving and dangerous situations.

Pragmatic Factors

The second most common underlying source of miscommunication was pragmatic factors, including 32% of miscommunication due to power differentials amongst interlocutors and 37% caused by face-saving and politeness strategies. Power and social distance can be highly influential in terms of communication, with thematic analysis suggesting that higher ranker mariners may tend to disregard input of lower ranked mariners, a finding that adds further support to previous research (e.g., Linde, 1988; Phase 1). In addition, analysis

demonstrated that lower ranked mariners tended to follow instructions without clarification/concern as well as avoided contradicting or imposing on higher ranked officers or crew. The perceived difference in power between speakers appeared to have a substantial effect on whether lower ranked mariners raised questions or concerns, thus having an important impact on communication.

Although Phase 1 highlighted how seafarers' cultural or linguistic backgrounds may influence the degree to which they adhere to strict hierarchies (Fan et al., 2016; Sampson & Zhao, 2003), the current analysis also demonstrated that these issues of power and social distance occurred during communication amongst native English speakers. For example, the crew of the El Faro, which sank during Hurricane Joaquin, made multiple hedged, polite suggestions to the captain regarding their path, with data demonstrating features often used by subordinate speakers interacting with a person of a higher status (Brown & Levinson, 1987). In addition, the captain appeared to disregard their concerns, providing further support for previous findings (e.g., Linde, 1988). In addition, these issues of power and social distance occurred between crew, such as mates and able-bodied seaman. Interview data also supported this finding, with multiple interviewees commenting on the need to create an environment in which crew would feel comfortable enough to raise concerns or even contradict the pilot or superior officers. For instance, the retired master stated, "And I think that communication really does start at the top. And if the captain is not encouraging his younger officers to speak up, they're very, very likely not to say something when they see something, just assuming that you're the captain, and you know what you're doing." Given that previous research has highlighted the increased challenges that multinational crew may have in terms of recognizing and resolving misunderstandings (e.g., Pauksztat, 2021; Squire, 2004; Sampson & Zhao, 2003; Short, 2006), cultivating such an onboard environment is crucial to facilitating efficient and effective communication.

Similarly, face-saving and politeness strategies accounted for 37% of the accidents analyzed for the current study. Face can be defined as a person's desired public image, and is universal across cultures in that saving face influences the choices a speaker makes (Brown & Levinson, 1987). In addition, power/social status, imposition, and cultural differences may impact how face threatening one perceives an utterance to be. In addition, indirectness is commonly used as a politeness strategy across many cultures and backgrounds (Tannen, 1994), although there is variation according to age, gender, region, ethnicity, socio-economic status, and experience. The use of face-saving and politeness strategies, such as indirectness, may cause confusion or ambiguity, leading to miscommunication and misunderstandings. These strategies were common among native English speakers, who may be more likely to use hedging or indirectness when giving commands (John et al., 2019). For example, prior to the collision of the American Liberty with multiple vessels, barges, and wharfs in the Mississippi River, the pilot asked the master to "give me whatever you can give me cap." Due to the indirectness of this request, the urgency was not clear to the master nor others on the bridge, leading to a mismatch

between the intentions of the speaker and the hearers. The pilot later explained his phrasing in his interview:

> "That's just a nice way of putting it. I think a lot of pilots say it that way, and it's the way I was trained. I heard lot of them -- it's just being just a nice way of putting it to them, like bring it up to slow when you can, Cap. You know, just a preference."

This quote illustrates how the use of indirectness led to confusion and miscommunication, as the politeness strategies obscured the urgency of the situation, ultimately causing a substantial amount of damage to vessels and property. Results demonstrate that face-saving strategies were also used to shield speakers from revealing or appearing to reveal a lack of experience or knowledge. For example, data from both the NTSB reports as well as interviews demonstrated that mariners, particularly during master and pilot communication, may respond positively even when the answer should be negative. For example, one pilot stated, "the Korean (masters) they usually are more pleasing with 'Yes, yes. Okay. Okay'. And you think 'that's okay, yeah, they know what's going on,' but they don't." These findings add support to previous research, highlighting how mariners from Confucian backgrounds may be more likely to use face-saving strategies when confronted with an issue they wish to avoid (Jwa, 2017; Kwek & Lee, 2015; Park, 2002; Pyne & Koester, 2005). Interviewees also highlighted how they would employ face-saving strategies when interacting with masters or pilots when seeking to confirm a problem or manage a developing situation. Together, these findings illustrate the importance of awareness-raising of these culturally driven preferences for politeness and face-saving, particularly for BRM. Similarly, cultural misunderstandings (5%) and confusion regarding authority or command (13%) also were identified as underlying sources of miscommunication.

Language Proficiency and Communicative Competence

Lack of language proficiency or other linguistic issues were identified as the third most common underlying cause of miscommunication, accounting for 12% of accidents overall. This finding supports the results of Phase 1, as well as provides additional evidence to previous research (Oraith et al., 2021). In addition, aligning with earlier findings, analysis demonstrated that crew may revert to their native language during stressful situations (Gat & Keith, 1978; Lecumberri et al., 2010). Interview data also supported these findings, with multiple interviewees commenting on experiences in which English proficiency was insufficient for communication, instead necessitating the use of gestures or hand drawn pictures as resources. In addition, interviewees described situations in which non-native English-speaking mariners used their native language to communicate with others, thereby excluding the pilot or master from the conversation. Because communication occurred in a language other than English, the pilot or other officers and crew were prevented from understanding important information, constraining their abilities to take action.

Recommendations: Phase 1 and 2

Together, these reports demonstrate the need for targeted training materials relevant to the linguistic, socio-cultural, and pragmatic issues underlying miscommunication. For example, training should include raising mariners' awareness of the conditions and environments in which communication failures are most likely to occur (e.g., bridge team interactions, pilot/master exchange). In addition, results demonstrate the need to raise awareness of the important role that face-saving and politeness strategies, such as indirectness, play in miscommunication. In other words, mariners need support and training to better understand how indirectness can lead to ambiguity and confusion, further exacerbating misunderstandings or miscomprehension. Furthermore, raising mariners' awareness of how different cultural backgrounds and beliefs may impact speakers' international choices will facilitate recognition of contexts in which miscommunication is likely to occur. These reports also highlight the importance of promoting an environment supportive of clear and open communication, particularly for lower ranked mariners who may be hesitant to raise issues or concerns with their superiors. Fostering cohesion and communication on board is a key step in improving communication and preventing failures due to issues in power and social distance. Junior officers or pilots may benefit from training to better understand the reticence of crew to question or contradict others, and to develop strategies to foster direct communication in hierarchical contexts.

Importantly, native English-speaking mariners may need more support in terms of being aware of standardized language, such as the SMCP, and how to use such language during communication. For example, interviews demonstrated that American mariners may receive little to no training on the use of standardized language compared to plain English, and need support to better understand how to maintain simplified, comprehensible language during interactions. In addition, English speakers may benefit from support in avoiding indirect, overly polite language in which mismatches between intentions and understandings may occur. Lastly, results demonstrate that improvements are needed in terms of overall English instruction for international seafarers, with linguistic issues identified as the third most common underlying cause of miscommunication. Proficiency remains problematic, with members of the global fleet highlighting the need for more interactional opportunities to improve overall speaking and listening skills. Drawing from applied linguistics research, such as TBLT, to inform and modernize pedagogical practices may help to improve learners' interactional and communicative competence.

Conclusions: Phases 1 and 2

Drawing on data from Phases 1 and 2, it is clear that despite efforts to improve training and communication practices, miscommunication remains a leading source of accidents and incidents at sea. Taken together, these reports provide important information regarding

the underlying linguistic, socio-cultural, and pragmatic causes of this miscommunication, including issues related to power, politeness, and English proficiency. Failure to communicate, such as a lack of clarification or confirmation regarding intentions or maneuvers, was identified as the primary source of miscommunication caused accidents. Pragmatic and socio-cultural issues, such as differences in power and social distance, as well as beliefs regarding politeness and indirectness, also heavily contributed to miscommunication both for native English speakers as well as during communication between international and American seafarers. In addition, lack of language proficiency further contributed to these failures, particularly during stressful situations when mariners may revert to languages other than English, thus leaving others unaware of critical information. Furthermore, these proficiency related issues were additionally exacerbated by native-English speakers' failure to use standardized language. Importantly, these reports highlight the myriad ways that native English speakers also contribute to miscommunication, demonstrating the need for improved training materials for both domestic and international seafarers. In particular, there is a clear need for materials drawing on tasks and real-world use, thereby providing international mariners with authentic interactional opportunities in which to build speaking and listening skills (e.g., Aeni et al., 2018; Fan et al., 2017; Zhang & Cole, 2018).

Looking Ahead: Phase 3

Building on the findings of Phases 1 and 2, Phase 3 would seek to expand the methods and sources by incorporating additional stakeholders and participants in a wider-ranging needs analysis. For example, additional participants for semi-structured interviews will be recruited, including representatives from shipping management companies and educators in both domestic and international maritime institutions. A questionnaire focused on possible target tasks for professional development, awareness raising, and language training will be shared with maritime professionals and organizations, thus providing a diverse range of perspectives on the tasks necessary for Phase 4 (the development of efficient and effective targeted training modules for the various stakeholders of Prince William Sound). By using a multiple methods and multiple sources approach (Long, 2015), the next phase will expand on the current results to further explore not only the sources of miscommunication, but identify the goals and communicative needs of both native and non-native English-speaking mariners to reduce instances of miscommunication and inform future curriculum design and materials development.

References

Acar, U., & Varsami, C. (2021). "Practical communication approach in Maritime English." TransNav, the International Journal on Marine Navigation and Safety of Sea Transportation, 15(3), 601–604.

Acejo, I., Sampson, H., Turgo, N., Ellis N., & Tang, L. (2018). "The causes of maritime accidents in the period 2002–2016." Seafarers International Research Centre (SIRC), Cardif University, United Kingdom.

Ahmmed, R., Sinha, B. S., Khan, R., & Islam, D. M. (2020). "A needs analysis of maritime English language skills for Bangladeshi seafarers to work on-board ships." *Marine Policy*, *119*, 104041.

Brenker, M., Möckel, S., Küper, M., Schmid, S., Spann, M., & Strohschneider, S. (2017). "Challenges of multinational crewing: A qualitative study with cadets." WMU Journal of Maritime Affairs, 16(3), 365–384. https://doi.org/10.1007/s13437-016-0117-5

Brown, P., & S. Levinson. (1987). *Politeness: Some universals in language usage.* Cambridge: Cambridge University Press.

Chauvin, C., Lardjane, S., Morel, G., Clostermann, J.-P., & Langard, B. (2013). "Human and organisational factors in maritime accidents: Analysis of collisions at sea using the HFACS." Accident Analysis & Prevention, 59, 26–37. https://doi.org/10.1016/j.aap.2013.05.006

Chong S.W., & Reinders H. (2020). "Technology-mediated task-based language teaching: A qualitative research synthesis." Language Learning & Technology, 24(3), 70–86.

Clarke, V., & Braun, V. (2017). Thematic analysis. *The journal of positive psychology*, *12*(3), 297-298.

Ćorović, B. M., & Djurovic, P. (2013). Marine accidents researched through human factor prisma. *Promet-Traffic&Transportation*, *25*(4), 369-377.

Darbra, R. M., Crawford, J. F. E., Haley, C. W., & Morrison, R. J. (2007). Safety culture and hazard risk perception of Australian and New Zealand maritime pilots. *Marine policy*, *31*(6), 736-745.

Fan, L., Fei, J., Schriever, U., & Fan, S. (2016). "The establishment of a framework of communicative competence of seafarers: A systematic review." In S. Fan & J. Fielding-Wells (Eds.), What Is Next in Educational Research? (pp. 233–248). Sense Publishers.

Fan, L., Fei, J., Schriever, U., & Fan, S. (2017). "A critical examination of the seafaring English education and training in China." Marine Policy, 86, 56–63. https://doi.org/10.1016/j.marpol.2017.09.013

Garcia, P. (2004). "Developmental differences in speech act recognition: A pragmatic awareness study." Language Awareness, 13(2), 96-115.

Gat, I. B., & Keith, R. W. (1978). "An effect of linguistic experience: Auditory word discrimination by native and non-native speakers of English." Audiology,14(4), 339-345.

Gill, G. W., & Wahner, C. M. (2012). "The herald of free enterprise casualty and its effect on maritime safety philosophy." Marine Technology Society Journal, 46(6), 72–84. https://doi.org/10.4031/mtsj.46.6.6

Graziano, A., Teixeira, A. P., & Soares, C. G. (2016). "Classification of human errors in grounding and collision accidents using the TRACEr taxonomy." Safety Science, 86, 245-257.

Hasanspahić, N., Vujičić, S., Frančić, V., & Čampara, L. (2021). "The role of the human factor in marine accidents." Journal of Marine Science and Engineering, 9(3), 261. https://doi.org/10.3390/jmse9030261

Hassel, M., Asbjørnslett, B. E., & Hole, L. P. (2011). "Underreporting of maritime accidents to vessel accident databases." Accident Analysis & Prevention, 43(6), 2053–2063. https://doi.org/10.1016/j.aap.2011.05.027

Holtgraves, T. (2007). "Second language learners and speech act comprehension." Language Learning, 57(4), 595-610.

IMO (1978). "International convention on standards of training, certification and watch-keeping for seafarers". London: IMO.

IMO (2001). "Standard Marine Communication Phrases." London: IMO.

IMO. (2011). "STCW including 2010 Manila amendments: STCW Convention and STCW Code." London: International Maritime Organization

John, P., Brooks, B., & Schriever, U. (2019). "Speech acts in professional maritime discourse: A pragmatic risk analysis of bridge team communication directives and commissives in full-mission simulation." Journal of Pragmatics, 140, 12–21. https://doi.org/10.1016/j.pragma.2018.11.013

Jurkovič, V. (2015). "Maritime English vocabulary in feature films: The Perfect Storm (2000) and Master and Commander (2003)." TESOL Journal, 7(3), 566–590. https://doi.org/10.1002/tesj.220

Jwa, S. (2017). Facework among L2 speakers: a close look at intercultural communication. *Journal of Multilingual and Multicultural Development*, *38*(6), 517-529.

Keck, C., Iberri-Shea, G., Tracy-Ventura, N., & Wa-Mbaleka, S. (2006). "Investigating the empirical link between task-based interaction and acquisition: A meta-analysis." In J. M. Norris & L. Ortega (Eds.), Synthesizing research on language learning and teaching (pp. 91–131). John Benjamins.

Kwek, A., & Lee, Y.-S. (2015). "How "face" matters: Chinese corporate tourists in Australia." Journal of Travel & Tourism Marketing, 32(1-2), 120–140. https://doi.org/10.1080/10548408.2014.986016

Lappalainen, J., Vepsäläinen, A., Salmi, K., & Tapaninen, U. (2011). "Incident reporting in Finnish shipping companies." WMU Journal of Maritime Affairs, 10(2), 167–181. https://doi.org/10.1007/s13437-011-0011-0

Lecumberri, M. L. G., Cooke, M., & Cutler, A. (2010). Non-native speech perception in adverse conditions: A review. *Speech communication*, *52*(11-12), 864-886.

Li, T., Chen, Q., Xi, Y., & Lau, Y. (2023). "A 40-Year bibliometric analysis of Maritime English research: Insights and implications." Sustainability, 15(5), 4348–4348. https://doi.org/10.3390/su15054348

Lim, T., and S. H. Choi. 1996. “Interpersonal Relationships in Korea.” In Communication in Personal Relationships Across Cultures, edited by William B. Gudykunst, Stella Ting-Toomey, and Tsukasa Nishida, 122–136. Thousand Oaks, CA: Sage Publications.
Linde, C. (1988). The quantitative study of communicative success: Politeness and accidents in aviation discourse. *Language in Society,* 17, 375-399.
Long, M. H. (2015). “Second language acquisition and task-based language teaching.” Wiley Blackwell.
Mackey, A., & Goo, J. (2007). “Interaction research in SLA: A meta-analysis and research synthesis.” In A.Mackey (Ed.), Conversational interaction in second language acquisition: A collection of empirical studies (pp. 407-452). Oxford: Oxford University Press.
Macrae, C. (2009). “Human factors at sea: Common patterns of error in groundings and collisions.” Maritime Policy & Management, 36(1), 21–38. https://doi.org/10.1080/03088830802652262
Mitroussi, K., & Notteboom, T. (2014). “Getting the work done: Motivation needs and processes for seafarers and dock workers.” WMU Journal of Maritime Affairs, 14(2), 247–265. https://doi.org/10.1007/s13437-014-0064-y
Oldenburg, M., Jensen, H.-J., Latza, U., & Baur, X. (2009). “Seafaring stressors aboard merchant and passenger ships.” International Journal of Public Health, 54(2), 96–105. https://doi.org/10.1007/s00038-009-7067-z
Oraith, H., Blanco-Davis, E., Yang, Z., & Matellini, B. (2021). “An evaluation of the effects of human factors on pilotage operations safety.” Journal of Marine Science and Application, 20(3), 393–409. https://doi.org/10.1007/s11804-021-00222-1
Qiao, W.; Liu, Y.; Ma, X.; Liu, Y. Human Factors Analysis for Maritime Accidents Based on a Dynamic Fuzzy Bayesian Network. Risk Anal. 2020, 40, 957–980.
Park, M. (2002). Differences in the advice-giving behavior between Korean EFL learners and English native speakers. *SNU Working Papers in English Language and Linguistics*, *1*, 62-91.
Pourzanjani, M. (2001). “Analysis of human error in co-ordinating ship's collision avoidance action.” In ICCGS 2001: 2nd international conference on collision and grounding of ships (Copenhagen, 1-3 July 2001, preprints) (pp. 85-91).
Pyne, R., & Koester, T. (2005). “Methods and means for analysis of crew communication in the maritime domain.” The Archives of Transport, 17(3-4), 193–208.
Sampson, H., & Zhao, M. (2003). “Multilingual crews: Communication and the operation of ships.” World Englishes, 22(1), 31–43. https://doi.org/10.1111/1467-971x.00270
Schriever, U. (2011). “Maritime English: The need to bridge linguistic and cultural barriers in the international shipping industry.” In Q. Le & T. Le (Eds.), Linguistic diversity and cultural identity: A global perspective (pp. 15–24). Nova Science Publishers.
Short, V. (2006). Maritime English: Valuing a common language. Journal of the Nautical Institute, 11, 1-12.
Squire, D. (2004). “The human element: The importance of effective communication.” (PowerPoint slides) Retrieved from Alert 1.
Tannen, D. (1994). *Talking from 9 to 5: How women’s and men’s conversational styles affect*

who gets heard, who gets credit, and what gets done at work. New York: William Morrow and Company.
Trenkner, P. (2007). "The IMO Standard Marine Communication Phrases - a communicative survival kit." Alert, 14, 3.
Tzannatos, E., & Kokotos, D. (2009) Analysis of accidents in Greek shipping during the pre- and post-ISM period. *Maritime Policy, 33*, 679–684
Tzannatos, E. (2010). Human element and accidents in Greek shipping. *The Journal of Navigation*, *63*(1), 119-127.
TSB (1995) A safety study of the operational relationship between ship masters/watchkeeping officers and marine pilots. TSB Study SM9501.
Uchida, Y. & Takagi, N. (2012b). "What did you say?–Why communication failures occur on the radio." International Maritime Lecturers' Association - International Maritime English Conference IMEC 24, Yangon, Myanmar, pp. 170–179.
Ugurlu, Ö., Köse, E., Yildirim, U., & Yüksekyildiz, E. (2015). "Marine accident analysis for collision and grounding in oil tanker using FTA method." Maritime Policy & Management, 42(2), 163-185.
Yıldırım, U., Başar, E., & Uğurlu, Ö. (2017). "Assessment of collisions and grounding accidents with human factors analysis and classification system (HFACS) and statistical methods." Safety Science. https://doi.org/10.1016/j.ssci.2017.09.022
Ziarati, R. (2006). "Safety at sea: Applying Pareto analysis." Proceedings of World Maritime Technology Conference.
Ziarati, R., Ziarati, M., & Çalbas, B. (2009). "Improving safety at sea and ports by developing standards for Maritime English." Paper published at the Bridge conference (pp. 1–15), Rauma, Finland.
Ziarati, M., Ziarati, R., Bigland, O., & Acar, U. (2011). "Communication and practical training applied in nautical studies." In International Maritime Lecturers' Association (IMLA), The International Maritime English Conference Proceedings Of IMEC, 23, p. 41.
Ziegler, N. (2016). "Taking technology to task: Technology-mediated TBLT, performance, and production." Annual Review of Applied Linguistics, 36, 136–163. https://doi.org/10.1017/s0267190516000039