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Safe Navigation of Cruise Ships in Greenlandic Waters - Legal Frame and Practical Challenges

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ABSTRACT: Climate change provides for improved conditions for maritime navigation and results in increased activity in the Arctic. Those increased activities influence the safety at sea and risk of accidents. A disaster as the Costa Concordia incident would have far more serious consequences in Greenlandic waters than it had in Italy, therefore the question of prevention and disaster-preparedness is crucial. One approach to avoid risks is to create specific legislation. The legal system guiding safe navigation of cruise ships in/around Greenlandic waters is complex: the legal regime for navigation is set in different general and specific international, regional and national legal acts, partly non-binding, therefore issues of effectiveness arise. Safety is also influenced by practical issues, e.g. the lack of sufficient nautical charts for Greenlandic waters and “preparedness” at land to handle potential disasters, such as the SAR-system and preparedness of different actors, for example hospitals.

1 INTRODUCTION

Navigation of Arctic waters has always been challenging. Large-scale maritime disasters, such as the Titanic and Exxon Valdez incidents have shown with all clarity the enormous consequences in terms of loss of human life and environmental damage if things go wrong in the harsh conditions in the Arctic.

During the last decades climate change has improved conditions for maritime navigation and exploitation of natural resources in the Arctic and has consequently led to increased sea-based activity in the area, such as transportation, fishing and tourism to name a few. Increased maritime activities in Greenlandic waters – and in the region as such – have an impact on safety at sea and the risk of accidents, for example with tourist vessels. Even through climate change might lead to improved conditions for navigation, the Arctic still is a difficult and dangerous maritime environment to navigate in. And not all

maritime actors seem to be fully aware of the risks at hand and prepared accordingly. Furthermore, a situation as the Costa Concordia incident would most likely have far more serious consequences in Greenland than it had in Italy. The activity of cruise ships in Greenlandic waters and in the Arctic in general has considerably increased in recent years, which leads to considerations on how to prevent potential disasters and how to react if things go wrong.

One way to approach the situation is to create specific legislation to limit the risks and to ensure safe navigation. Since the Exxon Valdez disaster in 1989 there has been intense work in the International Maritime Organizations Safety Committee on creating specific guidelines for safe navigation in the Arctic. In 2002 the Maritime Safety Committee under IMO approved the Guidelines for Ship Operation in Arctic Polar Waters. However, the guidelines were not mandatory, but only recommendations (Engtrø et al.

2018, Jensen 2016). Drafting recommendations instead of binding legal rules lead to the inherent question of effectiveness of the regulation at hand. In 2007 cruise ship "MV Explorer" came in distress and sank in Antarctic waters with 100 passengers and 54 members of crew onboard. All were rescued, but this incident resulted in an intensified focus on safe navigation in polar waters and put pressure on IMO to act. In 2009 the IMO has approved new guidelines on the issue, which were not mandatory. In 2010 the IMO started to work on the Polar Code, which became effective on 01.01.2017 (Engtrø et al. 2018, Jensen 2016). The aim of the Polar Code is limiting risks by setting a legal frame for safe ship operation and environmental protection in the Arctic and Antarctic by primarily binding regulation (Østergaard/Frier 2016). The question at the core of this article is to what extent the legal frame work for safe navigation in the Arctic waters can improve and secure the safety of cruise ships. One side of improving safe navigation in Greenlandic waters is an efficient legal frame work, however, another side of the medal are practical issues, such as sufficient nautical charts and the preparedness on land (and at sea) if things go wrong. This article is dealing with safety and disaster prevention issues connected to the increased navigation of cruise ships in Greenlandic waters. In this context, both the legal frame work will be briefly presented as well as practical challenges for safe navigation of cruise ships in Greenlandic waters.

2 SAFETY AND ACCIDENT PREVENTION

Safety plays an important role in maritime industry and there has consequently been focus on safety issues for many years. The same goes for the research. The roots of safety research derive from the 19th century. In the beginning the focus was on technical improvement of equipment, for example with view to preventing explosions and structures from collapsing. (Hale & Hovden 1998). In the 1960'ies and 1970'ies the focus in research has been on the development of probabilistic risk analysis and on the human factor and human error, as well as on the development of accidents models like the so-called Swiss cheese model (Reason, 1997). Major disasters as Chernobyl in 1986, Challenger in 1986, Piper Alpha in 1988 and Exxon Valdez in 1989 has, however, changed focus on management systems, procedures and organizational factors. The focus increased on safety management systems (SMS), safety culture and safety climate. There are different definitions of SMS. One definition comes from the Civil Aviation Authority, which defines SMS as following:

"SMS is an organised approach to managing safety, including the necessary organisational structures, accountabilities, policies and procedures. It is more than a manual and a set of procedures and requires safety management to be integrated into the day to day activities of the organisation. It requires the development of an organisational culture that reflects the safety policy and objectives" (Civil Aviation Authority). <http://www.caa.co.uk/docs/872/30JulySMS%20Guidance%20Materialversion3.pdf>

The shipping industry has adopted the idea of SMS with the introduction of The International Management Code for Safe Operation of Ships and for Pollution Prevention called also IMS Code in 1998. The IMS Code obligates the shipping companies to formulate SMS, taking into account existing risks in shipping operations and guideline the seafarers to conduct their work safely through the procedures in SMS. Regulation and procedures have been seen as an effective way to prevent accidents, however in recent times there has been focus on negative sides of procedures as possibility to undermine good seamanship and to increase bureaucracy (Knudsen 2009, DMAIB 2016, Oltedal 2011). The focus on safety culture and SMS is still intense, but the complexity of the systems makes the prevention of accidents more complex where SMS and safety concepts are not able to explain all mechanisms in the organisation. In the further development of the theoretical framework the focus is on coping with complexity of systems in accident prevention. The newest trend, which deals with this area is resilience. Resilience is defined as follows: "the ability of a system or an organisation to react to and recover from disturbances at an early stage, with minimal effect on the dynamic stability. The challenges to system safety come from instability, and resilience engineering is an expression of the methods and principles that prevent this taking place" (Hollnagel, Woods & Levson, 2006). The resilience theoretical framework also developed accident models, which include dynamic models, such as Rasmussen's model (1997), and the safe envelope concept (Hale & Borys 2013). One of the useful concepts in the newer theoretical approach are the concepts of Work-as-imagined (WAI) and Work-as-done (WAD), which origin from the Francophone tradition and "acknowledged the difference between tâche and activité. Roughly translated, this is the difference between a (prescribed) task, or what is to be done, and the (actual) activity, or what is done" (Dekker, 2017). The concept emphasizes how rules and regulations produced by people, who are not involved in actually performing the job, sometimes are drawn up in a way, which makes it difficult for the people at the "sharp end" to meet the demands and live up to the intention. WAI "refers to the various assumptions, explicit or implicit, that people have about how work should be done. WAD refers to (descriptions of) how something is actually done, either in a specific case or routinely". (Hollnagel 2017). WAI and WAD are useful concepts in exploring the legal frame work for safe navigation in arctic waters and challenges in real life.

3 METHODS

The study uses the qualitative methods and combines the traditional dogmatic legal method with sociology. Thus, the data consists of legislation and regulation on different levels, legal literature, documents and interviews. The legal frame work consists of the international (for example UNCLOS), regional (for example Polar Code) and national level (specific Greenlandic regulations). The interviews have been collected during the period from February 2017 until August 2017. The interviews were mostly conducted

as face-to-face except one which was conducted by telephone. The interviews lasted between 60-90 minutes interviews. Some of interviews were conducted as individual and some as two persons' interviews. The respondents of interviews were maritime stakeholders and shipping companies both in Denmark and Greenland. All interviews were recorded and analyzed with help of Nvivo 11.

4 THE LEGAL FRAME WORK FOR NAVIGATION IN GREENLANDIC WATERS

4.1 UNCLOS and other regulation

The legal regime for navigation of the oceans is set out in a number of international regulations (it its sum often called *the law of the sea*) with the UN Convention on the Law of the Sea (UNCLOS) as the central set of rules as the backbone. UNCLOS is often described as a constitution of the oceans, however, it is questionable, what that actually means in more practical terms (Feldtmann/Siig, 2018). The aim of UNCLOS is to provide comprehensive regulation of the governing of the oceans in general and more in particular to regulate central issues connected to the ocean such as the issue of free navigation, the distribution and use of resources, the rights and duties of coastal, flag and other states. Not all states are party to UNCLOS, however, it can be argued that the main principles of UNCLOS are widely accepted and regarded as customary international law.

Concerning the issue of cruise ships and save navigation in arctic waters, UNCLOS has little specific to offer. UNCLOS is more relevant on a general level, distributing powers and obligations in connection with the use and governance of the oceans. One major principle at the core of UNCLOS is the freedom of navigation. This means, beyond other things, that limitations of and setting rules for navigation must be justified by other important reasons such as the safety at sea or the protection of the environment. Thus, a number of specific regulations set out rules for safe navigation, for example with view to the construction of vessels and equipment etc. as regulated in International Convention for the Safety of Life at Sea (SOLAS).

Another crucial issue regulated by the international law of the sea is the Search and Rescue System (SAR). This topic is only partly addressed by UNCLOS and more specific regulated by other international law, in particular the International Convention on Maritime Search and Rescue (SAR Convention). The SAR Convention is supplementing the general obligation of ships to render assistance to vessels in distress, which is a deeply rooted maritime tradition but also codified in a number of international treaties. Before the SAR Convention, however, there was no specific international legal system covering search and rescue operations and the underlying SAR-system on land. The central elements of the SAR Convention are the establishment of SAR-zones and rescue co-ordination centers and subcenters, as well as specific duties and rights of coastal states (responsible state for a given SAR zone) in connection preparedness and distress situations.

The polar states USA, Canada, Denmark, Iceland, Norway, Sweden, Finland and Russia (also called the "Arctic 8") have in 2011 agreed on the Arctic Search and Rescue Agreement (Agreement on Cooperation on Aeronautical and Maritime Search and Rescue in the Arctic) which establishes the SAR zones of each state party. The Greenlandic SAR-zone, which as the other SAR-zones in the Arctic covers a huge area is, managed by the JRCC Greenland in Nuuk.

4.2 Polar Code

Polar Code has been, as mentioned above, developed to supplement already existing IMO instruments, in particular SOLAS and MARPOL, with aim to increase safe ship operation and the protection of polar environment. The Code consists of an introduction, part I and part II. The Introduction contains mandatory provisions applicable to both parts I and II. Part I is subdivided into part I-A, which contains 12 chapters on safety measures, and part I-B containing 12 chapters about recommendations on safety. Part II consists of two parts A and B. Part II-A includes mandatory provisions on pollution prevention presented in 5 chapters, and part II-B containing recommendations on pollution prevention also in 5 chapters. In the context of this article especially the first part of the Polar Code is of particular interest.

Part I of the Polar Code introduces a number of mandatory safety measures. Every ship the Polar Code applies for should have a valid Polar Ship Certificate (PSC) on board, which should follow the model of form of certificate for ships operation in Polar water presented in the appendix 1 of the Code. The PSC includes among others information about ship, category of ice class, equipment. Length of validity of certificate ect. Besides the PSC, the Polar Water Operational Manual should be also on board. (PWOM). PWOM should include information on ship specific capabilities and limitation in connection to an assessment of the ship and its equipment. Assessment should be conducted in relation to operating and environmental conditions such as operation in low air temperature, in ice or in high latitude. PWOM should address all aspects of operations described in chapter II part I-A. In the case that the shipping company has already procedures in place; there has to be reference from PWOM to existing procedures. Besides procedures describing ship operation in polar water, the manual has to include risk-based procedures about voyage planning to avoid ice, arrangements for receiving forecast, implementation of special measures, contacting emergency response providers. PWOM should also include risk-based procedures for monitoring and maintaining safety during operation in ice. The Polar Code gives guidelines for ship structure and stability depending on ship category. Some of the standards are obligatory for ships constructed after 1 January 2017. Information about icing allowance in the stability calculations should also be written in PWOM. The Polar Code describes specific demands to machinery installations, fire/safety protection, life-saving appliances, safety of navigation, communication, voyage planning and manning and training. According to Polar Code adequate thermal protection to all persons on board should be provided, which takes into account the

specific weather conditions of the area. The ship must ensure safe evacuation of the persons and provide the maximum expected time of rescue, which shall never be less than 5 days. The crew should be Certified in accordance with regulation II/2 of STCW Convention and section A-II/2 of the STCW Code (Polar Code 12.3.2) and when operating in polar waters the ship should have sufficient number of crew with appropriate training requirements for polar waters.

In its sum, it seems obvious that the Polar Code is improving the safety of navigation in Arctic waters. However, the combination of mandatory regulation and non-binding regulation might lead to gaps in the safety system. Furthermore, some regulations can be perceived as weak, for example does the Polar Code not explicitly demand that passenger vessels provide for thermal survival suits for all passengers and crew.

4.3 Mandatory Ship Reporting Systems

One element in the preparedness-system is the monitoring of traffic in Greenlandic waters through a specific mandatory ship reporting system established in 2003. The system is regulated in IMO circular on the GREENPOS/COASTAL CONTROL (IMO SN/Circ. 221 of 29 May 2002; Bekendtgørelse om skibrapporterings-systemer i farvandene ved Grønland; BEK 170/2003).

There are basically two mandatory ship reporting systems established for Greenlandic waters, in our context the GREENPOS-system is of particular interest. The GREENPOS-system applies to all ships on a voyage to and from Greenlandic waters and inside the Greenlandic continental shelf or EEZ. The ships are obliged to report their position, course, speed, and actual weather information every 6 hours. When joining the system, the ship must provide a sailing plan including the following information:

- Ship name/call sign
- Date and time
- Present position
- Course
- Speed
- Destination and estimated time of arrival
- Weather and ice information and
- Persons onboard.

Through this reporting system the JRCC in Nuuk is able to have a rather clear picture of the vessels navigating Greenlandic waters and to get alert if things are not proceeding according to plan or a vessel is not continuing to report.

4.4 The Order for Greenland on the Safe Navigation of ships; order no 1697 (Bekendtgørelse for Grønland om skibes sikre sejlads m.v.; Bek. 1697/2015)

The aim of the order is to enhance the safety of navigation in Greenland waters. The order applies for cargo ships with a gross tonnage of at least 150 and to ships carrying more than 12 passengers (order no 1697). For passenger ships carrying more than 250 certain particular strict rules apply. Warships etc. and other state vessels which are not used for commercial service are not covered by the provisions in chapter 3 of the order concerning safety requirements.

According to the order Greenland is divided in two navigation zones: the northern and southern navigation zone. All ships navigating Greenlandic waters have to observe ice in every area with ice presence. The speed should be adjusted and ice searchlight should be used in darkness. Ships shall keep a safe distance from icebergs. During the planning of the ship's voyage the master has to take into account the following:

- The safety procedures of the ship's safety management system related to navigation in Arctic waters;
- any restrictions in the information in nautical charts and aids to navigation;
- information about the extension and type of ice and icebergs in the vicinity of the planned voyage on an ongoing basis;
- statistical information about ice and temperatures from previous years;
- any possible places of refuge where the ship may be protected or receive assistance;
- any sea areas designated especially protected areas in the vicinity of the route; and
- voyages in areas with limited search and rescue facilities. (order no 1697)

Navigation is prohibited in areas delimited in the nautical charts by a dotted line with information about "numerous rock". Navigation in areas given in the chart "foul" or "unsurveyed" is only allowed if the ships follows previously used tracks that the master has assessed would have a sufficient safety margin in relation to the ship's greatest draught and width and the trip takes place in daylight and with "good visibility". Ships should have at least one person on board with the necessary local knowledge of the water to be navigated. The person should have the qualification that would entitle him/her to navigate the ship concerned or to be trained to have several years' experience navigating ships of similar size.

For passenger vessels carrying more than 250 passengers in the inner and outer territorial waters of Greenland it is mandatory to employ pilot services; in this context it may be noted that the territorial waters of Greenland are 3 nm. The pilot must be certificated to perform pilotage assignments in the area concerned. The vessel can get permission to navigate without a pilot, if the applicant documents the necessary qualifications and experience navigating in the Polar waters.

According to the order, ships should have an ice class, corresponding to the ice, which it is navigating. The ships have to follow the recommended routes around Nuuk. With connection to voyage planning, it is necessary for the master and shipping company to document the possibility to be assisted by other ships or SAR facilities within reasonable period of time and with sufficient rescue capacity (order chapter 4 § 15). Furthermore, the crew must have a proper training.

5 PRACTICAL CHALLENGES

5.1 *Emergency preparedness*

The biggest challenge in the Greenlandic waters is emergency preparedness. The infrastructure in Greenland is very limited. The only hospital is in Nuuk and the hospital does not have the capacity to accommodate patients from a cruise ship with 2000 passengers and crew. The nearest hospitals in the region are in Iceland and the nearest hospitals in the Danish are in Denmark, many hours away by plane. The emergency preparedness is limited to a small number of naval vessels of different sizes ships and helicopters and planes. The Greenlandic airline Air Greenland is in case of an emergency obliged to support possible rescue and evacuation operations with its aircrafts. The biggest challenge is here, that the airline has only one larger aircraft with a capacity of about 200 people, which can be used in an emergency. Furthermore, there is only one larger airport, in Kangerlussuaq in West Greenland, where this kind of aircraft can land and take off. Other Greenlandic airports have only capacity and runways for smaller aircrafts (for about 30-40 passengers).

5.2 *Survival chances*

The climate in Greenland is cold, changeable and complex due to ever-changing presents of ice. The weather can change rapidly from sunshine and good conditions for navigations to fog and challenging conditions. The waters around Greenland are cold the all year around and survival in the water is basically impossible. According to Polar Code a passenger should be able to survive not less than 5 days, however the exercises conducted in Svalbard, which to some degree is comparable to Greenland, has shown that the life-boats have certain limitations and passengers will most likely not survive for five days. Participants in the exercise SARex1 had to leave the lifeboats after 24 hours due too cold temperature and insufficient insulation on the bottom of the boat. The more recent exercise SARex2 has shown improved technology and better insulation at the bottom of the lifeboats, but another challenge was fresh air. It seems impossible to remain the proper level of oxygen in a covered lifeboat without opening "the roof" which has an impact on the ability to secure proper temperature for passengers (Solberg 2016 and 2017). The results of those exercises have shown with quite some clarity the challenges of surviving in Arctic waters for 5 days with the existing technology.

Another challenge in connection with the survival of cruise ship passengers if things go wrong is the physical condition and age of at least some of the passengers, who should be evacuated. The average age of passengers on cruise ships is rather high and not all passengers are very mobile, which makes it much more difficult to evacuate.

An accident report from Danish Maritime Accident Investigation Board (DMAIB) from 2016 illustrates another challenge with the growing industry of cruise ships: we have not only seen an increase of large cruise ships navigating Greenlandic waters, but also a growing industry of smaller tourist boats offering activities to cruise ship's passengers.

One of those smaller vessels got in distress in Greenlandic waters and subsequently sunk and the biggest challenge in the rescue operation was to evacuate passengers. There was no space on the vessels deck where 23 passengers could be able to dress into the survival suit. The report raises therefore the general question whether it is possible to evacuate the passengers from this kind of vessels (DMAIB 2016).

5.3 *Navigational challenges and limitations*

Greenlandic waters cover an area of about ca. 2 million km². In this large geographical area radio communication can be influence by atmospheric and magnetic disturbances. Furthermore, magnet compasses could be useless in (parts of) the region and gyrocompasses could be unreliable. To add to the complication, some parts of the Greenlandic waters have not been fully measured and nautical charts can be rather unreliable. There are currently no sufficient digital nautical charts, which adds to the difficulties of navigating the region.

Furthermore, complicated ice conditions are a challenge all year around and for example some forms of ice or underwater iceberg are not visible on radar. The weather is in general very unstable and unpredictable, which further adds to navigational risks.

However, our research seems to indicate that not all parts of the cruise ship industry are fully aware of the particular risks and challenges of navigating in arctic waters. And it seems that they are willing to take some risks to provide their customers an unique experience.

6 SUMMING UP

The legal system guiding safe navigation of cruise ships (and other vessels) in and around Greenlandic waters can be described as fragmented for at least three reasons: First, the legal regime for navigation is set in different legal acts under the law of the sea, some of those are of a general nature, some of those are specific to navigation in polar/arctic waters. Second, the legal regime for safe navigation is not only guided by international law, but also by regional and national rules. Third, some of the "law" guiding safe navigation in the Arctic is not binding and therefore issues of effectiveness must be addressed. This means in sum, that the legal framework for cruise ships in the Arctic is complex.

This complex legal system is one side of the medal, the other side are the practical conditions and circumstances influencing safe navigation at sea and the preparedness-system in place. The analysis of the practical challenges has shown that the existing legislation cannot stand alone and furthermore leaves some gaps. There is for example a gap between "work as imagine" – as described in the Polar Code – and "work as done" – as seen in the realities of navigating Greenlandic waters. Furthermore, there are some very specific conditions and challenges influencing navigation in Arctic waters. The legal frame work

tries to address some of those, but this need to be mirrored by training, sufficient equipment and effective structures on land. And at the end of the day there will always be a certain risk navigating Arctic waters

7 CONCLUSION

Our study has shown that there is a body of general and specific regulation on different levels governing safe navigation in Arctic waters and that this regulation to some degree has indeed improved the safety of navigation. This fragmented legal frame work addresses some of the existing risks which must be taken into account and sets a frame for the SAR-system and the preparedness on land. However, we have also identified certain short-comings, challenges and gaps connected to the existing legal frame work.

Furthermore, it is important to note, that the legal frame work cannot stand alone. In fact, in the Greenlandic context an number of practical challenges can be identified, which legislation is not able to address fully – to name the central challenges: first, a systematic education program for safe navigation in Greenlandic waters for foreign shipping companies is lacking. Second, digital nautical charts for Greenlandic waters are not completely developed yet and there are currently a lot of gaps in the existing nautical charts. Third, possibly the biggest challenge for navigating Greenlandic waters is still the complex weather and ice conditions, which means that knowledge and experience is a crucial part in safe navigation.

In addition, the infrastructure at land in Greenland is insufficient and not fully developed. It seems therefore quite unlikely, that a major incident with a large cruise ship of 2000-4000 passengers could be effectively and sufficiently handled.

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