Exploring Miscommunication at Sea: Causes and Contributing Factors

Nicole Ziegler

August 31, 2024
Prince William Sound Regional Citizens' Advisory Council
Project Number: 8520.23.01

The opinions expressed in this PWSRCAC commissioned report are not necessarily those of PWSRCAC.

This document is for internal use and distribution only. Please do not share outside of PWSRCAC.

Table of Contents

Acronym List

AB	Able Bodied Seaman
AC	Active Captain
ATSB	Australian Transport Safety Bureau
COLREG	Convention on the International Regulations for Preventing Collisions at Sea
DMAIB	Danish Maritime Accident Investigation Board
FTC	Failure to Communicate
GISIS	Global Integrated Shipping Information System
HFACS	Human Factors Analysis and Classification System
IMO	International Maritime Organization
JP	Junior Pilot
MAIB	Marine Accident Investigation Branch (U.K.)
ME	Maritime English
MET	Maritime English Training
NM	Nautical Miles
NTSB	National Transportation Safety Board
RM	Retired Master
SMCP	Standard Marine Communication Phrases
SMNV	Standard Marine Navigational Vocabulary
SP1	Senior Pilot 1
SP2	Senior Pilot 2
STCW	Standards of Training, Certification & Watchkeeping
TSB	Transportation Safety Board of Canada
VDR	Vessel Data Recorder
VHF	Very High Frequency
VTS	Vessel Traffic Service

Abstract

A growing body of research has identified miscommunication as one of the leading human-caused factors in marine accidents and incidents (Li et al, 2023; Oraith et al., 2021). As the number of multicultural and multinational crew has continued to grow, the maritime industry has sought to improve communication through the implementation of standardized language and the use of Maritime English as lingua franca. However, miscommunication caused accidents are continuing to increase (Ziarati et al., 2009). Although previous studies have demonstrated that communication failures, poor judgment, and error/mishandling are leading causes of collisions, groundings, and other accidents (Acejo et al., 2018), few studies have explored the linguistic, pragmatic, and social sources of these communication related issues (e.g., John et al., 2018). Seeking to fill this gap, this mixed methods exploratory analysis identifies the linguistic, pragmatic, and socio-cultural factors that contribute to or cause miscommunication at sea. Focusing on National Transportation Safety Board accident and incident reports involving U.S. flagged vessels, as well as semi-structured interviews with domain experts for triangulation and validation purposes, this report provides a systematic analysis of how pragmatic and linguistic factors may cause or contribute to miscommunication in maritime contexts.

Executive Summary

Background and Objective

Previous research has identified human error as a primary contributing cause of accidents and incidents at sea (e.g., Chauvin et al., 2013; Hasanphahić et al., 2021; Ziarati et al., 2009), with results suggesting that miscommunication amongst multinational and multicultural crews is one of the leading human-caused factors in many marine accidents (Li et al, 2023; Oraith et al., 2021). Despite efforts by the International Maritime Organization (IMO) to identify and promote Maritime English (ME) as a lingua franca for maritime communication, miscommunication and misunderstandings continue to occur in a wide range of contexts, including during communication between pilots, officers, engineers, and crew, as well as ship-to-shore communication with Vessel Traffic Services (VTS, Hasanphahić et al., 2021; Macrae, 2009; Yıldırım et al., 2017). In addition, the pragmatic and sociocultural beliefs of mariners may exacerbate issues, further contributing to miscommunication caused incidents.

Although previous research has provided crucial information on the human factors related to communication at sea, no research to date has comprehensively explored the underlying sources of miscommunication in maritime accidents involving U.S. flagged vessels. In an effort to address this gap, this exploratory analysis identifies the linguistic, pragmatic socio-cultural factors that contribute to or cause miscommunication at sea. Focusing on a comprehensive thematic analysis of accident and incident reports from the National Transportation Safety Board (NTSB), as well as semi-structured interviews with domain experts for triangulation and validation purposes, this report provides a holistic perspective on the causes of miscommunication at sea by identifying how pragmatic, linguistic, and sociocultural factors impact miscommunication in maritime contexts.

Methodology

Quantitative and qualitative methods were used to provide a holistic understanding of the possible sources of miscommunication. Following an initial literature review, a comprehensive search of NTSB accident and incident reports was completed. This initial retrieval stage of data collection focused on publicly available NTSB reports, with over 400 potentially relevant reports identified by a keyword search using the following terms: *miscommunication, communication, bridge resource management, language, misunderstanding.* Reports were considered relevant to this review if (mis)communication or language was explicitly or indirectly identified as a contributing or causative factor in the accident or incident. Sixty reports from 1995-2022 were identified as relevant and were subsequently thematically 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). These features were informed by previous research in which context (e.g., ship-to-ship, ship-to-shore, on board), environment (e.g., bridge, etc.), and interlocutor (e.g., pilot, master, etc.) have been identified as relevant to miscommunication (e.g., Oraith et al., 2021). In addition, reports were coded for participant characteristics (e.g., native language) as well as financial and environmental damages.

Semi-structured interviews were also conducted with active and retired Alaskan marine pilots and captains to triangulate the results of the analysis of NTSB reports. Because the experiences and actions of pilots and masters are critical in ensuring safe and successful operations, these participants were able to provide an important perspective on the underlying factors driving miscommunication. All interviews were recorded, transcribed, and thematically analyzed for factors related to miscommunication.

Findings

Overall, findings provide additional support for previous research in which poor bridge team management was found to be a common contributing factor to accidents (e.g., Macrae, 2009; Hasanphahić et al., 2021; Uğurlu et al., 2015). For example, analysis demonstrated that 76% (k = 40) of miscommunication happened on the bridge, with 23% (k = 14) of miscommunication occurring in the environment of the bridge and VHF radio communication combined. In addition, communication failures related to bridge resource management were identified in more than half of all reports (k = 45, 75%), including a smaller proportion specifically related to the pilot/master exchange (k = 8, 13%). These findings are aligned with earlier research in which poor bridge team management was found to be a common contributing factor to accidents (e.g., Macrae, 2009; Hasanphahić et al., 2021; Uğurlu et al., 2015), highlighting the importance of effective communication on the bridge and during pilotage (John et al., 2019; Graziano et al., 2016).

Multiple factors were identified as possible sources of miscommunication, with thematic analysis demonstrating that pragmatic (k = 37, 62%) and linguistic factors, such as communication failures related to lack of clarification or confirmation (k= 44, 78%), were the most common causes or contributing factors of miscommunication. English proficiency related issues were the third most common factor, causing or contributing to 18% of accidents (k = 11).

Linguistic Factors

Failure to communicate (FTC) was identified as the leading source of miscommunication (k = 44, 78%), and primarily stemmed from a lack of communication amongst the bridge team or in ship-to-ship interaction. For example, this category included instances in which pilots or masters failed to discuss or share their plans or intentions with each other, the bridge

team, or other vessels. In addition, this category included instances in which an interlocutor failed to share plans or intended actions, such as making passing arrangements, and pilots, masters, and/or crew failed to seek clarification or confirmation regarding the other party's plans and intentions. This failure to communicate was further exacerbated by language related issues on board vessels, with interlocutors frequently failing to seek clarification or confirmation related to the use of languages other than English.

Providing support for previous findings in which English language abilities have been cited as a substantial issue (Oraith et al., 2021), language proficiency was the second most common linguistic factor. Specifically, a lack of English proficiency or inadequate communicative competence was found to be responsible for 12% of accidents and incidents. During stressful situations, which may further complicate language related miscommunication (Gat & Keith, 1978; Lecumberri et al., 2010), non-native English-speaking crew often communicated using their first language, thus preventing the pilot and other crew members from hearing and understanding important information. Interview data supported these findings regarding proficiency and the use of languages other than English.

Pragmatic Factors

Pragmatic competence can be defined as the ability to situationally recognize and use language appropriately (Bachman & Palmer, 1996, 2010). Pragmatics also relates to "how speakers of a language other than their first language communicate with others either by using the language of the context or a lingua franca" (Gonzalez-Lloret, 2020), highlighting the relevance of this area for ME. Pragmatic failures were then analyzed further to identify the subcategories of these breakdowns and misunderstandings, with results demonstrating that 32% (k = 19) of miscommunication caused accidents were due to power differentials among pilots and masters and/or crew, or crew and officers/masters. For example, multiple accidents were attributed to the pilot or master disregarding input from lower-ranked crew, or crew following instructions without question if the command was given by a higher ranked crew member or the pilot.

These findings are aligned with previous research demonstrating the important role power differentials have in terms of causing and contributing to miscommunication (Sampson & Zhao, 2003), and were also supported by interview data. Multiple interviewees highlighted the importance of cultivating relationships with crew or pilots/masters in order to create an environment where lower-ranked officers or crew would feel comfortable raising concerns or contradicting higher ranked officers or the pilot.

Similarly, 37% of miscommunication was due to face-saving and politeness strategies, which often exacerbated issues related to power and hierarchy. Face-saving and politeness strategies, such as ambiguity, hedging, and indirectness, have a substantial impact on communication and are especially important in terms of pilot interactions and bridge

resource management. Importantly, miscommunication driven by face-saving and politeness also frequently occurred during interaction involving native English-speakers, highlighting that this source of miscommunication extends to both native and non-native English-speaking mariners. Interviews confirmed and validated these findings, with interviewees commenting on the importance of raising native-English mariners' awareness of politeness and face-saving strategies. Thematic analysis also identified confusion regarding authority and command (k = 8, 13%), as well as cultural misunderstandings (k=3, 5%), as additional sources of miscommunication.

Summary of Results

Overall, this study identified important findings for deepening our understanding of the sources of miscommunication at sea by conducting an exploratory thematic analysis of NTSB reports involving U.S. flagged vessels. Findings were then triangulated with semi-structured interviews, with results demonstrating the key role of linguistic and pragmatic factors in miscommunication. Results indicate that communication failures were frequently caused by interlocutors failing to share their intentions or confirm information, and were further exacerbated by the use of languages other than English. In addition, during stressful situations, non-native speaking mariners were more likely to revert to their first language, often leaving a pilot unaware of important information and developing situations. Findings also highlight the role of pragmatics factors in miscommunication, underscoring the importance of facilitating mariners' understanding of how power, politeness, and face-saving strategies may impact communication, particularly during interactions on the bridge.

General Recommendations

The primary cause of miscommunication was identified as failures to communicate, which included breakdowns in communication in which one party fails to provide information regarding their intentions and actions while the other(s) fail to seek the necessary information to ensure clarity and understanding. These findings highlight the importance of *fostering cohesion and community on board vessels by creating an environment in which mariners, regardless of rank, feel that they are able to seek clarification or confirmation.* These failures in communication were often complicated by proficiency issues, suggesting there is a need for training focused on *awareness raising of not only the importance of speaking slowly and clearly, but using standardized language as often as possible when interacting with mariners from diverse linguistic backgrounds to reduce misunderstandings*. Findings also demonstrate the potential for miscommunication during bridge resource management (BRM), *highlighting the need for training to address strategies for coping with insufficient linguistic proficiency or cultural misunderstandings.* Findings also demonstrate the need to raise mariners' awareness of how politeness and indirectness may contribute to and further exacerbate instances of miscommunication, particularly during BRM. Direct training to help *improve understanding of how cultural background and beliefs, particularly related to*

the role of power and politeness, may help native English-speaking mariners to recognize possible circumstances where miscommunication may occur.

Introduction

Building on the findings of Phase 1, which provided a comprehensive review and synthesis of research related to the role of miscommunication in the maritime industry, this exploratory analysis systematically examines the linguistic, pragmatic, and socio-cultural factors that cause or contribute to miscommunication at sea. This report will first provide a brief review of the relevant research. Then, following a description of the methods, including the study retrieval process, the coding scheme, and the thematic analysis used for both the primary National Transportation Safety Board (NTSB) reports and the semi-structured interviews, the quantitative results are discussed. Next, drawing on transcripts, interviews, and other data in NTSB reports and dockets, this report then qualitatively explores how linguistic and pragmatic factors contributed to miscommunication involving both native English-speaking and non-native English-speaking mariners. Finally, this report will conclude with suggestions for further investigation and how these findings might inform the development of future educational materials for various stakeholders in the maritime industry.

Maritime Miscommunication

Following a brief review of efforts to improve miscommunication in maritime contexts, such as the development of a standardized phraseology and the use of Maritime English (ME) as a lingua franca, this section will provide an overview of the previous research exploring human related factors in maritime accidents. Specifically, this section summarizes the findings of research examining accident and incident reports, providing a state-of-the-art perspective and identifying gaps for further exploration.

Previous research has identified human error as a primary contributing cause of accidents and incidents at sea (e.g., Chauvin et al., 2013; Hasanphahić et al., 2021; Ziarati et al., 2009), with results suggesting that miscommunication amongst multinational and multicultural crews is one of the leading human-caused factors in marine accidents (Li et al, 2023; Oraith et al., 2021). A number of efforts have been made to address miscommunication, including the development of the Standard Marine Navigational Vocabulary (SMNV) in 1977 (amended in 1985) and Maritime English (ME). Maritime English, defined as a highly simplified and technical variety of English for use in ship-to-ship, ship-to-shore, and onboard communication (Jurkovič, 2015), was included in the 1995 amendment of the International Maritime Organization's (IMO) Standards of Training, Certification & Watchkeeping (STCW 78/95). The amended STCW required all watchkeepers and personnel charged with operations and machinery to have sufficient written and oral English proficiency to perform critical duties, such as reading and understanding navigational information. Building on these efforts to improve communication, the IMO later instituted the Standard Marine Communication Phrases (SMCP) as a revised and expanded addition to the SMNV in 2001. Designed to reduce grammatical and lexical communicative needs,

the SMCP is a prescriptive phraseology consisting of more than 3,000 essential phrases for use in a wide range of situations, including ship-to-ship and ship-to-shore communication.

However, despite the development of these resources, numerous studies have demonstrated that miscommunication and misunderstandings continue to occur (Hasanphahić et al., 2021; Macrae, 2009; Yıldırım et al., 2017). For example, Tzannatos and Kokotos (2009) examined accidents between 1993-2006 involving Greek flagged vessels, with results demonstrating that 63.9% of accidents were caused by human error, including miscommunication. Similarly, Tzannatos (2010) analyzed incidents involving Greek flagged vessels, finding that 57.1% were due to human related factors. In addition, Tzannatos (2010) found that captains were involved in over 80% of accidents while other officers and crew were responsible for approximately 7% and 5% respectively. Hetherington et al. (2006) also found fatigue, stress, situational awareness, decision-making, and communication played an important role in causing accidents, while Darbra et al. (2007) identified a range of communication failures between captains, crew, and pilots in their interviews of New Zealand and Australian pilots.

More recently, Yildirim et al. (2017) found that accidents were most often caused by preconditions which led to unsafe acts, including human related factors such as decision errors, skill-based errors, violations, resource management deficiencies, and miscommunication. Qiao et al. (2020) found similar results in their investigation of a limited sample of Chinese accident reports, with unsafe preconditions and unsafe supervision the most common factors related to human caused errors.

Taken together, these findings highlight the impact of human error, demonstrating the need for further research to better understand the context, environment, and conditions that foster errors and communication breakdowns. With the increasing role of commercial shipping in the global economy (Hasanspahić et al., 2021), as well as the high financial, environmental, and human cost of accidents, there is a growing need to understand the underlying causes of miscommunication issues at sea.

Previous research has examined the conditions that might contribute to errors and miscommunication, with results demonstrating that insufficient bridge communication and errors in decision making are leading causes of miscommunication (Chauvin et al., 2013; Macrae, 2009; Pourzanjani, 2001). For example, Macrae (2009) examined 30 accident reports from the Australian Transport Safety Bureau (ATSB) using structural pattern analysis. Findings demonstrate that accidents were often caused by inadequate planning and communication problems on the bridge, with failures attributed to lack of cohesiveness amongst crew, lack of appropriate checks and balances across crew and pilots, and lack of clear procedures for communication. In their analysis of collision reports from the U.K. Marine Accident Investigation Branch (MAIB) and the Transportation Safety Board of Canada (TSB), Chauvin et al. (2013) demonstrated that the majority of collisions were due to decision errors, particularly amongst the bridge team.

Similarly, Uğurlu et al. (2015) examined collision and grounding data for oil tankers from 1998 to 2010 from Global Integrated Shipping Information System (GISIS). Using fault tree analysis, which utilizes a mixed method approach to explore the reasons behind event occurrence by providing a description of the system and its associated components, 378 accidents were analyzed. Findings indicate that failure to follow Convention on the International Regulations for Preventing Collisions at Sea (COLREG) and lack of communication was a leading factor in both collisions and groundings, particularly in onboard and ship-to-ship interaction. In addition, insufficient English proficiency, fatigue, and extreme workload were identified as sources of communication issues. Results also suggest that if bridge resource management and failed interpretations were resolved, rate of accidents would be substantially reduced.

Building on this work, Acejo et al.'s (2018) examination of accident reports focused on a broader global sample, with analysis targeting reports between 2002-2016 from MAIB, the ATSB, NTSB, the German Federal Bureau of Maritime Casualty Investigation, and the Danish Maritime Accident Investigation Board (DMAIB). Following analysis of 693 reports, results demonstrate that collision and contact related accidents were most common, followed by groundings, fire/explosion, lifeboats, and other types of accidents. Findings also demonstrate that "failure in communication," "poor judgement," and "pilot error/mishandling" were the primary cause of collisions and other contact related accidents. Overall, communication failures were the third most common cause of accidents, accounting for 23.5% of total accidents while miscommunication between masters and pilots explained 6.2% of accidents overall. The authors highlight that based on reports alone it is difficult to identify the underlying causes of these communication failures, which they speculate may be due to linguistic or hierarchical issues. Furthermore, mariners' pragmatic competence, which can be defined as the ability to situationally recognize and use language appropriately (Bachman & Palmer, 1996, 2010), may impact their ability to communicate effectively and efficiently (Fei et al., 2009; Schriever, 2011). This gap highlights the need for a deeper linguistic or pragmatic analysis of available interviews, transcripts, and other available data to help provide a more comprehensive and holistic perspective on the factors that contribute to these failures in communication.

More recently, Hasanphahić et al. (2021) reviewed 135 marine accident reports from 2010-2019 conducted by the U.K. MAIB. Using multiple linear regression to explore the relationship between the number of accidents and the most common human related causal factors, results demonstrated that organizational climate and software were the two primary causes. Organizational climate was defined as the "way things are done onboard a ship," and included culture, policies, and structure. In addition, national culture and leadership also comprised organizational climate. Although communication was considered an independent factor accounting for 5.9% of accidents, lack of communication also played a role in organizational climate. For example, lack of participation in pilotage or poor safety culture, both of which may be impacted by communication practices, were part

of the operationalization of organizational climate. Although these results provide important information regarding the human factors that contribute or cause accidents at sea, more research is needed to understand the foundational source of these problems related to organizational climate or lack of communication. In other words, the factors that lead to these breakdowns in culture, policies, and structure remain unclear, underscoring the need for a more detailed analysis of the root causes of these human factors.

Taking a narrower focus, Oraith et al. (2021) investigated the role of human factors in causing and contributing to pilotage accidents by analyzing reports between 1995-2015. Building on previous work that demonstrated 96.5% of errors occurred on the bridge involving captains, officers, and pilots (Graziano et al., 2016), Oraith et al. (2021) examined the complex and high-risk situations in which pilots were involved for the effect of human factors. Using a multi-methods approach, this study combined an analysis of reports from the NTSB, MAIB, and TSB with questionnaire results from experienced mariners to provide a more comprehensive and validated approach to the development of the hierarchical structure of risk factors. Following the identification of 25 contributory causes based on report analysis and survey findings, the resulting hierarchical structure was then reviewed by two experts with both and academic and maritime background. Results demonstrate that the most influential human error related causes are bridge team management failures, technical skills shortcomings, instructions and orders failures, and individual-task interaction factors. Lack of effective communication and language barriers was ranked as the primary contributing cause among the subfactors of bridge team management failures, providing further support for previous research indicating lack of communication among the bridge team and lack of sufficient information exchange were important causal factors in maritime accidents (TSB, 1995). In addition, the authors highlight the importance of sufficient English proficiency to ensure that the captain, officers, and crew can understand actions and orders from the pilot or Vessel Traffic Service (VTS) operators.

Numerous studies have also highlighted how miscommunication may occur more frequently when speakers are from different linguistic and cultural backgrounds (e.g., Mitroussi & Notteboom, 2014; Trenkner, 2007; Ziarati, 2006; Ziarati et al., 2011), with recent reviews demonstrating that the English proficiency of the crew is negatively correlated to the rate of accidents (e.g., Oraith et al., 2021). For example, Ćorović and Djurovic (2013) found that cultural and religious differences may have a substantial impact on health and psychological problems. In addition, multicultural backgrounds and nationalities were identified as potentially contributing causes of miscommunication and operational issues.

However, despite the growing number of analyses targeting human factors, the majority use quantitative modeling for analysis, such as Bayesian reasoning or HFACS (human factors analysis and classification system) modeling. Although these quantitative reports provide a detailed and comprehensive assessment of the causal and contributing factors of these accidents, few studies have sought to explore the underlying sources or initial causes of these human related issues from a more holistic, multiple methods approach. Indeed,

Hasanphahić et al. (2021) point out the need to better understand the foundational sources of miscommunication, particularly as these underlying linguistic and socio-cultural factors are likely to play an important role in miscommunication (Ziarati et al., 2009). For example, Fan et al. (2017) describe how maritime students felt underprepared for intercultural communication, despite cultural issues having been identified as an important factor in misunderstandings. In addition, previous research has called for more direct training on cultural issues, including addressing stereotypes and biases (Brenker et al., 2017), particularly as the pragmatic and sociocultural beliefs of mariners may exacerbate communication issues.

These results highlight the importance of developing a better understanding of how learners' linguistic, pragmatic, and sociocultural factors play a role in communication failures. For example, linguistic and pragmatic failures may contribute to miscommunication between vessels in high-traffic areas or amongst crew during highly stressful, technical maneuvers, in which there is often very little time or space to repair initial misunderstandings (Pyne & Koester, 2005; Sampson & Zhao, 2003; Trenkner, 2007; Ziarati, 2006; Ziarati, 2009). In these situations, confusion or misinterpretation of instructions or warnings is likely to intensify problems and difficulties, thus contributing to the occurrence of an accident. The need for clear and efficient communication is further amplified by the high risk involved in the shipping industry, including loss of life or environmental damage. Thus, although there is a growing number of analyses of the human element in maritime accidents, more in-depth analyses of accident reports are needed to identify possible linguistic and pragmatic sources of these communication issues (e.g., Acar & Varsami, 2021; Oraith et al., 2021; Hasanphahić et al., 2021; Pyne & Koester, 2005; Tzannatos & Kokotos, 2009).

Goal of the Current Research

Although previous research has provided crucial information on the human factors related to communication at sea, no research to date has comprehensively explored the role of linguistic, pragmatic, and socio-cultural factors in maritime accidents involving United States (U.S.) flagged vessels. Given that previous scholars have called for instructional practices to address these issues, more research is needed to understand the *how* and *what* of what should be included in professional development and Maritime English Training (MET). This need is further exacerbated by the continued growth of the commercial shipping industry, as well as the increasingly diverse composition of multinational crew who now comprise 90% of the global fleet (Fan et al., 2016).

In an effort to address this gap, this exploratory analysis identifies the linguistic, social, and cultural factors that contribute to or cause miscommunication at sea. Focusing on a comprehensive thematic analysis of accident and incident reports from the NTSB, as well as semi-structured interviews with domain experts for triangulation and validation purposes, this report provides a holistic perspective on the causes of miscommunication at

sea by identifying how pragmatic, linguistic, and sociocultural factors impact miscommunication in maritime contexts. Using quantitative and qualitative methods, this report sought to answer the following research question:

What pragmatic, linguistic, or socio-cultural factors contributed to or caused accidents involving U.S. flagged vessels?

Methodology

This section describes the quantitative and qualitative methodology used in this exploratory analysis, including how reports were identified, selected, and subsequently coded and thematically analyzed for features of interest. This is followed by a description of the procedures and participants for the semi-structured interviews.

Identification and Retrieval

National Transportation Safety Board Reports

The initial stage of data retrieval consisted of a comprehensive search of publicly available NTSB accident and incident reports. As an independent federal agency, the Office of Marine Safety, the branch of the NTSB that investigates marine accidents or incidents in U.S. territorial waters or those involving U.S. flagged vessels overseas, is responsible for identifying the probable cause and contributing factors of these accidents and incidents, as well as providing subsequent recommendations to improve marine practices and safety. In order to take a comprehensive approach and obtain as many relevant reports as possible, no restrictions were placed on years in which reports were produced. Although there are a number of international investigative agencies, such as the MAIB, ATSB, and TSB, only NTSB reports involving U.S. flagged vessels were included as the primary data for the current analysis. This targeted data set was selected to obtain a better understanding of the factors impacting U.S. based mariners and vessels, as previous research has suggested there are unique communicative factors impacting interactions between native and non-native English-speaking seafarers (e.g., English proficiency, cultural background). For example, this analysis sought to explore situations in which native and non-native English-speaking mariners interact, such as when a native English-speaking pilot interacts with a non-native English-speaking captain and crew when conducting maneuvers in and out of U.S. ports.

Keyword searches were conducted to identify potentially relevant reports in the NTSB database using the following search terms: *miscommunication, communication, bridge resource management, language,* and *misunderstanding.* Searches were conducted multiple times to ensure the retrieval phase was exhaustive and relevant reports were not overlooked. Keyword searches returned a total of 466 potentially relevant reports, which

were then manually reviewed for inclusion. Table 1 illustrates the initial number of reports retrieved for each search term.

Table 1. Initial retrieval results by search term

Keyword	Number of reports initially returned
Bridge Resource Management	67
Communication	174
Language	211
Miscommunication	5
Misunderstanding	9

Reports were included in the current analysis if (mis)communication or language was directly or indirectly identified as a contributing or causative factor in the accident or incident. Reports were manually reviewed for inclusion or exclusion, including a close review of the accident summary, analysis, probable cause, and bridge resource management sections for possible language or sociocultural factors. Reports were subsequently excluded if manual review demonstrated a) there were no instances of miscommunication that contributed to the accident, b) miscommunication contributed to the accident but was caused by a non-language or sociocultural factor, such as equipment failure, or c) language related issues referred to non-communication issues, such as radio malfunctions or transmission issues. Following a manual review of the initial sample of NTSB reports for miscommunication or language related causes, 60 reports from 1995-2022 were identified as relevant and were included in the final sample.

Thematic analysis was then selected as the analytical approach for identifying the linguistic, pragmatic, and/or sociocultural sources of miscommunication. Thematic analysis is a research method grounded in positive psychology that allows for the identification, analysis, and interpretation of themes within a data set (Clarke & Braun, 2015). This approach is iterative in nature regarding coding and thematic development, providing flexibility and adaptability in terms of analysis. In addition, this approach provides for the identification of patterns both within and across data sets, including in relation to "participants' lived experience, views and perspectives, and behavior and practices" (p. 2). Thus, thematic analysis provides a method for triangulating patterns across quantitative data, such as the NTSB reports in the current study, and qualitative data, including the semi-structured interviews conducted for this project. Importantly, this approach is appropriate for data sets in a variety of sizes, including case study research or more data-driven approaches.

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). These features were informed by previous research in which context (e.g.,

ship-to-ship, ship-to-shore, on board), environment (e.g., bridge, etc.), and interlocutor (e.g., pilot, master, etc.) have been identified as relevant to miscommunication (e.g., Oraith et al., 2021). In addition, reports were coded for participant characteristics (e.g., native language) as well as financial and environmental damages.

Semi-Structured Interviews

In order to provide a more holistic perspective on miscommunication, as well as a data source for triangulation of findings from the reports, semi-structured interviews were conducted with a number of experienced experts in the maritime industry. This sample of mariners included active and retired Alaska marine pilots (N = 3) and captains (N = 2). Pilots and captains were recruited because of their crucial role in onboard and ship-to-ship communication, particularly as research has demonstrated pilots are involved in a high percentage of miscommunication caused accidents (e.g., Orait et al., 2021). In other words, because the experiences and actions of pilots and masters are critical in ensuring safe and successful operations, these participants are able to provide an important perspective on the underlying factors driving miscommunication. Interviews focused on primarily Alaskan maritime experiences in order to provide a localized perspective for the purposes of this report. However, data related to non-Alaskan contexts was also analyzed.

Research has suggested that small sample sizes are sufficient when participants are experienced experts in a target area (Saaty, 2001), thus the number of participants was considered acceptable for triangulation purposes due to the consistency of their experiences. Purposeful and snowball sampling was used for recruitment, and all interviews were recorded and thematically analyzed for factors related to miscommunication, including possible strategies and instructional topics for future MET. Interviews were conducted using Zoom (either video-chat or audio-chat), telephone, or were conducted in person using a voice recorder. Each interview had an approximate duration of 45 minutes and focused on obtaining information regarding participants' experience with miscommunication, bridge resource management, cultural and linguistic backgrounds, politeness, and other pragmatic factors. All interviews were transcribed using Otter.ai. All participants were native English speakers and had a wide range of experiences in the maritime industry, including experience working with a variety of crew from different backgrounds, including both native and non-native English speakers. 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. Table 2 provides a brief description of the participants and their years of experience.

Table 2. Participant information for semi-structured interviews

	Years of experience
Senior Pilot 1 (SP1)	35
Senior Pilot 2 (SP2)	22

Junior Pilot (JP)	8
Retired Master (RM)	40
Active Captain (AC)	25

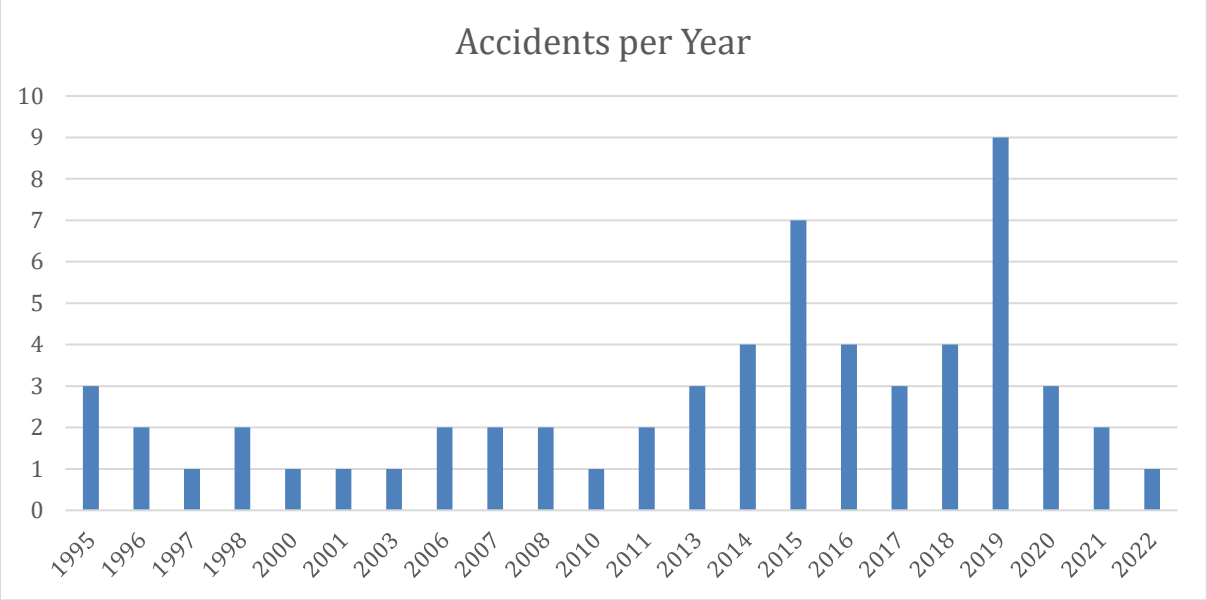
Findings

The following section presents the quantitative and qualitative findings, including the thematic analysis of the NTSB reports. Following a review of the quantitative results, this section provides an in-depth analysis of the identified sources of miscommunication, including the linguistic and pragmatic causes. These factors are then further categorized to provide a more comprehensive picture of the underlying sources of miscommunication.

Accident Details

The 60 NSTB reports included in this analysis represent a wide range of types of 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 accident per year from 1995-2022



These results provide further support for previous research suggesting accidents involving miscommunication are generally increasing (e.g., Ziarati et al., 2009), with three or more accidents occurring each year from 2013 to 2020.

The majority of reports citing miscommunication as a causal or contributing factor involved collisions (k = 37, 62%), allisions (k = 11, 18%), and groundings (k = 7, 12%), with additional types of accidents consisting of fires (k = 3, 5%) and capsizing (k = 1, 2%). In addition, oil

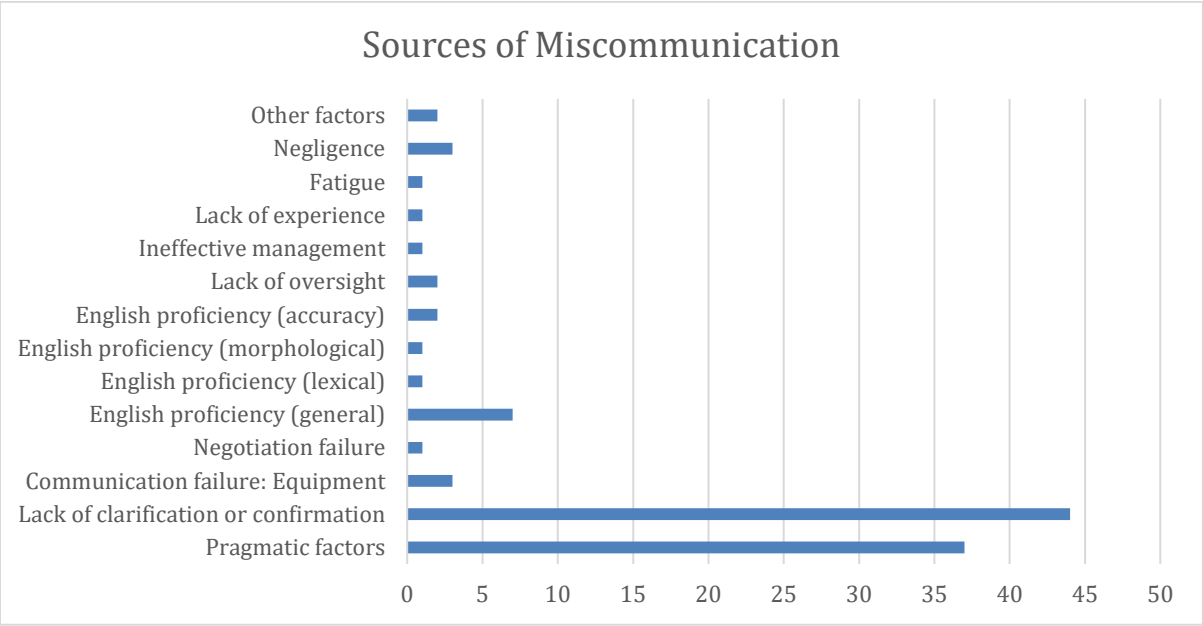
spills (k = 7, 12%) and injuries and casualties (k = 10, 17%) were reported in nearly a third of all accidents, highlighting the potential for human and environmental damages due to miscommunication. Monetary damages ranged from unreported “minimal damage” (Crown Princess) to over $300 million (U.S. Navy Destroyer Fitzgerald). Similar to previous studies (e.g., Oraith et al., 2021), pilots (k = 39, 65%) and masters (k = 33, 55%) were involved in the majority of accidents, while tugboats were involved in a small proportion of accidents and incidents (k = 11, 18%). Previous studies (e.g., Oraith et al., 2021) have demonstrated the crucial role of communication between pilots and the master and crew on the bridge, as well as the pilot and other external parties that may assist with maneuvers (e.g., tugboats), with the current findings providing additional evidence for the risk of miscommunication during pilotage or during bridge resource management. The context of miscommunication was relatively evenly distributed as on board (k = 35, 58%) or during ship-to-ship communication (k = 25, 42%). In the NTSB reports included in this analysis, there were no instances in which ship-to-shore miscommunication was a causal or contributory factor to the accident.

Providing further support for previous findings (e.g., Macrae, 2009; Hasanphahić et al., 2021; Uğurlu et al., 2015), analysis demonstrated that 76% (k = 40) of miscommunication happened on the bridge, with 23% (k =14) of miscommunication occurring in the environment of the bridge and VHF radio communication combined. The remaining instances of miscommunication occurred during very high frequency (VHF) radio communication (k = 5, 8%). In addition, communication failures related to bridge resource management were identified in more than half of all reports (k = 45, 75%), including a smaller proportion specifically related to the pilot/master exchange (k = 8, 13%). These findings are aligned with earlier research in which poor bridge team management was found to be a common contributing factor to accidents (e.g., Macrae, 2009; Hasanphahić et al., 2021; Uğurlu et al., 2015), highlighting the importance of effective communication on the bridge and during pilotage (John et al., 2019; Graziano et al., 2016).

Sources of Miscommunication

In order to explore the underlying sources of miscommunication, thematic analysis sought to identify not only the linguistic factors, such as insufficient English proficiency, but also the pragmatic and socio-cultural factors, such as politeness, indirectness, and power differentials. Multiple factors were identified as possible sources of miscommunication, with thematic analysis demonstrating that pragmatic factors (k = 37, 62%) and linguistic factors, such as communication failures related to lack of clarification or confirmation (k = 44, 73%), were the most common causes or contributing factors of miscommunication. English proficiency related issues were the third most common factor, causing or contributing to 18% of accidents (k = 11). Figure 2 illustrates the overall sources identified during thematic analysis (please note that accidents often had more than one contributing or causal source, thus the total number of factors is greater than the total number of accidents and incidents).

Figure 2. Initial Sources of Miscommunication



Linguistic Factors

Thematic analysis identified a number of language related factors as substantial causes of miscommunication, including issues related to English proficiency or the use of a language other than English on the bridge, as well as communication failures, such as the lack of clarification or confirmation. This section will describe these findings, drawing on interviews and transcripts to provide examples and illustrations from the NTSB dockets and reports.

Failure to Communicate

Failure to communicate (FTC) was identified as the leading source of miscommunication (k = 44, 78%), and primarily stemmed from a lack of communication amongst the bridge team or in ship-to-ship interaction. For example, this category included instances in which pilots or masters failed to discuss or share their plans or intentions with each other, the bridge team, or other vessels. In addition, this category included instances in which an interlocutor failed to share plans or intended actions, such as making passing arrangements, and pilots, masters, and/or crew failed to seek clarification or confirmation regarding the other party's plans and intentions. In other words, this category captures a multifaceted breakdown in communication in which one party fails to provide information regarding their intentions and actions while the other(s) fail to seek the necessary information to ensure clarity and understanding.

This failure to communicate was further exacerbated by language related issues on board vessels, with interlocutors frequently failing to seek clarification or confirmation related to the use of languages other than English. The collision of the containerships St. Louis Express and the Hammersmith Bridge in the Western Scheldt River (the Netherlands) provides an illustrative example of this type of FTC. In this accident, the Belgian pilot failed to share his plans for passing and transit through the narrow rivers with the English-speaking master, and the master and crew failed to seek clarification even as the situation became increasingly dire. Importantly, all communication between the pilots and VTS were conducted in Dutch, thus excluding the master and crew from understanding the directions and warnings issued by VTS officers who were concerned about the possibility of an imminent collision.

In interviews following the accident, the master of the St. Louis Express stated that the pilots usually would translate what they deemed to be "important" information from the Dutch VTS interactions into English. However, in this case, the pilot failed to do so, and because the master expected translations only when information was considered important by the pilot, he did not seek clarification. When the vessels were approximately 300 feet apart, VTS contacted the Dutch pilot on the St. Louis Express to ask if they were leaving enough space to safely pass the Hammersmith Bridge. This interaction occurred approximately one minute before the collision. However, because all communication between VTS and the pilot was in Dutch, the master and crew were unaware of the issues raised by VTS regarding the impending collision. Importantly, the master appeared to rely on the pilot's judgement to translate what was "important," even stating in a follow up interview that communications were "a little less than normal." Despite not understanding the warnings or communications from VTS, the master deferred to the pilot and failed to seek clarification or confirmation of the situation, illustrating the distinctly hands-off communication style of the bridge team.

Importantly, there were additional instances of FTC that further contributed to the accident. For instance, the second mate on the St. Louis Express stated in post-accident interviews that he noticed the Hammersmith Bridge after he exited the chart room. He indicated that he assumed the master and pilot were aware of the other vessel and that there did not seem to be anything "noteworthy." Shortly thereafter, the second mate noted that the Hammersmith Bridge was coming more to port as it came out of the bend, suggesting that although he was maintaining situational awareness, he failed to seek confirmation from the master regarding the developing situation. Other crew similarly failed to communication, with the bosun on watch at the bow only calling the bridge when the Hammersmith Bridge was making the turn (shortly before the collision), stating that he "knew" the bridge would have seen the approaching vessel since the landscape was visible and flat. The bosun also stated he watched for small traffic rather than large vessels, as bigger ships were more readily visible and thus not necessary to report to the bridge. These comments suggest the bosun had made broad assumptions in terms of what the bridge team would "know" in terms of vessel traffic, believing that the bridge team would

not need information regarding the approaching vessel as he assumed they would have already seen it. These assumptions from the second mate and bosun demonstrate that situational awareness alone is not sufficient, as not all parties may be attending to the situation in the same way. Rather, mariners may need to be encouraged to seek confirmation and clarification regarding actions and intentions to ensure that key members of the bridge team are aware of necessary information and actions.

Overall, this accident illustrates communication failures across multiple individuals, with the pilot failing to communicate important information to the master and the master failing to clarify or confirm the pilot's intentions. In addition, the bosun and second mate failed to confirm their assumptions regarding what the bridge team "knew" with the master. These multiple failures in communication stem from a lack of clarification and confirmation, thus leading to the collision of the two vessels and over $500,000 USD in repairs. The collision of the St. Louis Express and the Hammersmith Bridge thus illustrates the multi-dimensional nature of this type of communication failure, which accounted for 62% of all accidents in the current sample. Pilots and master are failing to share intentions with each other or the bridge team, with other parties then failing to confirm or clarify information, subsequently leading to lack of understanding and constraining the ability of interlocutors to take action to resolve potentially dangerous outcomes.

Linguistic and Communicative Competence

Providing support for previous findings in which English language abilities have been cited as a substantial issue (Oraith et al., 2021), language proficiency was the second most common linguistic factor following failure to communicate and the third most common factors overall following pragmatic factors. Specifically, a lack of English proficiency or inadequate communicative competence was found to be responsible for 12% of accidents and incidents. During stressful situations, which may further complicate language related miscommunication (Gat & Keith, 1978; Lecumberri et al., 2010), non-native English-speaking crew often communicated using their first language, thus preventing the pilot and other crew members from hearing and understanding important information. For example, prior to the allision of the Japanese cruise ship Nippon Maru with the wharf mooring dolphins in Apra Harbor, Guam, communication between the master and the second officer was conducted solely in Japanese while all communication between the pilot and tugboat captain was in English. As the vessel approached the mooring dolphins, the second officer made multiple reports to the captain regarding the distance and the approach. However, because all communications between the master and crew were in Japanese, which the pilot did not speak, the pilot was unaware of critical information related to the docking procedures. For example, during the moments leading up to the accident, the second officer reported the narrowing distance between the vessel and the mooring dolphins to the master in Japanese, which the pilot did not understand and the master did not translate. In addition, the pilot was unable to understand the warnings from the third officer to the master that he was steering the vessel full astern, contrary to the pilot's

orders and directions for “full thrust to port.” The pilot stated that the master did not verbally confirm his orders, although he reported that the master “seemed like he responded.” During this time, the third officer was checking the master’s use of the joystick, and having noted it was in the wrong position, said in Japanese to the master, “Now full astern, Sir, opposite, Sir. It should be full ahead.” Five seconds before impact, the third officer shouted in English, “Ahead! Ahead!” and unsuccessfully attempted to take control of the joystick from the master. Following contact with the Delta Pier, the third officer rushed to the bridge wing controls and returned the joy stick to the forward position. Although the investigation demonstrated that the master was intoxicated, the pilot was unaware of the increasing urgency of the situation due to the crew conversing solely in Japanese. Thus, because he was not able to clearly see the joystick controls, he did not understand the master was steering the ship in the wrong direction.

In a similar accident, mechanical failures on the Anna Smile were exacerbated by the lack of communication between the engineers in the engine room and the bridge team. As the accident developed, the master reverted to speaking in his native language (Greek) while other members of the crew, specifically the Filipino second mate and helmsman, spoke to each other in their native language. The English-speaking pilot was not able to understand any of these interactions, further complicating the situation and preventing him from drawing on all communicative resources to understand the extent of the mechanical failure. Lack of effective communication amongst the bridge team, attributed to their failure to use English to facilitate understanding with the pilot as well as the pilot’s failure to clarify that his orders were being followed correctly, contributed to these accidents.

Interview data provide additional support for these findings regarding proficiency and the use of languages other than English. For example, one of the senior pilots (SP2) commented on an experience in western Alaska in which the vessel was experiencing engine problems. As these problems occurred, the master communicated with the chief engineer solely in Japanese, excluding the pilot from understanding the situation. SP2 describes how the second mate translated the communication between the master and the engineer, informing the pilot that there was “no engine.” The pilot described how “then one (engine) would fire up again, the captain hung up the phone, he goes, okay, all better, all better. And, and then two minutes later they died again. And so that, so this is a miscommunication because the captain never told me that there was an engine problem.” Rather, the pilot was able to adjust his actions due to communication from the second mate. Although the master may have been attempting to save face in front of the pilot by not revealing the mechanical issues, similar to the actions of the master on the Bright Field discussed later in this report, the lack of communication could have had dangerous and costly implications. Because all of the communication was in Japanese, the pilot was only able to fully understand the situation once the second mate provided an update in English, thus preventing the situation from deteriorating further and leading to an accident. This experience stands in contrast to the accidents described above, where the crew failed to

inform the pilot of the situation in a timely manner, thus leading to communication failures and accidents.

In addition to issues related to the use of non-English languages amongst crew, data also suggested that English proficiency is an important issue on board vessels. For example, nearly all of the interviewees discussed the need for gestures or pictures to facilitate communication when English proficiency was insufficient. The necessity of such resources for communication varied, but the pilot participants all remarked on using gestures or pictures frequently to facilitate and support communication and comprehension. For example, SP2 described how he carried a notebook with him in order to support communication with non-native English-speaking crew:

> "And then I would, I always had a piece of paper, a notebook, I pull it out and make the symbol of an anchor, and, you know, draw the vessel, and, you know, point to the anchor, starboard anchor, and I write the number, you know, three shackles or one shackle, we're going to this dock that side, too. And so communication was always one of the things I established really early on, because I started with problems with that."

SP2 also described strategies he used to check communication shortly after boarding. Because of the importance of communication on board, SP2 described how he would issue a small change of direction or similar command to quickly evaluate if there were comprehension issues with the master, officers, or crew. If the crew failed to respond or understand these minor commands, this alerted him to potential language related issues. These strategies described by the pilot interviewees, such as using pictures or comprehension checks, highlight the potential issues with English proficiency on board multinational vessels. Overall, these findings add support to previous research in which inadequate English language skills were found to increase the likelihood of miscommunication (Oraith et al., 2021). Given the stressful and dynamic situations mariners are likely to encounter at sea, communicating in a language understood by all relevant parties is of critical importance. When mariners interact using their native languages, other bridge team or crew members are excluded from understanding and are thus left unaware of potential issues.

In addition, non-native English speakers are more likely to use their first language during stressful or high-pressure situations. These findings are supported by the interview data, in which RM commented on the effects of stress and pressure on the abilities of non-native English-speaking crew to effectively communicate:

> "And that I've observed too, is, is, you know, especially in periods of stress, people will revert back to their first language, you know, like, when things are difficult. Speaking English is burdensome, and they will often revert back to their first

> language. But that can of course, then that leaves many people in the dark about what's going on and can lead to other communication problems."

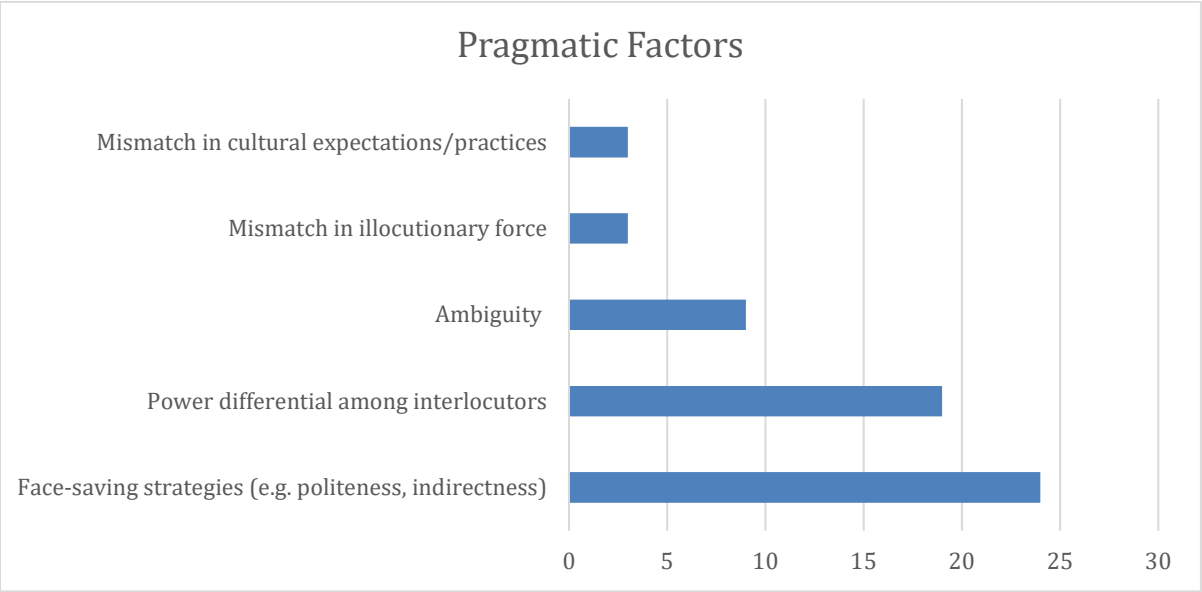
These failures to use English as the lingua franca for onboard and ship-to-ship communication may lead to miscommunication and misunderstandings, underscoring the importance of adequate training for both English and non-native English-speaking mariners. In addition, lack of standardized language and the use of plain English were identified as sources of miscommunication. For example, the American Liberty pilot intentionally used indirect and non-standard orders in an effort to be polite rather than issuing commands using more recognizable language and intentions. Although the IMO has developed standardized language, such as the SMCP, to be used in maritime communication, interviewees reported that they seldom used these standardized phrases, instead using what they referred to as "simple" language. These findings support previous research (e.g., Short, 2006; Uchida & Takagi, 2012) demonstrating that native English-speaking mariners receive little training in using these tools, often preferring to use non-standard English in place of the highly scripted and inflexible format of the SMCP.

Pragmatic Factors

This section explores the second most frequent source of miscommunication identified in the NTSB report. Beginning with a brief definition of pragmatics, this section then reports the subcategories identified through thematic analysis, including power differentials, indirectness, and other politeness strategies. Cultural mismatches or misunderstandings are also discussed.

The field of pragmatics suggests that in order to successfully communicate, speakers need to have an understanding of social and cultural knowledge as well as knowledge of the target language structure and vocabulary. In other words, learners may have advanced proficiency in terms of grammar, but may lack an understanding of how to use language in appropriate contexts and communication. Particularly relevant to the maritime industry, pragmatics also relates to "how speakers of a language other than their first language communicate with others either by using the language of the context or a lingua franca" (Gonzalez-Lloret, 2020). Because ME serves as the lingua franca for the commercial shipping industry, pragmatics are likely to play an important role in the communicative competence of multinational and multicultural crew. Thematic analysis of NTSB reports, as well as VDR (vessel data recorder) transcripts, interviews, and witness statements, identified pragmatic failures (62%) as the second most common causal or contributing source of miscommunication. Pragmatic failures were then analyzed further to identify the subcategory sources of these breakdowns and misunderstandings related to the social and cultural influences on language use. Figure 3 provides an illustration of these subcategories of pragmatic factors.

Figure 3. Number of reports in which pragmatic factors contributed to or caused miscommunication



Power and Social Distance

Previous research has suggested communication may be affected by the power differentials present in the occupational hierarchies associated with the shipping industry (e.g., Fan et al., 2016; Sampson & Zhao, 2003). The current findings provide a systematic review of the effects of power on communication, demonstrating that 32% (k = 19) of miscommunication caused accidents were due to power differentials among pilots and masters and/or crew, or crew and officers/masters. For example, multiple accidents were attributed to the pilot or master disregarding input from lower-ranked crew or crew following instructions without question if the command was given by a higher ranked crew member or the pilot. This tendency to ignore concerns or follow instructions blindly appeared to be exacerbated by the distance in power across interlocutors. In other words, distance and power seemed to influence to what extent lower ranked mariners raised concerns or questioned the orders or actions of a superior, particularly the pilot or master.

The greater the perceived power differential, the more indirect or polite language may be used by subordinate interlocutors attempting to make a suggestion or raise concerns. Politeness theory suggests that social distance, power, and the imposition of a speech act impact a speakers' choice in terms of selecting a more or less face-threatening strategy (Brown & Levinson, 1987). In other words, as this "weightiness" between interlocutors increases, a subordinate speaker may elect to use less force in their language, thereby seeking to maintain face for themselves and their interlocutor. By using indirectness or other features of politeness, lower-ranked speakers may seek to reduce the imposition of

their remarks or suggestions, thereby maintaining the superior interlocutors' power and position.

The sinking of the El Faro during Hurricane Joaquin provides an illustrative example of how power differentials influence the strength and force of suggestions or comments raised by crew. For example, review of the VDR transcripts indicates that multiple subordinate crew members were concerned with the course of the vessel. As it became clear to crew that the current course would take the El Faro within 20 nautical miles (nm) of the eye of the hurricane, the second mate called the captain to suggest a change of course.

> "(uh) I just wanted * * * (runs) south (of the) (island) * * * (old Bahama/weather) channel * * * we'll be meeting the storm. umm fox news just said it's up to category * * *. yeah– yes (that's what I heard) * * *. it isn't lookin' good right now .– right now my uh– trackline I have zero-two hundred– alter course straight south and then (we'll) * go through all these * shallow areas. umm (and the next) course change (will/gunna) be (through the Bahamas) and then (just gunna) turn * * *."

The second mate remains relatively indirect in her conversation with the captain, as no direct suggestion to change the course due to weather is made. For instance, her use of "I just wanted…" implies a preference or a hedged suggestion rather than an urgent statement. This use of relational language downplays the urgency of the situation by framing her remarks as a suggestion, thus reducing the force and urgency. The second mate also draws on information regarding the latest update from Fox News, stating "it isn't lookin' good right now," in an effort to draw the captain's attention to the deteriorating weather situation. In addition, using weather information from Sat-C, the second mate plotted a new route which would more safely take them out of the path of Hurricane Joaquin. The conversation is not captured clearly on VDR, but this repeated suggestion for a course change appears to again be declined by the captain.

Similarly, the third mate made multiple calls to the captain to suggest a change of course to the south to avoid the path of the strengthening storm. The third mate also uses multiple mitigation strategies, such as stating that the captain "might wanna take a look" at the latest weather report that had just come in. This implies that there may be a need to reevaluate the situation in light of the changes in the forecast, with the third mate providing an indirect suggestion to the captain. The third mate makes this suggestion multiple times, although he continues to hedge and defer, using language such as "if you have a chance" and "thought you might wanna take a look at it." The use of such language implies that his concerns are suggestions or preferences, rather than necessary actions due to the worsening storm. For example, the third mate states in a call to the captain:

> "just lookin' at the forecast and lookin' at our trackline. which way it's goin' and uhhh– thought you might wanna take a look at it."

This call to the captain was made after the latest weather report shows that the eye of the hurricane would be approximately 22 nm away from the El Faro's path, with recorded winds in excess of 100 knots. Less than 10 minutes later, the third mate again raises the issue, providing additional information regarding the storm and offering to provide more detailed information to the captain.

> "uhh well it's– the– the– the current forecast has it uhh– max winds um a hundred miles– an hour. At the center.– umm and if I'm lookin' at this right– um– and it's moving at– at two-three-zero at uh five knots. so I assume it stays on that same– moves that same direction for say the next five hours. and uh so it's advancing toward our trackline– and uhh– puts us real close to it. Umm you know like– I could be more specific– I could um– plot that out. but it's gunna be like real close (and). and uh– don't know. uh– uh I can give ya a better number and call ya back. we're lookin' a meet it at say like four o'clock in the morning. (you know)."

The captain, however, declined the additional plotting and decided against changing course. The third mate's use of hedging and politeness, features commonly used by subordinate speakers interacting with a hearer of higher rank (Brown & Levinson, 1987, Linde, 1998), may have downplayed his concerns, thus failing to adequately communicate to the captain the potential urgency of the situation. In addition to these excerpts, there are multiple examples of how power and distance between the captain and crew affected communication. The VDR captures numerous conversations between the helmsman and officers regarding the weather and their current situation. Although the crew discuss their concerns with each other, they do not raise these issues in the presence of the captain, suggesting that the environment on board may not have encouraged open discussion or communication. Furthermore, the power and distance between the officers and the captain are relatively clear in that the second and third mate use deferential and hedged language when communicating with the captain, framing their concerns as suggestions or preferences rather than assertively questioning the course, and thus the captain's decisions, directly. The captain also repeatedly fails to take their concerns into account, ignoring their suggestions to alter course to avoid the eye of the storm. Although it is unclear from the VDR transcripts if the captain acknowledged or recognized the concerns of the crew or the updated weather reports, no actions were taken to adjust course.

These effects of power differentials on speakers' language were not limited to captains or masters, however, with accidents indicating that issues with power and social distance occurred between mates and ABs as well. For example, in the moments leading up to the collision of the off-shore supply vessel Cheramie Bo Truc No. 22 with the articulated tug and barge Mariya Moran/Texas, the AB raises concerns to the mate in charge of the vessel. In post-accident interviews, the AB stated that the mate struggled to control the vessel, narrowly avoiding collision with two stationary jack-up mobile offshore drilling units. Following this near miss, the Cheramie Bo Truc No. 22 abruptly changed course and began to cross the channel. The AB stated that when he reported sighting the Mariya

Moran/Texas, the mate responded with “That’s a ship.” As the vessels approached one another in the channel, the Cheramie Bo Truc No. 22 began a starboard turn, which prompted the AB to raise his concerns and direct the mate to turn left to avoid the oncoming Mariya Moran/Texas. In the following excerpt from the interview between the NTSB investigator and the AB, the AB details the moments preceding the accident (Q is the interviewer, A the AB):

11 Q. So you think -- so everybody on board at that point could
12 identify that they could see the vessel and that --
13 A. That's why we needed to get out of there.
14 Q. And that the vessel needed to turn, correct?
15 A. Yes.
16 Q. When you made that statement to let the mate know to actually
17 turn, what did the mate do?
18 A. I didn't get any acknowledgement.
19 Q. No acknowledgement?
20 A. That's why I repeated my command. Well, not command, but
21 request.
22 Q. Okay. And he just ignored your request?
23 A. I said it with a little bit more -- so it was ignored, yes.
24 Q. I know it was a few days ago, but how many times did you
25 actually state that to him, do you --
1 A. Twice.
2 Q. Twice?
3 A. Yes.
4 Q. Twice and then you departed from the bridge?
5 A. No, twice and then we got close, you know, in here because he
6 wasn't going to listen, so I just rode it out.
7 Q. Okay.
8 A. And then when it got to be imminent, I decided, for my life.

In post-accident interviews, the chief engineer, who was also on bridge, confirms that he and the AB corrected the mate’s steering twice before the turn in front of the Mariya Moran/Texas. However, neither the AB nor the engineer called for the captain to return to the bridge. In his interview, the engineer states that the mate acknowledged the AB’s warnings, however no actions were taken. Moments before impact, the pilot from the Mariya Moran/Texas called the Cheramie Bo Truc No. 22 on the radio, asking “Hey Capt… you see me?” to which the mate responded “Yes, sir, uh oh (expletive). Hold on.” The collision occurred approximately ten seconds later. The pilot stated that he attempted to contact the Cheramie Bo Truc No. 22 multiple times before the collision after he noted the hard to starboard turn the vessel made into the channel. This accident also highlights the need for more communication between vessels, as the pilot only reached out to the Cheramie Bo Truc No. 22 less than a minute before the collision (this accident was also

coded for FTC as a contributing cause, as the pilot failed to plan passing procedures or communicate with Cheramie Bo Truc No. 22 before the accident was imminent).

Another example of how face-saving strategies grounded in power differentials may lead to an accident is the collision of the liquid petroleum gas carrier Levant with the mooring dolphins in Ferndale, WA. The master, whose nationality is not stated although he is identified as a non-native English speaker, did not question or challenge the pilot's decision to take a more aggressive approach than usual to the mooring dolphin. Rather, the master describes how the pilot seemed very confident and experienced, causing him to relax his usual habits of monitoring the pilot. Although the master directly states the need for him to monitor and check what his crew may be doing ("I have to watch my (indiscernible) that they're not doing some stupid things.") and the need for him to normally watch the pilot, his response to the investigator seems to imply that the was also accustomed to situations in which the pilot is fully responsible and the master is less involved.

> "I am in charge and I am -- the master is always -- only in Panama the pilot take full responsibility. Otherwise, it's master command, pilot advise."

Although the master confirms that he is ultimately responsible for the vessel, he states multiple times that he felt confident with the pilot, saying "I was -- I feel confident with this pilot. He talks, he say like this before for (indiscernible) -- I was 100 percent sure he knew what to do." In addition, the master did not insist on a master/pilot exchange because he had already conducted one with the same pilot previously for off-docking maneuvers. The master's actions, including what appears to be an abdication of responsibility in favor of the pilot, might be attributed to his perception that the pilot was more experienced and had more expertise. In other words, the master perceived the pilot as a having a greater position of power, thereby deferring completely to the pilot's decisions and actions.

Overall, thematic analysis of the NTSB reports demonstrated how power differentials may have influenced communication, particularly related to subordinate speakers seeking to avoid contradicting decisions or using hedging to moderate the perceptions of imposition on a superior officer or mariner of higher rank, such as in the examples described above. These findings provide further support for previous research demonstrating the important role power differentials have in terms of causing and contributing to communication failures (e.g., Fan et al., 2016; Sampson & Zhao, 2003), particularly when subordinate or lower-ranked crew are interacting with higher ranked interlocutors or those perceived to have more power. These findings align with previous research demonstrating the tendency of higher ranked interlocutors to disregard concerns or hints from subordinate speakers (e.g., Linde, 1998). For example, in their analysis of NTSB transcripts, Goguen and Linde (1983) found that the first officer (in an aviation context) often mitigated their speech, instead using indirect suggestions and reducing the urgency or importance of potential or serious problems. More recent research examining transcripts from cockpit simulators (Krifka et al., 2003) suggests that hesitations and hedges increase under high task load

conditions, with highly functioning crews using fewer politeness elements during high task load than poorly functioning crew. In other words, crew that did not work well together used language that became more indirect during periods of stress, further exacerbating crew cohesion and the potential for miscommunication, while crew that did work well together used more direct language.

Importantly, the speakers on the El Faro, as well as all those involved in the Cheramie Bo Truc No. 22 collision, were native English speakers, demonstrating that these issues are not limited to speakers of other languages and cultures. Rather, power and distance can play a role regardless of native language and cultural background, underscoring the importance of training and support for subordinate crew in terms of raising concerns, particularly in terms of bridge resource management.

These findings regarding the implications of power on communication were also supported by interview data. Multiple interviewees highlighted the importance of cultivating relationships with crew or pilots and masters in order to create an environment where lower-ranked officers or crew would feel comfortable raising concerns or contradicting higher ranked officers or the pilot. For example, RM described how during his career, he sought to cultivate an onboard culture in which officers and crew felt comfortable to communicate effectively and efficiently during challenging situations. For example, he stated:

> “I believe that unless junior officers, third mates, second mates, and even the chief mate, are encouraged to speak up at any time that they see anything that is unusual, or they're worried about, then they might not speak up, because, oh, the captain knows what he's doing. I'm not going to question him or the pilot knows what he's doing. I'm not going to question him. In my experience, that was very common.”

This remark highlights RM’s awareness of the role of power and social distance, and how this may prevent subordinate crew from raising concerns or seeking confirmation or clarification. He went on to describe how if a master has not cultivated an environment in which crew feel safe to raise issues despite these power differentials, then miscommunication may occur. For example, he 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.”

These comments demonstrate the importance of creating an onboard culture that values open communication, including raising concerns and issues with higher ranked mariners when necessary. However, promoting an environment in which crew feel comfortable to

raise issues to higher ranked officers and pilots may be challenging due to the wide range of leadership styles, the high turnover of crew, and the linguistic and cultural diversity of the modern fleet, all of which may impact crew harmony and cohesion. For example, mixed nationality crew may experience more difficulties in terms of recognizing and resolving misunderstandings or miscommunication (e.g., Pauksztat, 2021; Squire, 2004; Sampson & Zhao, 2003; Short, 2006), thus affecting their subsequent social interactions and ability to work effectively. These potentially negative implications emphasize the importance of building trust and good relationships amongst crew as this may promote effective communication practices, particularly in terms of building relationships for successful bridge resource management. Interview data further support this finding, with RM referring to the need to use English as a lingua franca on board, remarking:

> "And that's also so that it's for everyone's benefit, because if you have two or three guys together, and they're speaking in a foreign language, whether it's Spanish, Yemeni, or whatever, and then you have other crew members there, there can be some hatred or resentment, especially if there are a couple of people that don't like each other."

These language issues may also be exacerbated by other factors associated with the maritime industry, such as isolation, pressure related to both social and professional factors, fatigue, and a physically demanding environment (Carotenuto et al., 2012; Hystad & Eid, 2016; Oldenburg et al., 2009). In addition, poor-functioning crew may be less likely to report accidents or errors (e.g., Hassel et al., 2011; Lappalainen et al., 2011). Thus, in order to support a favorable working environment, mariners need sufficient English proficiency for not only work-related tasks, but also social tasks that contribute to positive relationship building, such as small-talk and making requests. Studies have suggested that crew are more likely to make suggestions and resolve problems as their proficiency increases (Pauksztat, 2021), highlighting the importance of minimum levels of both linguistic and pragmatic competence to facilitate communication onboard.

Face-Saving and Politeness Strategies

Building on the previous themes, this section explores how face-saving and politeness strategies impacted miscommunication. Beginning with a brief review of the concept of face-saving, this section then draws on both overall thematic analysis as well as examples from NTSB reports and interview data to illustrate the role of these strategies in miscommunication.

The results of the thematic analysis indicated that face-saving and politeness strategies contributed to 37% (k = 24) of the miscommunication in the sample of NTSB reports. Speakers' choices in using different face and politeness strategies, and thus whether an act is considered face threatening or not, are affected by a number of variables. Brown and Levinson (1987) postulate that face, or a desired public image, is universal across cultures,

and that face management motivates the various forms that linguistic utterances might take; certain variables, such as differences in social and power status, imposition, and cultural differences, impact the degree to which any verbal expression is considered face threatening by the recipient.

According to politeness theory, there are two types of face, positive and negative. Positive face refers to the want to be approved of by others, while negative face refers to the want to be unimpeded by others. Face threatening acts are those verbal acts that are considered contrary to these wants, and can be categorized into four strategies: 1) bald-on-record, which are direct and considered the most threatening, 2) positive politeness strategies, which indicate solidarity with the hearer, 3) negative politeness strategies, which indicate respect for the hearer's choice of action, and 4) off-record acts, which rely on indirectness to communicate intentions and are considered the least threatening. For example, indirectness and positive politeness were often used by pilots and masters in an effort to save face.

However, the use of such politeness strategies may lead to ambiguity and misinterpretation, such as in the contact of the American Liberty with multiple vessels, barges, and wharfs in the Mississippi River. The NTSB identified the probable cause of this accident as the slow response by the bridge team to carry out an engine order issued by the pilot. This is turn caused a delay in attaining sufficient speed for the vessel to maneuver in the higher than usual water and fast current. To prevent similar accidents in the future, the NTSB recommended that commands should be acknowledged and carried out promptly to avoid similar accidents in the future. Importantly, however, the crew of the American Liberty may not have interpreted the pilot's statements as orders due to the degree of indirectness. The following excerpt from the VDR illustrates the pilot's use of indirectness and positive politeness, particularly in his request to "bring her up to slow when you – whenever you can." Approximately a minute later, the pilot again asks for more speed.

> 2036:37.6 **PILOT**
> give me whatever you can give me cap.
> 2036:40.0 **MASTER**
> yup.
> 2036:54.2 **MASTER**
> yeah we should be good.

The pilot's use of indirect language in this excerpt illustrates the potential for misinterpretation by the master and crew. Although the pilot was seeking to be polite and not impose upon the master, the urgency of the situation may not have been clear due to the indirect nature of the request. In other words, the forcefulness of the directive was reduced because of the hedging and indirectness, leading to ambiguity and providing an opportunity for the hearer to falsely interpret the underlying intention of the remark. This

accident illustrates a mismatch in illocutionary force, which occurs when the purpose or action the speaker intends is not interpreted accurately by the hearer.

In other words, mismatches in illocutionary force occur when a hearer fails to understand the intended meaning of the speaker's utterance. For example, a hearer may interpret an order as a suggestion and thus fail to act with the urgency required by the situation. NTSB interviews demonstrate that this mismatch in illocutionary force contributed to this accident, as the mate did not realize the pilot's statement was an order, instead interpreting it as a suggestion. The pilot's indirect order is aligned with previous findings, which suggest that native English speakers are more likely to hedge and be indirect in their commands or directives (John et al., 2019), thereby contributing to confusion and lack of clarity in orders. For example, when asked by investigators why he said "whenever you can" instead of using a standard engine command such as slow ahead, the pilot responded:

> "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."

Although understanding the underlying illocutionary force is especially challenging for non-native English speakers, as research has suggested that their ability to recognize speech acts is not as rapid or automatic as native English speakers (Garcia, 2004; Holtgraves, 2007), the miscommunication on board the American Liberty demonstrates that these incidents aren't limited to non-native speakers of English. In addition, this accident illustrates how the need for standardized language may be ignored in favor of politeness. The pilot stated multiple times in his interview that his directives were a "nice way, a polite way" of providing commands. However, because of their indirectness and ambiguity, their underlying intent was not recognized by other members of the bridge team. Interestingly, the VDR also captured the pilot issuing commands to the tugboat captain, in which direct language is used and there is no evidence of hedging or politeness.

> 2027:43.9 **VERA**
> you want me to stay off you?
> 2027:45.4 **PILOT**
> stay off me until I ask you to push.
> 2027:52.8 **VERA**
> alright captain.

These excerpts demonstrate how the pilot used indirectness to maintain politeness when providing commands to the master. This in contrast to the pilot's use of direct language with the tugboat captain, highlighting how the pilot's perceptions of power and hierarchy may have influenced the indirectness of his commands. In this case, these politeness strategies masked the urgency of the situation and the need for quick action, leading to delays and the subsequent accident. Although the NTSB's recommendations are for

commands to be followed quickly and efficiently, due to the use of indirectness and politeness strategies, commands may not always be clear to the interlocutor. Instead, hearers may interpret such remarks as suggestions rather than orders, thus leading to miscommunication and subsequent failures or delays in response.

In a similar incident, indirectness may have contributed to the miscommunication-caused accident in which the container ship Ever Grade collided with the U.S. Coast Guard buoy tender Cowslip in the Columbia River, OR. The pilot on the Ever Grade initiated communication to suggest the Cowslip change course, as he was concerned that the Cowslip was too close to the centerline of the channel, thus impeding safe passage. The pilot stated in his interview that he contacted the captain of the Cowslip, saying “"Do you know that there is a great amount of water over to your right and you can actually go over and kiss the shore without getting in trouble?" Although the radio operator on the Cowslip responded, saying he would provide “all the room possible,” the commanding officer of the Cowslip did not respond to the pilot’s call. In contacting the Cowslip, the pilot intended for the Coast Guard vessel to alter course to the right to provide more room for the Ever Grade to make the hard turn at Tansy Point. However, the hearer, in this case the commanding officer of the Cowslip, failed to confirm understanding or modify their course, perhaps because the indirectness of the question masked the underlying intent.

The Cowslip then entered a blind spot and was obscured from the view of the bridge team on the Ever Grade. The master of the Ever Grade stated in his interview that when he received the call from the officer on the bow regarding the Cowslip’s range lights, he shouted to the Ever Grade helmsman to adjust course hard starboard. The master also reported to investigators that the pilot seemed surprised by the location of the Cowslip and the subsequent collision. The miscommunication in this accident illustrates the implications of the pilot’s indirect suggestion, as the Cowslip failed to act accordingly. However, because the pilot assumed the Cowslip complied and was unable to visually confirm due to the blind spot on the Ever Grade, he was “surprised” that the Cowslip was in fact directly in their path.

These examples highlight the impact of indirectness during interaction, including between native English speakers. Face saving and politeness strategies like indirectness may vary in terms of age, gender, region, ethnicity, socio-economic status, and experience, regardless of whether speakers are from the same cultural background with the same native language. As Tannen (1994) points out, indirectness is a vital aspect of communication that can vary across cultures and backgrounds, potentially leading to misunderstandings when speakers and hearers have different habits regarding its use. As illustrated through the analyses above, indirectness can have important consequences as it may negatively impact the communicative success of the interaction. The use of more direct language, including using more standardized language or making more direct statements or requests, such as when establishing safe passing procedures, may help prevent this type of miscommunication.

Thematic analysis of reports also demonstrated that face-saving strategies were used to protect speakers from revealing (or appearing to reveal) a lack of knowledge or experience related to a problem. For instance, the miscommunication between the English-speaking pilot and the Chinese master of the Bright Field illustrated the potentially negative implications of face-saving strategies. In this accident, the Bright Field lost power while approaching the New Orleans River Walk. Because the communication between the engineer and the master was in Chinese, the pilot was unaware of the developing situation (thus this accident was also coded for linguistic failure to communicate). Importantly, when the pilot directly asked the master if the engines were functioning appropriately, the master "answered with "just a simple yes" in an effort to save face during a difficult situation.

Face-saving behaviors are also influenced by a speaker's cultural background, as demonstrated by previous research highlighting the practice of Chinese mariners to respond positively in spite of negative situations (Pyne & Koester, 2005). This preference for providing positive confirmation regardless of the true nature of the situation may be an in effort to save face, particularly when there are also issues of rank. For example, Pan (2000) highlights how Chinese speakers may prefer to provide polite and non-threatening information to interlocutors of higher rank rather than providing a true account of a potentially negative situation. In other words, Chinese mariners may provide positive confirmation because they feel this may be what the superior interlocutor prefers to hear (Ziegler, 2022). Chinese mariners in particular may be sensitive to such issues related to hierarchies and saving face (Kwek & Lee, 2015), highlighting the importance of raising seafarers' awareness of these potential cultural mismatches that may impact communication.

Data from the semi-structured interviews also support this finding, with multiple experts highlighting how interlocutors may deploy face-saving strategies, such as agreement and confirmation, in order to reveal their lack of understanding or experience. One of the retired pilots, SP1, described how masters may not voluntarily raise issues with pilots, thus leaving the pilot unaware of potentially important issues or problems. For example, in discussing how a pilot can evaluate if there may be an issue that he is unaware of but needs to know about, he stated, "when you may be speaking to a master and he starts answering your question with 'no problems, no problem.' Well, he says that two or three times you know that you've got a big problem." SP1 suggested this may happen more frequently with masters of East Asian backgrounds, highlighting the role that cultural expectations may play in influencing how forthcoming a master may be with a pilot regarding potential problems. In other words, the effects of hierarchy, and the related variations in power and distance, may be greater for interlocutors from Chinese and Korean backgrounds in particular (Pan, 2000; Park, 2002). Another participant, JP1, had similar experiences, stating "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 experiences are aligned with research suggesting that speakers from Confucian backgrounds may be more inclined to ignore unclear situations or utterances in order to save face (Jwa, 2017). One of the experienced pilots, SP1, addressed how he handled such situations, saying:

> "So if you have a suspicion, you've got to turn into an investigator, and a lot of ways that, you know, you might figure out what it is, again, you know... And you got to be a little circuitous about that the longer they've done it (been a master), the easier they are without somebody getting defensive, and all sudden, clamming up about what issues might or might not be going wrong."

This excerpt illustrates how this experienced pilot used face-saving strategies and indirectness to strategically encourage open communication and assess the severity of potential problems. In these situations, directness might be interpreted as an attack on the master's expertise or their vessel, thus negatively impacting the master's willingness to be honest and forthcoming. In addition, this pilot described how he used face-saving strategies when communicating with a master with lower English proficiency than other members of the crew. In order to maintain face and not undermine the authority or position of the master, SP1 described how he would look at the master while ensuring that another member of the crew with higher English proficiency was nearby to hear and understand the orders or information.

> "You may have a Filipino or Korean captain who some cases speak little to no English. That's not entirely true because they trade and tramp all over the world. So they understand the basics. You know, the engine orders and directions to go and stop. And they understand when you start flapping your arms and making some noises or they don't, but they know if you're upset or something wrong. And so you speak to the person on the bridge, the helmsman or the lookout who does speak really good English. But sometimes you got to look at the captain like you're talking to him. But no, you're talking to this guy. Because if you turn and ignore the captain, there's a loss of face issue. You know, you speak to them, even though they haven't a clue what you're saying. Somebody over here on the wheel understands and everything you're doing. So you're kind of looking around the corner, your eyes, the real person you're communicating with."

Another pilot, SP2, shared similar experiences, stating "I've been in a number of situations where the captain isn't saying anything and one of the younger mates volunteers the information." These experiences underscore the need for pilots to be aware of these types of face-saving strategies that may be employed by the master, officers, or crew, as the omission of information or failure to confirm mechanical issues or other problems may have critical implications for safety.

Multiple pilots described their strategies for maintaining face when seeking to identify or confirm developing problems, drawing on indirectness or seeking out other crew or officers for clarification to mitigate any personal threat or potential embarrassment to the master (Brown & Levinson, 1987). This is especially relevant when interacting with speakers from certain cultural backgrounds, such as China, Korea, and Japan, in which face is more connected to social interaction and community-oriented behaviors (Lim & Choi, 1996; Yu, 2003). Chinese speakers, for instance, may be driven more by the desire to maintain harmony between their public image and social expectations, rather than their own self-image (Jwa, 2017). For instance, SP2 remarked when discussing a masters' hesitancy to share problems or issues, "…they don't want the pilot to think their vessel isn't adequate for the job. And so, you know, they want everybody to think the best of that." This comment highlights the desire of certain speakers to maintain their public-image or save face in front of both the pilot and their crew, thus maintaining the established hierarchies onboard.

This desire to save face in order to maintain a public-image is in contrast to the relatively self-image driven Western perspectives, in which speakers may prioritize their desire for a certain identity (Jwa, 2017). Indirectness may increase as social distance and power differences increase, as directness may be seen as threatening and inappropriate, resulting in breakdowns in harmony and solidarity (Park, 2002). These cultural differences in face-saving strategies have important implications for communication at sea, as English-speaking pilots may not be aware of these patterns of interaction.

These face-saving and politeness strategies, such as ambiguity, hedging, and indirectness, have a substantial impact on communication and are especially important in terms of pilot interactions and bridge resource management. Interviews confirmed and validated these findings, with interviewees commenting on the importance of raising native-English mariners' awareness of politeness and face-saving strategies that may be employed by multicultural crew. Taken together, these findings from the thematic analysis of interviews and NTSB reports have demonstrated the importance of facilitating mariners' understanding of how power, politeness, social distance, and face-saving strategies may impact communication, particularly during interactions on the bridge. In addition, findings suggest that the English proficiency of many mariners, particularly masters, may not be sufficient in some cases, with language-related problems causing substantial communication failures.

Thematic analysis also identified confusion regarding authority and command (k = 8, 13%), as well as cultural misunderstandings (k = 3, 5%), as additional sources of miscommunication. For instance, cultural misunderstanding may have contributed to the miscommunication caused collision between the Conti Peridot and the Carla Maersk. When discussing the factors that led to the accident, in which the pilot failed to inform the master of fluctuations in the heading, he also remarked that neither the crew nor the master questioned his decisions or actions. The following exchange illustrates the pilot's

suggestion that differences in both training and cultural expectations affected the willingness of the crew to raise concerns:

> 12 Q. At any point as this situation started unfolding, do you
> 13 think the captain on your vessel should have done anything
> 14 different? Could he have stepped in and --
> 15 A. I don't think they knew we're -- I don't think they knew
> 16 what was happening.
>
> 6 A. But no one member of the bridge team came up to me and
> 7 said, "Captain Reeser, why are you over here? Why are you over
> 8 there?" Nothing like that.
> 9 Q. Okay.
> 10 A. But I have had that. I've had that asked on many ships,
> 11 you know. Bridge teams asking me why I'm over here or why I'm
> 12 over there, and I explain to them what I'm doing.
> 13 Q. Are there any reasons or different type reasons why you
> 14 think some bridge teams do that and some don't?
> 15 A. It's got to be the training. That's all I know of. All
> 16 right. That's all I know. All I know is like some bridge teams
> 17 -- I'll give you an example. Those ships that have the Indian
> 18 officers, I mean, they're on you. On you all the time, yes.

These remarks highlight the role that not only cultural expectations may have, but also the crucial differences in training and support that may influence a crew member to raise concerns or issues. Although a number of instructional programs have been developed, such as the MarTEL project (2007-2009) or MARCOM, studies have demonstrated that training may not sufficiently prepare mariners for their real-world interactional English needs (Acar & Varsami, 2021; Ahmmed, 2020). In addition, there is wide variation in terms of the training for linguistic and communicative competence across institutions.

Summary of Results

A large and growing body of evidence has demonstrated the importance of clear and effective communication at sea (e.g., Hasanspahić et al., 2021; Oraith et al., 2021; Ziarati et al., 2009). However, despite efforts to improve communication, miscommunication caused accidents continue to increase (e.g., Ziarati, 2009). This study identified important findings for improving our understanding of the sources of miscommunication at sea by conducting an exploratory thematic analysis of NTSB reports involving U.S. flagged vessels. Findings were then triangulated with semi-structured interviews, with results demonstrating the key role of linguistic and pragmatic factors in miscommunication.

Thematic analysis identified failure to communicate, including a lack of confirmation or clarification regarding plans or maneuvers, as the most frequent cause of miscommunication. These communication failures were frequently caused by interlocutors failing to share their intentions or confirm information, and were further exacerbated by the use of languages other than English. In addition, during stressful situations, non-native speaking mariners were more likely to revert to their first language, often leaving a pilot unaware of important information or developing situations. Failure to use standardized language as well as insufficient proficiency also contributed to miscommunication. Analysis also identified pragmatic factors as a leading cause in miscommunication caused accidents, with power differentials, politeness, ambiguity, and indirectness contributing to miscommunication, including in interactions amongst native English-speaking seafarers. Cultural mismatches were also found to be a source of miscommunication.

General Recommendations

This report had addressed an important gap in previous literature, providing an in-depth systematic analysis of the underlying linguistic and pragmatic causes of miscommunication in maritime accidents with U.S. flagged vessels. Results demonstrate a range of language and sociocultural factors, including failure to communicate, pragmatic factors, proficiency issues, and mismatches in cultural expectations, contribute to miscommunication. For example, FTC results demonstrate that officers and crew may not feel confident in raising concerns, potentially contributing to an accident. These findings highlight the importance of *fostering cohesion and community on board vessels by creating an environment in which mariners, regardless of rank, feel that they are able to seek clarification or confirmation.*

Findings also demonstrate the potential for miscommunication during bridge resource management, particularly when pilots and masters fail to share plans or information or pilots, masters, or other crew fail to seek clarification. *Possible opportunities for reducing this source of miscommunication include the consistent and clear use of the pilot/master exchange to confirm forthcoming procedures and actions.* Multiple NTSB reports demonstrated that preceding an accident, pilots often failed to conduct a pilot/master exchange or experienced miscommunication during the exchange itself. Although the importance of this task has been highlighted in previous research (Oraith et al., 2021), the current results underscore the crucial nature of this task.

NTSB reports also demonstrate that pilots and masters may fail to both share and obtain important information during this exchange, such as the planned path for inbound or outbound travel, known mechanical issues, use of navigational equipment, channel depth, etc. Thus, *training programs may wish to consider highlighting not only the critical information that should be included in this exchange, but also awareness raising of how other issues, such as linguistic proficiency or cultural misunderstandings, may also impact the open flow of communication during this important task as well as during bridge team communication overall.*

For U.S. based pilots working with international masters and crew, these findings also demonstrate the importance of clear, direct communication. In addition, native English speakers may benefit from *training to become more familiar and proficient with standard language rather than using plain English.* Because international mariners may be expecting standardized phrases, they may experience comprehension problems when hearing plain English. For example, Japanese VTS officers reported that Americans often used overly long and unfamiliar expressions (Uchida & Takagi, 2012). In addition, native English speakers may use a rate of speech that is faster than what international mariners are used to. Standardized phrases and language are familiar and easier to recognize, and may promote understanding despite rapid speech. Because training for domestic maritime professional does not appear to include thorough training on the use of standardized phrasing, this is an important area to address. *Native English-speaking professionals, particularly pilots, may benefit from awareness raising of not only the importance of speaking slowly and clearly, but using standardized language as often as possible when interacting with mariners from diverse linguistic backgrounds*.

Although the proficiency of international mariners should be sufficient for communication, training and standards vary widely, and pilots may find communication difficult. Rather than relying on the ambiguous proficiency standards used to guide training of multinational mariners, pilots may wish to *develop their resources for facilitating and promoting communication by using standardized phrasing when possible, keeping their language simple and uncomplicated, and using visual aids when necessary.*

Improving the standards of proficiency and communicative competence of non-native English-speaking mariners may also help to reduce the use of native languages during times of stress, particularly if international seafarers were provided with opportunities to improve their communicative competence in real-world tasks. Previous research has suggested that many international mariners feel there is a mismatch between their training and their real-world needs, with studies demonstrating the need for more speaking, listening, and interactional skills development (e.g., Ahmmed, 2020).

Findings also demonstrated the role of power, politeness, and indirectness as leading sources of miscommunication. Importantly, these findings suggest that miscommunication is not restricted solely to multinational and multicultural contexts. Pragmatic factors, specifically politeness and indirectness, contributed to miscommunication not only between native and non-native English-speaking interlocutors, but also in interactions where all participants were native English-speakers. Based on these findings, there is a need for *raising the awareness of native English-speakers regarding how politeness and indirectness may contribute to and further exacerbate instances of miscommunication.* Similarly, direct training to help *raise awareness of the impact of cultural background and beliefs on communication, particularly related to the role of power and politeness, may help*

native English-speaking mariners to recognize possible circumstances where miscommunication may occur.

Recommendations for the Prince William Sound Regional Citizens' Advisory Council

Building on the results of Phase 1, which provided a comprehensive review of miscommunication in maritime contexts, this report (Phase 2) identified multiple linguistic and pragmatic factors that contribute to or cause miscommunication at sea. Building on these findings, Phase 3 would extend and further develop this line of research by broadening the scope to include a wider range of stakeholders and participants. For example, additional participants for semi-structured interviews will be sought, including active and retired marine pilots, masters, officers, and crew, as well as representatives from shipping management companies and educators in both domestic and international maritime institutions.

Drawing on existing and additional interview data, 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.

Conclusions

Addressing calls made by multiple researchers to examine the underlying causes of miscommunication (e.g., Acar & Varsami, 2021; Oraith et al., 2021; Hasanphahić et al., 2021; Pyne & Koester, 2005; Tzannatos & Kokotos, 2009), the results of the current analysis identified a number of important findings regarding sources of miscommunication with U.S. flagged vessels, including a range of linguistic, pragmatic, and socio-cultural factors. In terms of language related sources of miscommunication, failure to clarify or confirm was the leading source of miscommunication, followed by language proficiency and linguistic competence related factors. Pragmatic factors were the second most common source of miscommunication, with power differentials, face-saving and politeness strategies such as indirectness, and cultural misunderstandings contributing to or causing miscommunication. In addition, bridge resource management was identified as the most common context of miscommunication.

These findings thus add to the growing body of research highlighting the role of miscommunication in the maritime industry. Importantly, although previous studies have demonstrated miscommunication as a leading cause of accidents at sea, this study extends these findings by focusing on the sources of miscommunication. By identifying the underlying causes of these communication failures, potential directions for future training and awareness raising may be developed. This exploratory report provides the first empirical and mixed methods approach to identifying the linguistic, pragmatic, and socio-cultural sources of miscommunication in accidents involving U.S. flagged vessels.

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.

Bachman, L. F., & Palmer, A. S. (1996). "Language testing in practice: Designing and developing useful language tests." Oxford University Press.

Bachman, L. F., & Palmer, A. S. (2010). "Language assessment in practice: Developing language assessments and justifying their use in the real world." Oxford University Press.

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.

Carotenuto, A., Molino, I., Fasanaro, A. M., & Amenta, F. (2012). Psychological stress in seafarers: a review. *International maritime health*, *63*(4), 188-194.

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

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

Fei, J., Chen, S., & Chen, S.-L. (2009). Organisational knowledge base and knowledge transfer in the shipping industry. Electronic Journal of Knowledge Management, 7(3), 325–340.
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
González-Lloret, M. (2020). Pragmatic development in L2: An overview. In Schneider, K. P., & Ifantidou, E. (Eds.), *Developmental and clinical pragmatics*, pp. 237-267.
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.
Krifka, M., Martens, S., & Schwarz, F. (2003). Group interaction in the cockpit: some linguistic factors. *Linguistische Berichte*, *12*, 75-101.
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
Hetherington, C., Flin, R., & Mearns, K. (2006). Safety in shipping: The human element. *Journal of safety research*, *37*(4), 401-411.
Holtgraves, T. (2007). "Second language learners and speech act comprehension." Language Learning, 57(4), 595-610.
Hystad, S. W., & Eid, J. (2016). Sleep and fatigue among seafarers: the role of environmental stressors, duration at sea and psychological capital. *Safety and health at work*, *7*(4), 363-371.
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
Ishihara, N., & Lee, H. E. (2021). Face and (im) politeness in aviation English: The pragmatics of radiotelephony communications. *Journal of pragmatics*, *180*, 102-113.
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.
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.
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
National Transportation Safety Board. (1998). “National Transportation Safety Board marine accident report - Allision of the Liberian freighter Bright Field with the Poydras Street Wharf, Riverwalk Marketplace, and New Orleans Hilton Hotel in New Orleans, Louisiana, December 14, 1996." (PDF). 1998-01-13.
National Transportation Safety Board. (1999). “National Transportation Safety Board marine accident brief: *DCA-97-MM-033*." (PDF). 1999-05-14.
National Transportation Safety Board. (2007). “National Transportation Safety Board marine accident report - Allision of the Hong Kong registered M/V Cosco Busan with the Delta Tower of the San Francisco-Oakland Bay Bridge.” (PDF). 2007-11-07.
National Transportation Safety Board. (2015a). “National Transportation Safety Board marine accident report: Collision between bulk carrier Conti Peridot and tanker Carla Maersk Houston ship channel near Morgan’s Point, Texas.” (PDF). 2015-03-09.
National Transportation Safety Board. (2015b). “National Transportation Safety Board marine accident report: Sinking of US cargo vessel SS El Faro in the Atlantic Ocean,

northeast of Acklins and Crooked Island, Bahamas Bridge." (PDF). 2015-10-01.
National Transportation Safety Board. (2015c). "National Transportation Safety Board marine accident brief: Allision of bulk carrier Anna Smile with Louis Dreyfus grain elevator." (PDF). 2015-15-08.
National Transportation Safety Board. (2015c). "National Transportation Safety Board marine accident brief: Collision between containerships St. Louis Express and Hammersmith Bridge." (PDF). 2015-02-15.
National Transportation Safety Board. (2018). "National Transportation Safety Board marine accident brief: Contact of the cruise ship Nippon Maru with mooring dolphins." (PDF). 2018-12-30.
National Transportation Safety Board. (2020). "National Transportation Safety Board marine accident brief: Contact of the tanker American Liberty with multiple vessels." (PDF). 2020-12-17.
National Transportation Safety Board. (2021a). "National Transportation Safety Board marine accident brief: Collision between offshore supply vessel Cheramie Bo Truc No 22 and articulated tug and barge Mariya Moran/Texas." (PDF). 2019-11-14.
National Transportation Safety Board. (2021b). "National Transportation Safety Board marine accident brief: Contact of liquid petroleum gas carrier Levant with mooring dolphin." (PDF). 2019-12-15.
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.
Pan, Y.(2000). "Politeness in Chinese face-to-face interaction." Stamford, CT: Ablex Press.
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.
Saaty TL (2001) Decision Making for Leaders. The analytic hierarchy process for decision in a complex world. RWS Publications, Pittsburgh
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

Yu, M. 2003. "On the Universality of Face: Evidence from Chinese Compliment Response Behavior." Journal of Pragmatics 35: 1679–1710.

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.