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Search and rescue in the Arctic: The role of vessels of opportunity

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The Arctic is characterized by multiple factors that make maritime search and rescue (SAR) in this area a complicated activity. Experiences from a series of maritime incidents and accidents in the Arctic illustrate the harsh and difficult operating conditions in the region. This demanding context creates challenges both for ships in distress, as well as for the overall SAR operation. Large distances and remoteness in the region entail cross-national cooperation to carry out successful maritime rescue operations, in addition to the invaluable response of the so-called "vessels of opportunity" (VOO). This study brings the role of vessels that just happen to be in the area in search and rescue operations in the Arctic to the forefront. More precisely, the aim of the work is to investigate how the role of vessels of opportunity is included in international agreements and international maritime search and rescue exercises. Data is collected through document analysis of 4 key international agreements related to maritime search and rescue, 21 exercises and deeper analysis of five of these exercise reports. Findings show that vessels of opportunity are not mentioned explicitly in international agreements for search and rescue. However, specific agreements, like IMO Polar Code and SOLAS, have direct and practical impact regarding how vessels prepare for unwanted maritime incidents. The study also shows that vessels of opportunity are part of scenarios in tabletop exercises, and cruise ships are typically assigned this role in exercises. Real incidents also show the role vessels of opportunity have as an on-scene coordinator (OSC), coordinating a search and rescue operation within a specified geographical area. The use of vessels of opportunity shows the importance of international cooperation on search and rescue in the Arctic.

Keywords: Arctic, Search and rescue, Maritime, Vessel of opportunity, International cooperation, Exercise

1. Introduction

The Arctic is a complicated area for maritime search and rescue operations, due to challenges that are unique for this region, like large distances, climatic conditions, scarce resources, and limited infrastructure. These factors have come into play in multiple maritime incidents over the years; the Maxim Gorkiy cruise ship collided with ice southwest of Spitsbergen in 1989 and Explorer hit ice in the Antarctic in 2007. Accidents like these show that assistance is often needed in remote, polar areas.

However, in many cases the first responders are not professional search and rescue units. It is often a so-called "vessel of opportunity" (VOO) – a vessel that just happens to be nearby and can aid a ship in distress (Kruke and Auestad 2021). These vessels, and the crew onboard, now have a significant role in the successful management of maritime accidents. This puts pressure on performance and quick and correct action. VOOs are therefore part of the SAR response in the acute phase. But how are these vessels part of the preparedness planning, the pre-crisis phase?

This paper aims to investigate how the role of vessels of opportunity is included in international agreements and international maritime search and rescue exercises. Data is collected through document analysis of 4 key international agreements related to maritime search and rescue, 21 exercise reports, with deeper analysis of five of these reports.

2. Conceptual framework

This chapter introduces the theoretical framework of the study, with preparedness, training, and exercises as the foundation for crisis response.

2.1. *Preparedness*

Preparedness is about being able to handle the events we cannot prevent, to handle the residual risk (Aven and Renn 2010). Preparatory activities need constant updating due to a dynamic risk picture, i.e. preparedness is a process. However,

preparedness may also be described as a product to reflect preparedness analysis, plans, and equipment. Preparedness is also an activity, such as analysis, planning, training, and exercising. When defining preparedness, many refer to the United Nations definition, that preparedness is "the knowledge and capacities developed by governments, response and recovery organizations, communities and individuals to effectively anticipate, respond to and recover from the impacts of likely, imminent or current disasters" (UNDRR 2017). This being a rather broad definition, covering all phases of crisis, we turn to Perry and Lindell for a definition to be used in this paper. They define preparedness as "the readiness to react constructively to threats from the environment in a way that minimizes the negative consequences of impact for the health and safety of individuals and the integrity and functioning of physical structures and systems" (Perry and Lindell 2003, 338). This definition focuses on the preparatory activities in the pre-crisis phase, such as training and exercises.

2.2. *Exercises*

All preparedness plans should have a training component to provide for testing of proposed response operations (Perry and Lindell 2003), that the relevance of preparedness plans is reviewed in training and exercises. Thus, exercises may be understood as constructed occasions for investigating the relevance of preparedness protocols and equipment specified in the preparedness plan (Perry 2004). However, crisis response or search and rescue operations are unique and challenging situations, making relevant training and exercise scenarios the foundation for identifying the competencies, systems and procedures required to coordinate and manage response (Drabek and McEntire 2003). There are many types of training and exercises. Training may be understood as an individual or team activity in terms of skills, procedures, equipment, function, or area of responsibility. Exercises, and in particular full-scale exercises, are more according to a realistic scenario where all or large parts of a plan are tested, together with all or most of the relevant actors. These exercises are extremely resource intensive, both in planning and implementation. A functional exercise on the other hand, as a test of one or more functions, is not that resource intensive, but also not that realistic since cooperation among a wider group of stakeholders is not tested.

There are many benefits to a comprehensive and realistic training and exercise program. They may for instance contribute to the development of shared mental models across team members (Salas, Sims and Burke 2005) and to increased understanding of each other's knowledge, skills, roles, anticipated behavior, and needs (Flin, O'Connor and Crichton 2008).

2.3. *Crises*

A crisis may be defined in various ways, but in this study the following definition by Rosenthal, Charles and 't Hart (1989, 10) is selected: "A crisis is a serious threat to the basic structures or the fundamental values and norms of a social system, which – under time pressure and highly uncertain circumstances – necessitates making critical decisions." This definition specifically focuses on the aspect of time pressure and decision-making. This is especially relevant for this study, as it investigates the role and ability of nearby vessels to respond to maritime incidents in the Arctic.

A crisis is a circular process, consisting of three phases: the pre-crisis phase, the acute crisis phase, and the post-crisis phase (Kruke 2012). The two main activities in the pre-crisis phase are prevention and preparedness. Both activities need to have a focus towards the next crisis. All preventive activities and our preparedness focus should, even though we need to utilize all experience gained in previous crises, be focused on the next crisis. This proactive approach with focus on the "next" crisis will also assist us in making our preparedness activities more relevant given our experiences from past events and our expectations regarding what awaits us in the future. Activities are planned and executed to reduce the consequence of the upcoming event (Kruke 2015). The main activity in the acute crisis phase is the response, the crisis response or search and rescue operations, all activities to minimize damage to life and health, the environment, infrastructure, and reputation. The planning and training from the pre-crisis phase are implemented and tested in the pre-crisis phase (Kruke 2015). Crisis management is often characterized by uncertainty, and in many cases, decision-making is based on improvisation and

adaptation. Response often requires actions from multiple actors, both on tactical, operational, and strategic levels. The post-crisis phase is characterized by recovery and learning. An evaluation of the crisis and crisis management draws parallels to the preparedness work in the pre-crisis phase. Experiences are used as learning points and preparation for the next crisis (Kruke 2015).

2.4. *Crisis response*

Crisis response is in many ways about decision-making under a high degree of uncertainty to deal with the situation at hand. A crisis is in many ways an unwanted dynamic event, with a degree of uncertainty, and characterized by a high level of stress for the directly involved and for the responders. The unwanted event could be a smaller accident, or it could be a larger event involving many actors. It is fair to assume that smaller accidents or larger crises at sea would require a response formed by ship crew and passengers, but also professional search and rescue capacities. What is common in crisis response is that the involved actors need to cooperate or coordinate to deal with the situation at hand. Whereas cooperation is "the act or process of working together to get something done for a common purpose or to achieve mutual benefit" (UNICEF 2025), coordination is defined as "management of dependencies" (Malone and Crowston 1994). A larger unwanted event might require a network response formed by a lot of actors, planned or ad-hoc. These larger events need a coordinated response formed by actors cooperating towards a common goal. Thus, they need to communicate, to have a common platform for exchanging information, and speak the same language both linguistically as well as professionally. Latent failures in preplanned, trained, and exercised crisis response capacities not including the relevant actors, the need for communication between the actors and the need to secure relevant coordination and cooperation, may weaken the exchange between the actors and the quality of the response itself.

3. Methodology

The study is based on a qualitative document analysis with data from a larger study (Solbakken 2024) and consists of 4 international agreements related to maritime SAR and 21 exercise reports focusing on Arctic maritime SAR, with deeper analysis of 5 of these reports (figure 1).

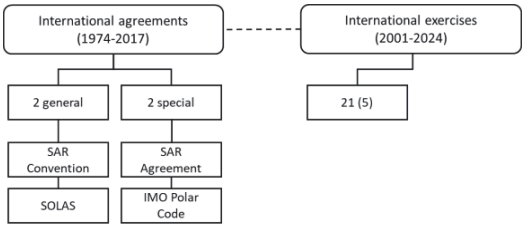

Figure 1: Overview of the data collection.

Both authors have participated in the 2018 SARex3 (Solberg and Gudmestad 2018). One of the authors has been part of the Norwegian Coast Guard service, and the other is affiliated with the Arctic Safety Centre in Svalbard.

4. Findings

This chapter identifies the key findings of the study, with a focus on how VOOs play a role in SAR preparedness. This includes a description of two significant accidents in the Arctic. Furthermore, the findings and analysis of the four key international agreements are explained, and findings from exercise reports are presented.

4.1. *Maxim Gorkiy and Explorer*

The Maxim Gorkiy and Explorer incidents are real examples of accidents ending in mass rescue operations where VOOs play a crucial part.

In 1989, the Russian cruise ship Maxim Gorkiy, carrying 953 people, hit an ice floe in a remote area southwest of Spitsbergen. The captain instructed people to evacuate the ship. Poor radio connections and incomplete information made coordination from mainland Norway challenging. The Norwegian Coast Guard vessel "Senja" just happened to be in the area and reached Maxim Gorkiy four hours later. When "KV Senja" arrived, Maxim Gorkiy was partially submerged. Passengers and crew waited for rescue in lifeboats, rafts, and on ice floes. "KV Senja" commenced rescue operations and was later joined by additional professional rescue capacities. All people onboard Maxim Gorkiy survived (Andreassen et al. 2018).

In 2007, the Liberian registered passenger vessel Explorer, carrying 154 people, sailed in Antarctic remote areas when it hit ice, took in water, and sank. Passengers and crewmembers abandoned the ship into lifeboats, which quickly

got crowded. The Norwegian passenger vessel "MS Nordnorge" received details of the emergency, changed course, and got appointed as on-scene coordinator (OSC) – defined in the IAMSAR manual (IMO and ICAO 2022) as "a person designated to coordinate search and rescue operations within a specified area" (p. xvi). Evacuation was successful and while "Explorer" sank, all passengers onboard survived (Commissioner of Maritime Affairs 2009).

4.2. *International agreements*

Four international agreements were selected specifically for this study: SOLAS, SAR Convention (both are general, overarching, and worldwide agreements), SAR Agreement, and IMO Polar Code (both are specifically developed to address polar areas). These are key documents regarding search and rescue.

As illustrated in table 1, the word "vessel(s) of opportunity" has zero hits in either of the included agreements.

Table 1: Overview of the reviewed agreements.

Agreement	Year	Description	Keyword "Vessel(s) of opporunity"
SOLAS	1974	General agreement specifying ship standards for safety regarding construction, equipment and operation	0
SAR Convention	1979	General convention for search and rescue. Ensures operations are handled through intergovernmental cooperation	0
SAR Agreement	2011	Specific agreement for search and rescue in the Arctic, developed by the Arctic Council	0
IMO Polar Code	2017	Specific agreement for polar regions specifying requirements regarding ship design, equipment, proteciton of ecosystems and search and rescue	0

The term and phenomenon "vessel of opportunity" is therefore not explicitly mentioned in any of the agreements. Below, all four agreements are briefly explained. Selected quotes from the agreements indicate how VOO's role is reflected in such agreements.

4.2.1. *SOLAS*

The "International Convention for the Safety of Life at Sea" (SOLAS) (United Nations 1980) is developed by the International Maritime Organization (IMO). This is a general, international agreement concerning the safety of vessels at sea. SOLAS specifies minimum standards for construction, equipment, and operation of ships, to make sure safety onboard is maintained. According to Regulation 10 "The master of a ship at sea, on receiving a signal from any source that a ship or aircraft or survival craft thereof is in distress, is bound to proceed with all speed to the assistance of the persons in distress informing them if possible that he is doing so" (United Nations 1980 (SOLAS), 414). This clearly states that any vessel in an area is obligated to help in emergency situations.

Regulation 15 mentions "search and rescue": "Each Contracting Government undertakes to ensure that any necessary arrangements made for coast watching and for the rescue of persons in distress at sea round its coasts. These arrangements should include the establishment, operation and maintenance of density of the ongoing traffic, and the navigational dangers and should, so far as possible, afford adequate means of locating and rescuing such persons" (United Nations 1980 (SOLAS), 416).

This covers the duties of the contracting states of SOLAS to ensure well-functioning safety facilities and equipment that may be used in a SAR situation.

4.2.2. *SAR Convention*

The "International Convention on Maritime Search and Rescue" (SAR Convention) (United Nations 1985), by IMO, aims to develop an international SAR plan so that maritime accidents and the rescue can be coordinated by a SAR organization or by a cooperation between SAR organizations.

The SAR Convention Chapter 5.6 addresses coordination of search and rescue activities, and 5.6.1 states: "The activities of units engaged in search and rescue operations, whether they be rescue units or other assisting units, shall be co-ordinated to ensure the most effective results" (United Nations 1985 (SAR Convention), 131). The SAR Convention defines a "rescue unit" as: "A unit composed of trained personnel and provided with equipment suitable for the expeditious conduct of search and rescue operations" (p. 124). So, rescuing units are trained for unwanted maritime operations and they have the equipment needed to successfully manage the situation. "Assisting units" are not defined in the convention. They could be commercial vessels.

Chapter 5.7 explains the designation of an "on-scene commander". The Convention defines this as: "The commander of a rescue unit

designated to co-ordinate search and rescue operations within a specified area" (United Nations 1985 (SAR Convention), 124).

The term **"rescue unit"** indicates a professional unit. However, 5.7.3 states that until an OSC has been designated, "the first rescue unit arriving at the scene of action should automatically assume the duties and responsibilities of an on-scene commander" (p. 131). This opens for other vessels, e.g. commercial vessels (which potentially are VOOs), to act as OSC. Worth mentioning is the IAMSAR manual (IMO and ICAO 2022) which also states that the person in charge of the first facility arriving at the scene will normally assume the OSC function. According to the IAMSAR, an OSC may be the person in charge of a "SAR unit, ship or aircraft participating in a search; or nearby facility in a position to handle OSC duties" (p. 1-2).

4.2.3. *SAR Agreement*

The "Agreement on Cooperation on Aeronautical and Maritime Search and Rescue" (SAR Agreement) is developed by the Arctic Council (2011) and is developed specifically for the Arctic region. The agreement establishes search and rescue responsibility areas for each of the eight Arctic nations (Norway, Iceland, Sweden, Denmark, Finland, Russia, USA, and Canada) (Arctic Council 2011).

The SAR Agreement only refers to "the Parties" in the agreement, which includes Denmark, Finland, Sweden, Iceland, Norway, Russia, Canada, and USA. The agreement only focuses on these Arctic nations' cooperation, communication, and information flow. Article 18 "Non-Parties" states that: "Any Party to this Agreement may, where appropriate, seek cooperation with States not party to his Agreement that may be able to contribute to the conduct of search and rescue operations, consistent with existing international agreements" (Arctic Council 2011, 9).

Although Article 18 opens for cooperation with non-parties of the SAR agreement, it still focuses on "states". Other institutions or groups of vessels, like cruise ships or fishing vessels, are not mentioned.

4.2.4. *IMO Polar Code*

The Polar Code (2017) is developed by IMO, specifically for polar regions and provides standards for equipment for vessels operating in these areas. The aim of the Polar Code is to provide for safe ship operation and protection of the environment (IMO 2017). The Code provides a wide range of requirements within ship design, construction, equipment, and SAR. The Polar Code operates with a five-day survival perspective – the equipment onboard should be of a quality that enables the personnel to survive a minimum of five days before being rescued.

Polar Code requirements are linked to the unique challenges that vessels operating in the Arctic face: harsh weather conditions, remoteness, limited access to infrastructure and resources, lack of knowledge and experience data, and climate change. These challenges have implications for e.g., communication capability, create potential delays in emergency response, and affect both equipment and human performance (Albrechtsen and Indreiten 2021; Andreassen et al. 2018; IMO 2017). The Introductory part of the Polar Code explicitly addresses these challenges in the Arctic context and how these may increase the risk of unwanted incidents and consequences of these: "[…] limited readily deployable SAR facilities, delays in emergency response and limited communications capability, with the potential to affect incidents response" (IMO 2017, 7).

The same chapter (Introduction) points at limitations for preparedness due to Arctic conditions, like darkness, ice, and low temperatures, and that these may affect navigation, machinery systems, and human and equipment performance (IMO 2017). Surrounding vessels are not mentioned specifically in this context, but it is reasonable that these vessels play an important role when Arctic conditions make communication and SAR operations challenging. Generally, the Polar Code focuses more on ship standards, safety equipment and facilities that may support survival, than on the actual rescue and help from surrounding vessels.

4.3. *Exercises*

In a larger study (Solbakken 2024) 21 exercises were identified and from these, 5 exercise reports were selected for in-depth analysis. Key points from these five reports are reported here.

Joint Arctic SAR TTX is a tabletop exercise series, arranged by the Association of Arctic

Expedition Cruise Operators (AECO) between 2016 and 2024. This being a series makes comparisons more meaningful and enables evaluation of development and changes over time. Scenarios change every year, and VOOs are included in only the 2018 and 2020 Joint Arctic SAR TTX exercises included in table 2.

Table 2: Overview of the five exercises and exercise reports that are the focus of this study.

Exercise	Year	Type of exercise
Joint Arctic SAR TTX	2017	Tabletop
Joint Arctic SAR TTX	2018	Tabletop
Joint Arctic SAR TTX	2019	Tabletop
Joint Arctic SAR TTX	2020	Tabletop
SARex3	2018	Live test

SARex3 (Solberg and Gudmestad 2018) focused on equipment requirements from the IMO Polar Code. The scenario was an emergency on a cruise ship and evacuation of passengers, carrying Polar Code required equipment, to shore.

4.3.1. *Exercises and agreements*

None of the five exercise reports mention the SAR Agreement. SARex3 briefly mentions the SAR Convention. These two are key, general agreements that may be underlying prerequisites for Arctic exercise activities. SOLAS and the Polar Code are most often linked to exercises, as these agreements have concrete and practical relevance for exercises. SARex3 (Solberg and Gudmestad 2018) live tests the requirements provided by the Polar Code. Findings show that survival gear, equipment, and food rations are not sufficient for five-day onshore survival (a Polar Code requirement saying that each vessel should have equipment which makes five days of survival possible) Joint Arctic SAR TTX 2017 (AECO 2017), 2019 (Ikonen and Andreassen 2019), and 2020 (Ikonen et al. 2021) are tabletop exercises and reports from these all address the potential insufficiencies in equipment requirements provided by both SOLAS and the Polar Code. The effectiveness of the agreements is questioned and there is a need for a re-evaluation of e.g., the survival and rescue equipment for polar conditions (AECO 2017). Exercise participants express that the five-day requirement defined by the Polar Code is impossible (AECO 2017) or that meeting this requirement is challenging (Ikonen et al. 2021).

4.3.2. *Exercises reports – exercise participants*

"Vessels of opportunity" being part of the scenario in exercises indicates a recognition of their role in real events. When looking into exercise participants, the most interesting for this study is to reveal whether potential VOOs are included in exercise activities as participants, and not only as an exercise scenario. The Joint Arctic SAR TTX exercise series is organized by, among others, AECO. Experiences from real incidents, e.g., the Explorer accident, show how cruise ships may play the role of VOO (Commissioner of Maritime Affairs 2009). A report from a SAR gathering in Iceland in 2023 further expresses the value of cruise vessels participating in exercises: "The cruise industry is not just a risk generator – they are also a risk mitigator, with their assets and resources" (Øien and Cainzos 2023, 4).

There is thus a clear focus on engaging the cruise industry in exercises. However, few mention the relevance of the fishing fleet and cargo ships in the merchant fleet. Fishing vessels are the most common type of vessel sailing in the Arctic (Arctic Council 2024). Only one report, gathered in this study's original 21 exercises, mentions the benefit of including fishing vessels in future exercises: "There is a need to practice and train more on emergency towing, preferably involving the two most relevant vessel categories: fishing boats and expedition cruise vessels" (Andreassen and Cainzos 2022, 23). Given the prevalence of fishing vessels, compared to other types of vessels, it is expected that fishing vessels may play the role as VOO at some point.

5. Discussion

The aim of this paper is to investigate how the role of vessels of opportunity is included in international agreements and international maritime search and rescue exercises.

5.1. *Arctic maritime accidents and rescue*

It is fair to assume that the situations in which both the Maxim Gorkiy and the Explorer found themselves coincide with the key components of a crisis, such as a serious threat, time pressure and highly uncertain circumstances (Boin and 't Hart 2006; Rosenthal, et. Al., 1989, 10). The specific challenges of the polar waters make maritime SAR operations extremely difficult, due to unique

challenges that include large distances and extreme climatic conditions, but also scarce resources and limited preparedness infrastructure. Thus, it is likely that the first responders, i.e. the first to arrive at the accident scene, will not be professional SAR responders. They are likely to be from other vessels that just happen to be in the area and can aid a ship in distress (Kruke and Auestad 2021). They are vessels of opportunity.

5.2. *VOO coverage in agreements and exercises*

A key part of preparedness, the readiness to react constructively (Perry and Lindell 2003, 338), is having preparedness, or contingency, plans. The four key international agreements studied in this paper may be perceived as such plans – they provide requirements and advice for a variety of situations. Agreements should reflect the dimensioning and allocating of resources in a rescue mission.

Real incidents (e.g., Maxim Gorkiy and Explorer accidents) disclose that coordination, understood as "management of dependencies" (Malone and Crowston 1994) between ship crew and passengers and any nearby ships (Kruke and Auestad 2021) is crucial for reliable response in remote waters. However, as this study shows, there is little or no guidance in key agreements on how to utilize the ad-hoc resources of VOOs on accident scenes because VOOs are not sufficiently covered in agreements. This is in stark contrast to how real events play out and what resources actually come into play. The lack of inclusion of VOOs in maritime agreements indicates that these specific agreements are not relevant to all aspects of Arctic SAR operations. So, what can we learn from a study of Arctic maritime exercises?

Exercises are constructed occasions for investigating the relevance of preparedness protocols and equipment specified in the preparedness plans (Perry, 2004). Exercises are a key part of preparedness and create a foundation for crisis management and may provide relevant actors practical experience in SAR response, understanding of relevant network response, and finally, exercises are opportunities to test our preparedness plans (Perry 2004). In this case, these plans are international agreements. However, we have seen that VOOs are not necessarily a part of these agreements, which may make it challenging to test VOOs' role in rescue operations.

Preparedness plans need a training component for testing of proposed response operations (Perry and Lindell 2003). However, out of 21 mapped exercises (Solbakken 2024) SARex3 (Solberg and Gudmestad 2018) is the only exercise that actually peforms a test of an agreement (the IMO Polar Code), but not a test of a VOO.

Scenarios from the 2018 and 2020 Joint Arctic SAR TTX exercises include VOOs. The findings and experiences from these exercises could be further analyzed and developed to understand the role of VOOs in Arctic maritime SAR operations. Given the tabletop format of these exercises, they work well for fruitful discussions around the table but are less fit to *test* the executing role of VOOs, to increase the quality of working together for a mutual benefit (UNICEF 2025) between relevant professional or VOO units and organizations (Perry 2004).

6. Conclusions

This paper investigates search and rescue in the Arctic, with specific focus on how the invaluable role of vessels of opportunity is reflected in international maritime agreements and exercises.

Main findings are that SOLAS and the Polar Code have standards that are challenging to fulfil, that rescue equipment is insufficient for survival, especially survival for several days, and that there is a discrepancy between the observed role of VOOs in real events, e.g., Maxim Gorkiy and Explorer, and VOOs' deficient role in key agreements and in exercise activities. None of the included key agreements mention VOOs explicitly. Additionally, potential VOOs, e.g., fishing vessels and cargo ships in the merchant fleet, typically do not participate or are not invited to international SAR exercises. Thus, preparedness plans and exercises miss out this rescue capacity, with a negative impact on the quality of SAR in the remote polar waters.

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