The Swedish Club

With you at all times

Navigational Claims

2020

LOSS PREVENTION ESSENTIALS

How to avoid navigational claims

The navigation policy should: Define how the bridge should be manned efficiently; cover CPA requirements; ensure that the passage plan is berth to berth; detail how to conduct a pilot briefing.

The OOW should call the Master and request extra support when the situation dictates. The circumstances should be defined in the navigation policy and be based on visibility, distance to shallow water and traffic density.

It is essential that the OOW ensures that a proper lookout is maintained all-round the vessel.

A two-person check of the passage plan and all critical navigational equipment e.g. GPS, Radar and ECDIS should always be completed before departure.

When taking over the watch the OOW should check the passage plan and ensure that all the correct parameters are included in the GPS, Radar and ECDIS.

Specific bridge team roles as described in the Club's Bridge instructions booklet (see Appendix (i)) should be implemented. We would suggest that during simulator training every member of the bridge team should be trained in all roles.

Port cards (see page 40) should be created which provide key information on each port e.g. specific risks, how to approach the port and designated berth, radar map overlays, no go areas, turn radius, rate of turn, defined under-keel clearance, maximum speed on the different legs, radar overlay on the ECDIS, and index lines.

During the pilot briefing the Master should ask the pilot about local regulations, concerned traffic, expected currents and winds, passing requirements and how the pilot plans to approach the arrival/departure. If the local language is spoken the pilot has to explain what he said in English to the bridge team.

Focus on training that highlights why procedures are in place, so the crew members believe in the process. For this to work the crew's feedback needs to be evaluated and if useful, also implemented.

Carry out MRM training so the bridge team work more efficiently.

Contents

1. Introduction

The Swedish Club has spent many years compiling and reviewing information on navigational claims, which the Club defines as collisions, contacts and groundings.

The aim of 'Navigational Claims' is to use that experience to provide those crewing a vessel with the knowledge that they need to avoid major pitfalls that we have seen occurring all too often.

We have based our findings on statistics and our own experience of specific claims. This publication aims at not only highlighting the most common errors, but more importantly focuses on providing suggestions on how to prevent claims, increasing the safety of those on board and reducing vessel casualties.

Recurring causes

In our previous study we highlighted that the following are recurring causes:

- Poor lookout
- Lack of situational awareness
- Complacency

We are still seeing these issues, and in this new publication we are specifically focussing on what can be done to prevent this from happening. In addition, this year we have included a new section. 'What can we learn?', where we discuss the issues of the case.

Common immediate causes

In the cases we have included in this publication and from our statistics, the most common immediate causes are:

- Lack of situational awareness
- Navigational error by the Master or pilot
- Underestimating natural forces

Most accidents happen in congested waters with several officers on the bridge. This is discussed in more detail later.

We would like to thank Marcel van der Horst for his expertise in providing pilot comments on selected case studies.

2. What can we learn?

The value of hindsight

It is easy with hindsight to point at what went wrong. We, as the reader or investigator, have all the facts about what happened. We can see all the decisions that led up to the accident.

Do not be quick to judge, however, as the officer involved in the incident at the time believed that they were making the correct decision based upon their experience, knowledge and competence. It is also not always true that if a decision, or some of those decisions, were made differently then the result would have been different. We can only guess what would have happened if another decision had been taken.

The question is - why did the officer believe it was the correct decision? Other questions we should ask are, why didn't the officer recognise that this was a high-risk situation? Why weren't they challenged?

We will try to answer these questions, but the purpose of this publication is not to give answers to all these questions, but to raise awareness of accidents and ensure that individuals understand the consequences of their actions or inactions. Then it is up to the shipowner, manager or officer to decide how best to use this information.

Our role at The Swedish Club is to give advice on how to approach these types of scenarios, identify the risks and advise how the bridge team should prepare themselves and ensure that all people and equipment are best utilised.

Training

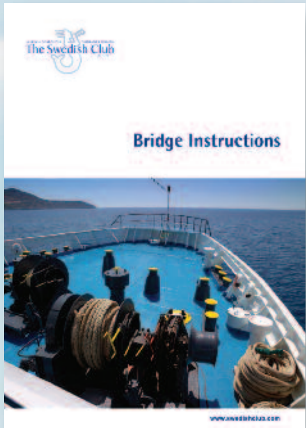
As a technical manager, it is important that the bridge team's training focuses on how to take early action and be able to analyse what is happening around the vessel and adapt to the continuously changing environment. This kind of training should preferably be done in a simulator.

The idea behind 'Navigational Claims' is to encourage the reader to look at any accident and learn from it, so officers on board can recognise a dangerous situation and risks. In the section 'What can we learn?' in our case studies, we will point out actions that were not ideal and what would be preferable in a similar situation.

In this publication we have highlighted some specific incidents and detailed what went wrong. Whilst every collision or grounding is a unique event, we believe that a competent and well-trained crew that discusses and questions what is happening, is better prepared to deal with the high risks of navigating a vessel.

3. The bridge team

During critical operations, an extra officer or a pilot is often added to the bridge team with the objective of preventing an individual from making a mistake. However, if the bridge team do not have a plan and discuss what is happening, this defeats the purpose of adding another person. The lack of people on the bridge and their competence is usually not a concern. The problem is that there is no unified plan. Often there is an assumption that all have the same plan, but frequently we see that the departure or arrival have not been discussed in detail, and there is no consensus on roles and responsibilities.



To prevent this The Swedish Club has published 'Bridge Instructions', a guide for building an efficient bridge team. The publication defines the different roles every person in a bridge team should adopt and individual areas of responsibility. A condensed version of this publication is shown in Appendix (i).

4. General statistics

4.1 Introduction

The Swedish Club analysed more than 600 navigational claims in this publication:
These claims:

- Are based on all vessel types
- Concern collisions, contacts and groundings
- For H&M use the cost after the deductible (which is on average USD 100,000)
- Focus on claims above USD 10,000 until uncapped

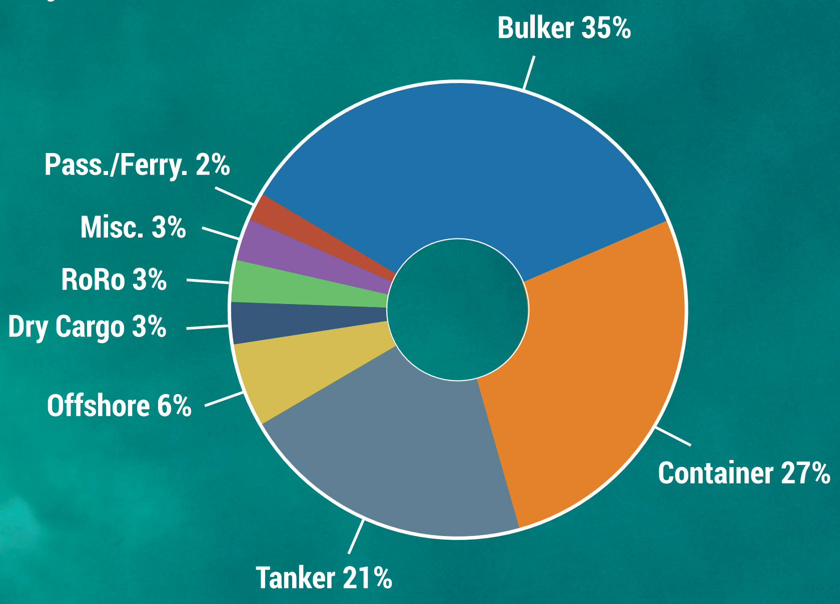
We have also included some statistics from USD 1 to highlight the number of claims the Club experiences. However, the usual bracket we analyse is from USD 10,000, as this removes smaller claims which have only generated very small costs e.g. survey cost.

It should be remembered that the consequences of a casualty for shipping companies are not purely financial, but also include loss of life, environmental pollution and loss of reputation.

The Swedish Club has based this publication on claims statistics from its own fleet.

The Swedish Club Fleet Distribution (H&M)

August 2019



4.1.1 H&M claims distribution by type

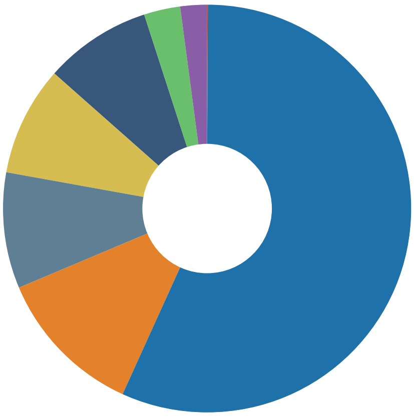
The most common H&M claims are machinery or equipment claims, which make up 57% of all H&M claims. Navigational claims make up 30%.

In our previous study we saw 50% machinery claims and 36% navigational claims.

GRAPH 1

H&M: number of claims *(2014 – 2018)*
Claims cost > USD 10,000 – non capped
All vessel types
As per 4/2/2019

Machinery or equipment	57%
Contact	12%
Other HM	9%
Collision	9%
Grounding	8%
Fire or explosion	3%
Heavy weather	2%



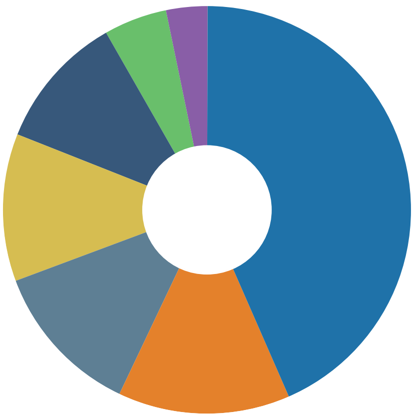
4.1.2 H&M claims distribution by cost

The overall costliest claim category for claims over USD 10,000 is machinery and equipment at 45%. Navigational claims stand for 33% of the overall claims cost. In our previous study the cost for machinery and equipment claims was 31% and navigational claims 52%.

GRAPH 2

H&M: total cost *(2014 – 2018)*
Claims cost > USD 10,000 – non capped
All vessel types
As per 4/2/2019

Machinery or equipment	43%
Fire or explosion	14%
Grounding	12%
Collision	12%
Contact	11%
Other HM	5%
Heavy weather	3%



4.1.3 Navigational claims

The frequency for navigational claims decreased from 0.11 in 2014 to 0.085 in 2018 i.e. 8.5% of all insured vessels suffered a navigational claim in 2018. This means that the total amount of navigational claims has fallen since the previous report.

However, the Club has seen the average claim cost rising as there were some unusually expensive claims between 2016-2018. In 2016 there was a complicated collision, in 2017 there were two claims, a grounding and a contact. Finally, in 2018 there were two claims, a contact and a collision. These claims have had an average cost of more than USD 20 million.

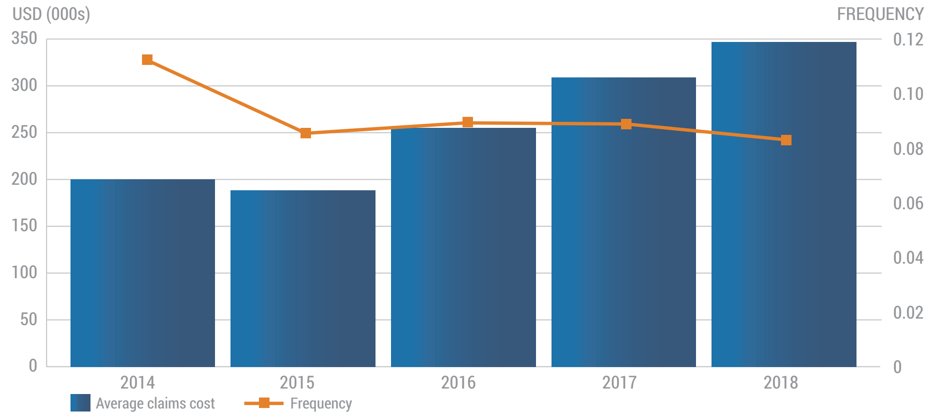
GRAPH 3

Average claims cost & frequency of navigational claims *(2014 – 2018)*

Claims cost > USD 1 – non capped

All vessel types

As per 8/2/2019



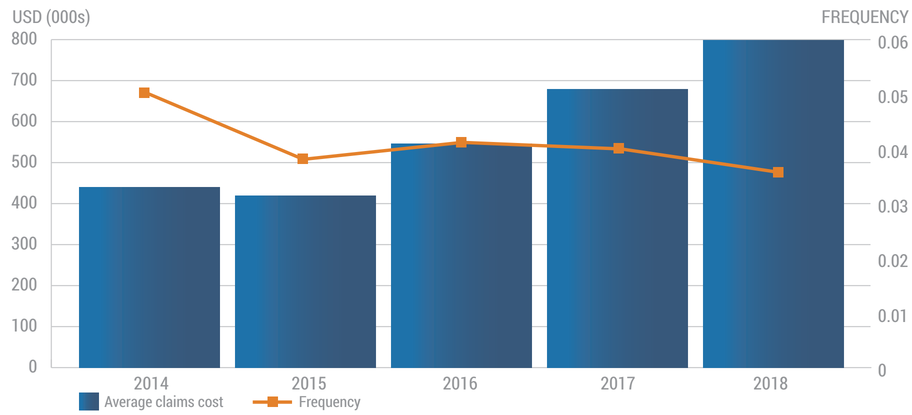
GRAPH 4

Average claims cost & frequency of navigational claims *(2014 – 2018)*

Claims cost > USD 10,000 – non capped

All vessel types

As per 8/2/2019



The frequency of claims from USD 10,000 is decreasing. For 2018 the frequency was 0.036 i.e. 3.6% of insured vessels suffered a navigational claim which cost more than USD 10,000. The number of claims in this more expensive bracket is also falling, however there is a rise in the average claims cost due to the reasons detailed earlier.


8.1M

5. Collisions

5.1 Introduction

We examined collisions across a range of vessels. In many of the collision cases we handle we observe a number of recurring issues which are highlighted in the statistics and the case studies that we cover.

Speed and situational awareness

It is common that an incident concerns a vessel maintaining an unsafe speed in congested waters and in restricted visibility. By reducing the speed, it is likely that the officer will increase his situational awareness, as there will be more time for making decisions.

In hindsight it is easy to blame the officer on the bridge who took the critical decisions that led to the collision for having poor situational awareness. The problem is that the definition of situational awareness can differ a lot from person to person. This is how The National Academies Press[1] defines situation(al) awareness,

Situation awareness is the perception of the elements in the environment within a volume of time and space, the comprehension of their meaning, and the projection of their status in the near future.

Situational awareness defines our understanding of what is happening and what is likely to happen. When the bridge officer is not fully aware what is happening around the vessel and has not fully reflected on what the consequences will be because of his action or inaction then we see poor situational awareness.

Operating bridge equipment correctly

It is also common that vessels involved in a collision have plotted each other on the radar, yet for some reason the OOW did not act upon the information displayed on the radar and did not take any evasive action. This also happens when there are several officers and a pilot on the bridge. This demonstrates again that just having more officers on the bridge will not prevent a collision unless they have defined roles, assigned responsibilities and are well trained.

It is imperative that technical managers train their officers on how to operate the bridge equipment correctly and what the limitations are. OOWs should demonstrate prudence when it comes to radar navigation and especially when making critical decisions. This is best verified during internal audits and during simulator training.

We also see COLREGs arrangements being made on the VHF. The VHF can be a very useful tool but its use is not advised for making COLREGs arrangements in open waters. However in European international waterways it should be noted that there is a requirement to make arrangements over the VHF and there are specific local COLREGs rules for these inland waters. It is up to the pilot to explain this to the bridge team and if the bridge team is uncertain, they need to ask for an explanation.

Restricted visibility

When reviewing cases and statistics we often see officers demonstrating confusion while navigating in restricted visibility, with a reluctance to alter and/or reduce speed to avoid collisions. This will be highlighted in some of our cases.

We believe that many of the issues that we raise in this publication can be rectified by proper training.

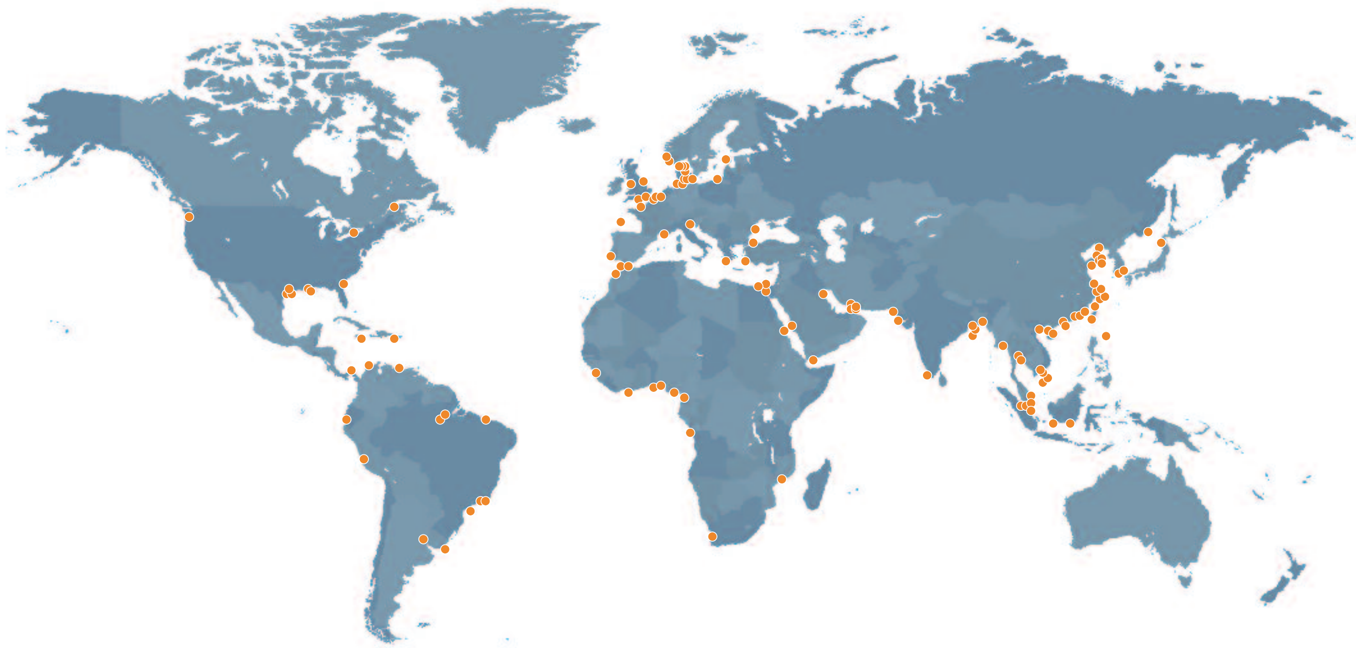
[1] https//www.nap.edu/read/6173/chapter/9

5.2 Statistics

GRAPH 5

World map of collisions

The collision map shows the location of collision claims between 2014-2018



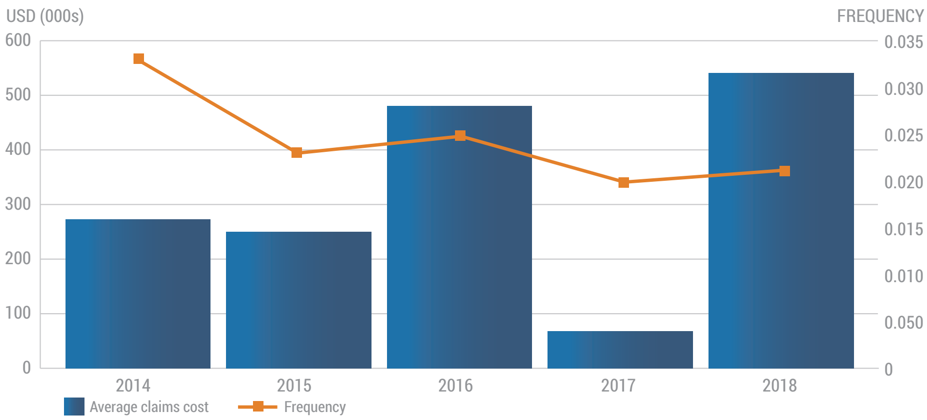
GRAPH 6

H&M collision: Average claims cost & frequency *(2014 – 2018)*

Claims cost > USD 1 – non capped

All vessel types

As per 8/2/2019

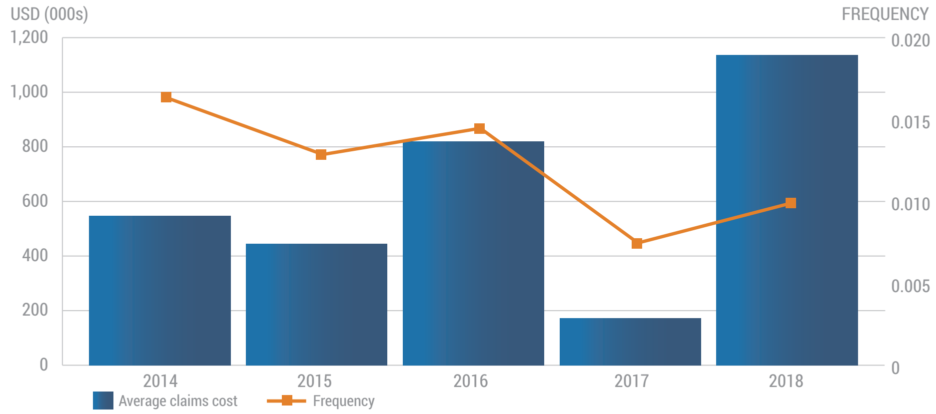


Over the last five years the frequency of claims has been decreasing. However we have seen that the average claims cost is more volatile due to a few expensive claims.

GRAPH 7

H&M collision: Average claims cost & frequency *(2014 – 2018)*

Claims cost => USD 10,000 – non capped
All vessel types
As per 8/2/2019



In the more expensive bracket from USD 10,000 we can see that the frequency has decreased since 2016.

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The average cost for a collision claim in the =>USD 10,000 bracket for this period is over USD 500,000. In our previous publication the cost was over USD 900,000. If we consider inflation the average at the time of the previous publication would have been even higher.

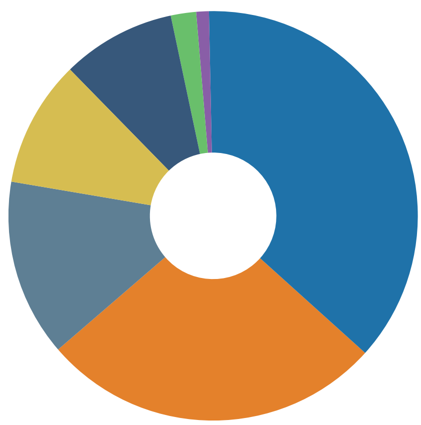
Over this five-year period there have been two expensive collisions. The fall in frequency in combination with fewer expensive claims compared to the last publication will reduce the overall cost.

GRAPH 8

H&M collision: Most common vessel type *(2014 – 2018)*

Claims cost => USD 10,000 – non capped
All vessel types
As per 4/2/2019

Container	37%
Bulker	27%
Tanker	14%
Dry Cargo	10%
Roro	9%
Pass./Ferry	2%
Offshore	1%



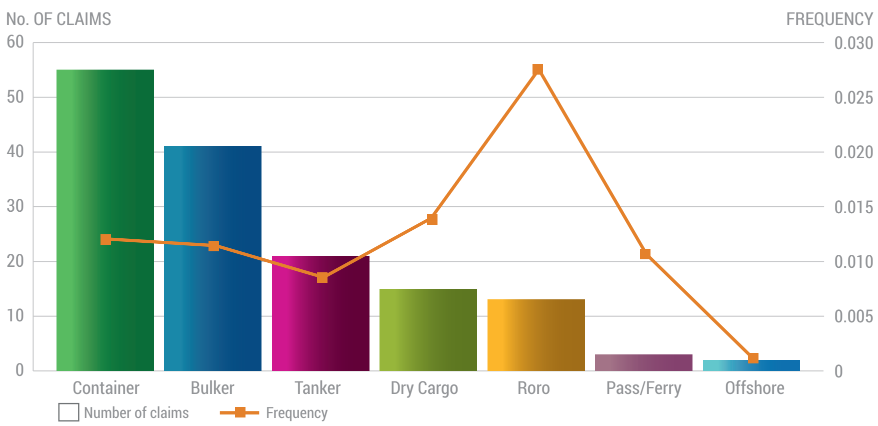
Top three vessel types involved with collisions are container vessels, bulk carriers and tanker vessels which represent about 77.2% of claims, and 77% of the Club's insured fleet.

GRAPH 9

H&M collision: Number of claims & frequency by vessel type *(2014 – 2018)*

Claims cost > USD 10,000 – non capped

As per 8/2/2019



The number of claims is the highest on container vessels and for bulk carriers and tankers. However, the frequency is highest on RoRos. Our statistics show that most collisions happened within the port area and RoRo vessels mostly trade short distances between specific ports, which means that they have more port of calls than the more conventional merchant vessels such as containers, bulkers and tankers.

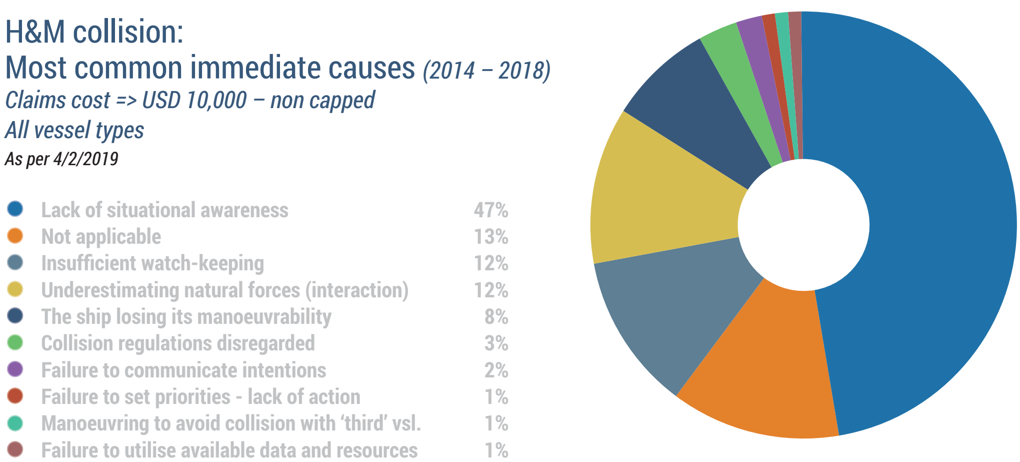
GRAPH 10

H&M collision: Most common immediate causes *(2014 – 2018)*

Claims cost => USD 10,000 – non capped

All vessel types

As per 4/2/2019



There may be a number of factors contributing to an incident – for example an officer with incomplete situational awareness might also be on a bridge with insufficient watch-keeping. The main contributing factor is used to determine the immediate cause.

The most common immediate cause is lack of situational awareness and it is also one of the costliest.

Insufficient watch-keeping is also one of the top three most common categories. This can mean that there was no dedicated lookout on the bridge. It can also be that for some reason the OOW did not have a properly manned bridge or the officer did not use all available bridge equipment effectively.

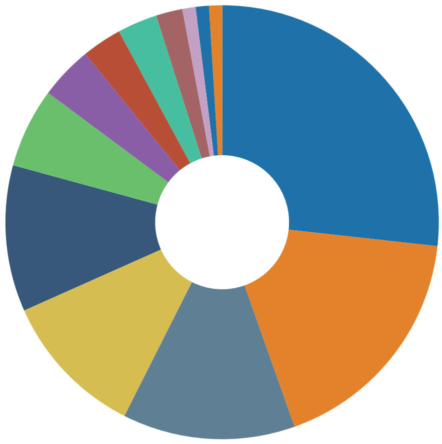
The 'Not applicable category" covers situations which do not fit any pre-determined immediate cause e.g. the vessel being hit by another vessel when at anchor or alongside.

GRAPH 11

H&M collision: Vessel location *(2014 – 2018)*

Claims cost > USD 10,000 – non capped
All vessel types
As per 4/2/2019

Port	27%
Anchorage area	18%
Port approach	13%
Coastal water, within 12nm	11%
Open sea, inside EEZ, 12-200nm	10%
Canal	6%
River	4%
Open sea, inside EEZ, >200nm	3%
Traffic Separation Scheme	3%
Unknown	2%
Lock	1%
Archipelago	1%
Shipyard	1%



About 70% of all collisions occur in congested waters. We define these as those encountered when departing or approaching the port, or navigating in the port, canal, river or by an anchorage. If we also include coastal waters, this figure increases to about 80%.

When navigating in congested waters, the bridge team should be reinforced by the Master or another officer and sometimes an extra lookout. This is to ensure that not only one person is making the decisions in a high-risk area. This should be defined in the company's navigation policy. It's also important that the OOW calls the Master for extra support if the traffic increases or visibility decreases.

In many of the cases we handled this was not the case and it is not uncommon that in coastal collisions the OOW did not call the Master or ask for more support on the bridge

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These statistics echo those in our previous publication. This is not surprising as ports and the VTS operate similarly.

See Section 8: Sea Traffic Management, for more information on congested waters.

5.3 Cases

5.3.1 Vessel being overtaken

Vessel A was a small general cargo vessel sailing at night in a busy area in the Baltic Sea. Visibility was good, and winds were westerly at 3 Beaufort. The vessel was maintaining a speed of about 10 knots.

Bridge equipment
The S-band ARPA radar was set up in off centre, range 12 NM, north up, in relative motion mode, while the X-band radar was on standby. Both radars had similar blind zones as the masts were positioned close to each other on the ship's upper bridge. The bridge equipment included an ECDIS, which the Master who was on the 8-12 watch was monitoring. A lookout was also on the bridge.

Handover
There were a number of vessels astern of vessel A. Five minutes before midnight the Second Officer came to the bridge for his night watch. During the handover, the Master informed him about the vessels which were astern, and advised that they were being overtaken by a number of them. After the handover the Master left the bridge.

The Second Officer was aware of a vessel overtaking them on the portside but was not aware of vessel B also overtaking them, but on the starboard side.

He switched the radar between centred display to off-centre several times. The lookout was on the port bridge wing.

One minute from collision (C-1 minute)
The Second Officer was monitoring the ARPA S-band radar when he noticed a target astern on the starboard quarter - it was very close. This was vessel B and it was one minute from collision and only a few cables away. The officer turned around and looked out through the aft starboard bridge windows. Vessel B was almost on top of them.

He tried to call the Master but could not reach him. He then switched to manual steering and altered hard to starboard which was towards the overtaking vessel, and the vessels collided.

Collision
Soon after the collision the Master came onto the bridge. He noticed that the engines were still full ahead and the rudder was hard to starboard, but the vessel was not turning. He reduced the engines to 60%. Vessel A was not moving. Vessel B had struck vessel A on the starboard side in way of cargo hold 2. After a while vessel B moved astern, and the vessels disengaged. The Master contacted vessel B but the OOW on vessel B responded that they had only been involved in a near miss. After a while they admitted that they had been involved in a collision.

Recording
The Master saved the VDR. However, only the X-band radar was interfaced with the VDR and as that radar was in standby mode, radar screenshots of the developing close quarter situation had not been recorded by the VDR.

COLREGs

Rule 5 - Look out: *Every vessel shall at all times maintain a proper look-out by sight and hearing, as well as by all available means appropriate in the prevailing circumstances and conditions, so as to make a full appraisal of the situation and of the risk of collision.*

It is essential that the OOW ensures that a proper lookout is maintained all-round the vessel in cooperation with the AB on watch. This is the responsibility of the OOW. It is unclear why the lookout did not actively inform the OOW about the vessel overtaking on the starboard side.

Rule 7 - Risk of collision: *(a) Every vessel shall use all available means appropriate to the prevailing circumstances and conditions to determine if risk of collision exists. If there is any doubt such risk shall be deemed to exist.*

This may include running both radars. The ARPA radars should always be used for plotting all critical traffic. The X-band radar was the only radar recorded by the VDR, which means that the X-band radar should always be running when the vessel is on passage. It is also imperative that the OOW is aware of the bridge equipment's limitations and is not over-reliant on any specific equipment.

Rule 13 - Overtaking: *(a) Notwithstanding anything contained in the Rules of Part B, Sections I and II, any vessel overtaking any other shall keep out of the way of the vessel being overtaken:*

(b) A vessel shall be deemed to be overtaking when coming up with another vessel from a direction more than 22.5° abaft her beam.

In this collision vessel B was overtaking vessel A and should have kept out of the way of vessel A.

Rule 17 - Action by stand-on vessel: *(a)(i) Where one of the two vessels is to keep out of the way the other shall keep her course and speed.*

(ii) The latter vessel may however take action to avoid collision by her manoeuvre alone, as soon as it becomes apparent to her that the vessel required to keep out of the way is not taking appropriate action in compliance with these rules.

(b) When, from any cause, the vessel required to keep her course and speed finds herself so close that the collision cannot be avoided by the action of the give-way vessel alone, she shall take such action as will best aid to avoid collision.

Vessel A was the stand-on vessel. The OOW on vessel A noticed vessel B only one minute prior to the collision. The OOW took the action that he thought would be effective However, it was too late to be able avoid the collision.

What can we learn?

- In this accident vessel B did not alter course or adjust its speed at any point. Vessel A was the stand-on vessel and vessel B was the give-way vessel as it was overtaking vessel A on the starboard quarter. Vessel B would have been able to see the stern light of vessel A but not her sidelights.
- Rule 5 stipulates that every vessel shall maintain a proper look-out by all available means. The proximate cause of this collision was poor lookout by those on the bridge of vessel B. Vessel A was the stand-on vessel as it was being overtaken. However, it is essential that the bridge team (the OOW and the dedicated lookout) maintain a proper 360° lookout, track all traffic around the vessel and use all navigation equipment available on the bridge.
- It is imperative that the OOW and lookout discuss all traffic concerned and that the lookout updates the OOW with any change in the movement of the targets. It is the responsibility of the OOW to ensure that the lookout is actively reporting targets observed.
- The X-band radar can, depending on the sea conditions, be better at detecting smaller targets compared to the S-band radar. However, it was on standby. Preferably both radars should be running all the time as with today's modern ARPA radars there is no reason not to do this. Furthermore, there is an IMO requirement[2] on VDRs installed after 1 July 2014 that both ARPA radars should be recorded to the VDR which was not the case when the VDR was installed on vessel A.

[2] IMO MSC 333 (90) 5.5.7 Radar

5.3.2 Collision in restricted visibility

Vessel A, a 1000 TEU container vessel, was approaching the pilot station at 17 knots. The vessel was in manual-steering mode and was on a course of 280°. It was an afternoon and the visibility was restricted to approximately 0.1 NM due to fog. The Bosun was on deck preparing the pilot ladder after which he would go to the forecastle to act as a lookout.

The bridge

The Master, the Second Officer and the AB were on the bridge. The Master had the conn, the Second Officer was monitoring and the AB was on the wheel. Two ARPA radars were used alternatively on ranges between 6 NM, 3 NM and 1.5 NM. Both the Master and OOW were monitoring the vessel's progress on the radars.

Monitoring

The Master saw a target on the radar and acquired it on the ARPA as vessel B. The target was 10° on the port bow, 4 NM away with a CPA of 0.2 NM. Vessel A was overtaking vessel B. It could be seen that if vessel A maintained this course, it could hit vessel B on the starboard side. Vessel B was also on a course of about 280° and making a speed of 6 knots. The Master started the fog signal.

C-15 minutes: Vessel B was on course of 293° and the CPA was 0.14 NM. Vessel A was maintaining its course and speed.

C-10 minutes: Vessel B's course was 285°, CPA 0.04 NM and distant 1.4 NM.

C-5 minutes: Vessel B's course was 289°, CPA 0.03 NM and distant 0.65 NM.

C-2 minutes: Vessel B's course was 304° and CPA 0.01 NM and distant 0.3 NM. Vessel B was still on the port bow of vessel A. At this point the Master on vessel A realised that vessel B was very close and ordered hard-to-starboard and stop engines.

Collision: It was too late to avoid the collision and vessel A struck vessel B on its starboard side about midships. The Master saw that vessel B was a small tanker. Shortly afterwards vessel B began to list heavily to starboard and the crew were forced to deploy the life rafts and abandon ship. They were all rescued by vessel A.

COLREGs

Rule 5 - Look out: *Every vessel shall at all times maintain a proper look-out by sight and hearing, as well as by all available means appropriate in the prevailing circumstances and conditions, so as to make a full appraisal of the situation and of the risk of collision.*

In this collision neither vessel seems to have maintained proper lookout.

Rule 6 - Safe speed: *Every vessel shall at all times proceed at a safe speed so that she can take proper and effective action to avoid collision and be stopped within a distance appropriate to the prevailing circumstances and conditions. In determining a safe speed, the following factors shall be among those taken into account: (a) By all vessels:*
(i) the state of visibility

The OOW must have time to take proper and effective action to avoid collision as required under Rule 6 to be considered to have proceeded at safe speed. Vessel A was making a speed of 17 knots in restricted visibility while approaching a congested area and a pilot station and this would probably be considered not to be a safe speed in the prevailing circumstances. This is also emphasised in Rule 19.

Rule 7 - Risk of collision: *(a) Every vessel shall use all available means appropriate to the prevailing circumstances and conditions to determine if risk of collision exists. If there is any doubt (then) such risk shall be deemed to exist.*
(b) Proper use shall be made of radar equipment if fitted and operational, including long-range scanning to obtain early warning of risk of collision and radar plotting or equivalent systematic observation of detected objects.

Vessel B was plotted on the ARPA on board vessel A and showed a small CPA. Despite the small CPA, no action was taken by the bridge team on vessel A.

At about C-15, the CPA to vessel B was 0.14 NM, which indicated that a risk of collision existed between the vessels. Visibility was restricted and so it was even more important to ensure that the CPA was large enough to account for any margin of error in the equipment. As per ARPA performance standards regulation the CPA should be calculated by the ARPA within three minutes with an accuracy of within 0.5 NM. This means that if the ARPA reports a CPA of 0.5 NM the actual CPA could be 0.0 miles or 0.5 miles. The bridge team must factor in this margin of error of the CPA when planning any collision avoidance manoeuvres and the passing distances to other vessels.

Rule 8 - Action to avoid collision: *(e) Any action taken to avoid collision shall be taken in accordance with the Rules of this Part and shall, if the circumstances of the case admit, be positive, made in ample time and with due regard to the observance of good seamanship.*

(f) Any alteration of course and/or speed to avoid collision shall, if the circumstances of the case admit, be large enough to be readily apparent to another vessel observing visually or by radar: a succession of small alterations of course and/or speed should be avoided.

It is prudent and good seamanship to take action at an early stage by altering course and/or reducing speed to open up the CPA. In this case neither vessel took any action to avoid collision.

Rule 13 – Overtaking: *(a). Notwithstanding anything contained in the Rules of part B, sections I and II, any vessel overtaking any other shall keep out of the way of the vessel being overtaken.*

Vessel A was overtaking vessel B.

Rule 19 Restricted visibility – *(a) This Rule applies to vessels not in sight of one another when navigating in or near an area of restricted visibility.*
(b) Every vessel shall proceed at a safe speed adapted to the prevailing circumstances and conditions of restricted visibility. A power-driven vessel shall have her engines ready for immediate manoeuvre.
(d) A vessel which detects by radar alone the presence of another vessel shall determine if a close-quarters situation is developing and/or risk of collision exists. If so, she shall take avoiding action in ample time, provided that when such action consists of an alteration of course, so far as possible the following shall be avoided:
(i) an alteration of course to port for a vessel forward of the beam, other than for a vessel being overtaken:
(ii) an alteration of course towards a vessel abeam or abaft the beam.

In restricted visibility both vessels have a requirement to stay clear of each other. It is likely that vessel B was altering course as per her passage plan. It is still the responsibility of vessel A to ensure they stay clear of vessel B as per Rule 19.

What can we learn?

- The bridge team on vessel A acquired vessel B on the ARPA at about C-15 minutes. The CPA was 0.14 NM. With such a small CPA this should be considered a close quarter situation. At this point the bridge team had time to make an alteration to ensure the collision was avoided but no action was taken on vessel A.
- When sailing in restricted visibility all vessels have a responsibility to stay clear of each other. All vessels also have a responsibility to proceed at a safe speed which ensures that they can stop quickly. Maintaining full speed in restricted visibility under these navigational circumstances could be considered proceeding at an unsafe speed. Vessel A was approaching a pilot station in restricted visibility which meant there was also an increased risk of encountering a greater concentration of different types of vessels.
- In restricted visibility both vessels have an obligation to stay clear of each other. However, we do not know why vessel B altered to starboard. It is possible vessel B altered course in accordance with their passage plan. Vessel A was overtaking vessel B which required vessel A to stay well clear of vessel B.
- It is important that the officers understand the rules and increased risks when sailing in restricted visibility. It is also important to understand the limitations of the navigation equipment. It appears that the bridge team on vessel A considered a CPA of 0.14 NM to be an acceptable CPA. To ensure situational awareness is maintained, the bridge team should discuss all plotted targets, what risks they pose and take appropriate action.

5.3.3 Collision in river

It was the middle of the night and vessel A, a 6,500 TEU container vessel, was sailing out from a port in a busy river with a pilot conning the vessel. The weather was fine with clear skies and winds at around Beaufort scale 6. All navigation equipment on vessel A was in good working order except for the AIS transceiver, which was not working.

Vessel A was on an easterly course in the outbound deep-water channel of the river fairway. Vessel B was proceeding on a reciprocal course in the inbound fairway of the river. The vessels were in sight of each other. The Master, Chief Officer, lookout, helmsman and the pilot were on the bridge of vessel A.

Underestimated weather conditions
Vessel B, a Handymax bulk carrier, then reduced speed in order to time arrival for its berth. However, the bridge team on vessel B underestimated the impact of the wind and current, and the vessel was set towards the outbound fairway and her heading altered to port and towards vessel A. This caused vessel B to enter the outbound fairway.

No room for manoeuvre
Vessel A was sailing in the fairway of the extended deep-water channel but towards the centreline between the inbound and outbound fairway. The bridge team saw that vessel B had slowed down and that her heading was changing towards them.

There was some room for vessel A to turn to starboard and still remain in the fairway, but it was limited. The vessels were approaching each other and vessel A was not able to turn to starboard and clear vessel B and still remain in the fairway.

An attempt to communicate
The pilot on vessel A flashed the signal lamp and called vessel B on the VHF but vessel B did not respond. The pilot ordered full astern and tried to alter course to starboard with the bow thruster.

This did not prevent the collision. The Master on vessel A saved the VDR data after the accident. There were no injuries or pollution.

COLREGs

Rule 5 - Look out: *Every vessel shall at all times maintain a proper look-out by sight and hearing, as well as by all available means appropriate in the prevailing circumstances and conditions, so as to make a full appraisal of the situation and of the risk of collision.*

In this case vessel B failed to keep a proper look-out.

Rule 7 - Risk of collision: *(a) Every vessel shall use all available means appropriate to the prevailing circumstances and conditions to determine if risk of collision exists. If there is any doubt such risk shall be deemed to exist.*

When vessel B drifted towards the outbound side of the channel it should have been clear to both vessels that a risk of collision was developing. Vessel B did nothing, and vessel A tried to contact vessel B instead of taking evasive action. The COLREGS do not mention the use of VHF. The rules are clear and should not require any discussion between the vessels.

Rule 9 - Narrow channels: *(a) A vessel proceeding along the course of a narrow channel or fairway shall keep as near to the outer limit of the channel or fairway which lies on her starboard side as is safe and practicable.*

Neither of the vessels navigated near the outer limits of the fairway.

What can we learn?

- If we look at this case from vessel A's point of view, there are several problems in this collision which could have been resolved if the pilot had clarified the intentions of vessel B.
- The major fault in this collision lies with vessel B as it drifted into the opposite fairway when it slowed down. What happened on vessel B's bridge and why it did not respond to vessel A or take any action when it started to drift is unknown.
- It is important to continually evaluate all traffic, especially if the vessel is in a congested area such as approaching or departing a port. In the port state investigation vessel A was found to be positioned close to her starboard side of the fairway, and this was identified as a fault. However, vessel B was found to be preponderantly to blame. The bridge team was not maintaining a proper look-out, they did not respond on the VHF and vessel B failed to stay clear of vessel A as it drifted into the opposite side of the fairway. The investigation also raised the issue of vessel A not having a working AIS.
- It is important that the bridge team has a departure briefing, where different scenarios are discussed and the potential risks identified. When the pilot boards, the Master should discuss the plan for the pilotage. It is also important that the Master asks about local regulations, concerned traffic, expected currents and winds, and knows what the passing requirements are and how the pilot plans to approach the departure. If the local language is spoken the pilot must share the conversation, in English, with the bridge team.
- If the Master for some reason is not confident in the pilot's orders he needs to voice this concern immediately. If he believes the vessel's safety is at risk, he must relieve the pilot. It is not uncommon for The Swedish Club to find that following navigational claims the Master has afterwards stated that he was concerned with the pilot and how they navigated the vessel. However, he did not relieve the pilot and take over.
- It is important that Masters are confident enough and are trained on how to challenge correctly. As in any line of work there is a vast difference in competence between different pilots and officers around the world. The safety of the crew and vessel should always be the Master's priority.

Pilot comment - local rules

During the training of a pilot there is a focus on the general flow of traffic and how to deal with exceptions and special manoeuvres. A special manoeuvre can be slowing down and waiting, and if this is done it has to be announced on VHF.

In this situation COLREGs are probably clear but there are also local regulations to comply with. Neither bridge team had good situational awareness in the above collision. Vessel A could probably have reduced its speed earlier and kept to the side of the fairway. However, the vessel most at fault is vessel B which for unknown reasons did not respond to the VHF or signal lamp.

5.3.4 Collision in busy anchorage after grounding

In an evening with good visibility, vessel A, a 2,470 TEU container vessel, was approaching port. The Master had received orders to arrive at the pilot station at 20:40, which was one hour earlier than previously planned. To make the new ETA the speed had to be increased from 10 knots to 14 knots. Instead of following the passage plan, the Master decided to take a shortcut through an anchorage. On the bridge was the Third Officer, who was the OOW, the Navigation Officer, the Master who had the conn and the Chief Officer who was monitoring traffic both on the radar and visually. He was also talking on the VHF. An AB was manually steering. The Third Officer was filling out the logbook. The two ARPA radars were in north up, relative motion and the radars were switched between 3 NM and 6 NM range. The CPA alarm was set to 0.3 NM.

The Second Officer who was the Navigation Officer, had already entered the waypoints for the original passage plan into both ARPA radars and the ECDIS, and a cross-track error alarm of 1 cable had been set up. During the approach he was not on the bridge and the passage plan was not updated for the shortcut as the Master did not consider it was necessary to update the passage plan.

C-15 minutes: During the approach to the pilot station there were two smaller vessels ahead of vessel A that would be overtaken on their starboard side. Shortly after the vessels had been overtaken the Master ordered an alteration to port which meant that vessel A crossed in front of the bow of the two vessels.

C-12 minutes: The Master was also aware of two outbound vessels from the port, vessels B and C. These vessels were not acquired on the radar. Vessel B called up vessel A and asked what their intentions were. The Master responded that he would like to have a port-to-port passing. Vessel B replied that it was turning hard to starboard to make the passing. The Master altered course to starboard. At this time vessel B was about 1 NM away on the port bow.

C-9 minutes: The Master became aware of vessel C on the port bow. He could see the green, red and forward top lights on vessel C but did not take any action. Vessel A was maintaining a speed of 10 knots.

C-7 minutes: The Master decided to open up/increase the CPA by altering 5 degrees to starboard for vessel C. A minute later the Master realised that vessel C was very close, and he ordered full ahead and hard to starboard. The vessels just passed each other clear by 10 metres. When vessel C was abeam the Master became aware of an island just ahead and he ordered hard to port. When C passed clear the Master ordered midships and then 20 degrees to port.

C-4 minutes: A minute later the pilot called the vessel on the VHF and asked why the vessel was heading dangerously close to the island. The vessel was now very close to it. The Master once again ordered midships and believed they would stay clear of the island.

C-3 minutes: Suddenly the vessel started to vibrate heavily and there was a loud noise. The vessel's speed was reduced to 5 knots. The Master was initially confused about what had happened but then understood that the vessel had hit the bottom but was still making way.

C-2 minutes: The Master identified that vessel D was at anchor only 0.15 NM ahead of them, at which point the AB informed him that the rudder was not responding. The Master ordered starboard 20 and then hard to starboard, but the AB repeated that the rudder was not responding. The vessel was now sailing at about 7 knots. The Chief Officer suggested dropping the anchor but the Master declined.

Collision: The Master ordered full astern but shortly afterwards vessel A's bow hit the side of vessel D.

The Master reported the grounding to the VTS but did not consider it was necessary to report the collision. Shortly afterwards the vessel managed to disengage from vessel D by engine manoeuvres and later dropped anchor.

COLREGs

Rule 5 - Look out: *Every vessel shall at all times maintain a proper look-out by sight and hearing, as well as by all available means appropriate in the prevailing circumstances and conditions, so as to make a full appraisal of the situation and of the risk of collision.*

The bridge was manned properly in terms of number of individuals present and number of functions represented. However, the different members of the bridge team had not been assigned properly defined roles and duties. The Master was in charge but he did not use the members of the bridge team to provide him with the information he needed to make decisions about the safe navigation of the vessel. A bridge team will be more efficient if roles and responsibilities are defined as outlined in The Swedish Club Bridge Instructions booklet (see Appendix (i)).

Rule 6 - Safe speed: *Every vessel shall at all times proceed at a safe speed so that she can take proper and effective action to avoid collision and be stopped within a distance appropriate to the prevailing circumstances and conditions. In determining a safe speed, the following factors shall be among those taken into account: (a) By all vessels:*
(ii) the traffic density including concentrations of fishing vessels or any other vessels:
(iv) at night the presence of background light such as from shore lights or from back scatter of her own lights.

Proceeding at a speed of 14 knots through a busy anchorage can probably be considered to be unsafe. We know that the Master stated at the hearing following the incident that the vessel was not proceeding at a safe speed but that he was determined to make the ETA.

Rule 7 - Risk of collision: *(a) Every vessel shall use all available means appropriate to the prevailing circumstances and conditions to determine if risk of collision exists. If there is any doubt (then) such risk shall be deemed to exist.*
(b) Proper use shall be made of radar equipment if fitted and operational, including long-range scanning to obtain early warning of risk of collision and radar plotting or equivalent systematic observation of detected objects.

All available equipment on the bridge should be used to determine if a risk of collision exists. In this case not all the vessels were plotted on the ARPA, not even vessels which were in close quarter situations. It is imperative to plot all vessels to determine if risk of collision exists. The bridge was manned with three officers including the Master. However, the Master had not delegated the task of monitoring surrounding traffic and report close quarters situations before they became dangerous.

Rule 8 - Action to avoid collision: *(a) Any action to avoid collision shall be taken in accordance with the Rules of this Part and shall, if the circumstances of the case admit, be positive, made in ample time and with due regard to the observance of good seamanship.*
(b) Any alteration of course and/or speed to avoid collision shall, if the circumstances of the case admit, be large enough to be readily apparent to another vessel observing visually or by radar: a succession of small alterations of course and/or speed should be avoided.

The Master appears not to have communicated his intentions to the bridge team. The Master did not make a proper appraisal of the possibility of arriving at the pilot station at the time requested by the pilots.

What can we learn?

- There are several causes why this vessel went aground and also suffered a collision. These were set in motion by a change to the passage plan; the order to arrive earlier at the pilot station. This is a common root cause of groundings and other accidents.
- In his desire to arrive at the pilot station on time the Master lost focus on safe navigation. He improvised the passage plan, which meant that no evaluation of the safety of the route was made. He demonstrated a complete loss of situational awareness. He failed to communicate his intentions to the bridge team and did not delegate tasks to the officers on the bridge. A proper evaluation of the options would probably have resulted in the Master calling the pilots to say that they could not make the desired ETA but would arrive 20 minutes later.
- It is not good seamanship to cross in front of vessels that have just been overtaken. Once again it highlights the risks the Master was willing to take risks to make the ETA.
- Any deviation from the passage plan other than for collision avoidance should be documented and subject to a proper appraisal. The passage plan should be berth to berth and not only pilot station to pilot station. The new passage plan needs to be entered in the ECDIS. All bridge team members need to sign the updated passage plan. If paper charts are used, the charts must be updated and the route plotted on the charts.

5.3.5 Collision when approaching port

Vessel A, a capesize bulk carrier, was approaching port while fully loaded with iron ore. It had a LOA of 325 metres, breadth of 52.5 metres and drafts of 17.8 metres. The water depth in the fairway of the port was more than 18 metres. However, the water depth to the north and south of the fairway was less than 17 metres. Vessel A was constrained by her draught and had the correct lights displayed. The fairway was about 420 metres in breadth.

The pilot had embarked, and three tugs were lining up to connect to the vessel. The Master and pilot on vessel A had carried out a pilot briefing and the pilot had received a copy of the pilot card. It was evening with clear skies and light winds. Vessel A had a speed of 7 knots and a course of 310 degrees and both steering pumps were switched on. All navigation equipment was working. The vessel was in manual steering mode. Both X-band and S-band ARPA radars were set to north up and true motion. The range was switched between 3NM and 6NM.

On the bridge of vessel A were the Master, the Third Officer who was OOW, the pilot and the helmsman.

According to the wheelhouse poster the minimum manoeuvring speed for vessel A was 5 knots. In ballast condition, it would take her about 12 minutes to stop if the engines were put from full ahead to full astern. If vessel A was sailing at 15 knots in deep water, it would take about 153 seconds to alter course by 90 degrees at hard-over angle.

C-30 minutes: Vessel B outbound from the port was acquired on the ARPA. It was a Panamax bulk carrier with a length overall of 225 metres, breadth if 32.3 metres and was about 10 degrees on the starboard bow, 6 NM away. It was on a course of 125 degrees making about 10 knots, giving it a course almost reciprocal to the course of vessel A. Vessel B had a CPA of 0.5 NM and was shaping up to pass down the starboard side of vessel A. Those in vessel A observed the starboard green sidelight and masthead lights on vessel B. The vessel had a pilot on board.

C-14 minutes: Vessel B was about 3 NM distant. Behind vessel B there was a third outbound vessel. Vessel B was still slightly on the starboard bow of vessel A. Vessel B was outbound and navigating in the waters outside and to the north of the fairway.

C-12 minutes: The pilot on vessel A talked to the pilot of vessel B in the local language, and was advised that vessel B's pilot had just disembarked, before which he had told the Master of vessel B that he should pass vessel A green to green. Vessel A's pilot ordered the tugs to standby as they were approaching the buoyed fairway.

C-11 minutes: The pilot on vessel A called vessel B on the VHF and asked to pass green to green, which an officer on vessel B agreed upon. Vessel A was now on a course of 300 degrees and making about 8 knots. At about the same time, the VTS called vessel B and informed it about vessel A being inbound. Vessel B's officer acknowledged that they were aware of vessel A and that they would pass green to green.

C-9 minutes: The pilot ordered the first tug to make fast on the stern, the second on the starboard side and the third to follow the vessel on the port side. Vessel B was at a distance of 2.3 NM.

C-2 minutes: When vessel B was about 0.5 NM off the starboard bow it started to alter to starboard and towards vessel A and the red side light on B could be seen.

The pilot on vessel A was alarmed by vessel B and called on the VHF and yelled "green to green vessel B" and at the same time ordered hard to port and stop engine.

An officer on vessel B replied, "too close have to pass port to port" and continued to alter to starboard.

Collision: The pilot on vessel A ordered hard to starboard and full astern but it was too late, and the vessels collided. Vessel B's port side shell plating was torn open from cargo hold 2 to cargo hold 6.

COLREGs

Rule 3 - General definitions: *(h) The term 'vessel constrained by her draught' means a power-driven vessel which, because of her draught in relation to the available depth and width of navigable water, is severely restricted in her ability to deviate from the course she is following.*

Vessel B should have stayed clear of vessel A as she was constrained by her draught.

Rule 8 - Action to avoid collision: *(a) Any action to avoid collision shall be taken in accordance with the Rules of this Part and shall, if the circumstances of the case admit, be positive, made in ample time and with due regard to the observance of good seamanship. (b) Any alteration of course and/or speed to avoid collision shall, if the circumstances of the case admit, be large enough to be readily apparent to another vessel observing visually or by radar, a succession of small alterations of course and/or speed should be avoided. (c) If there is sufficient sea-room, alteration of course alone may be the most effective action to avoid a close-quarters situation provided that it is made in good time, is substantial and does not result in another close-quarters situation.*

Reviewing the radar screenshots recorded by the VDR on vessel A shows that the vessels were positioned to make a safe 'starboard to starboard' passing had they kept their courses. At this point there was no risk of collision. However, just before the vessels began to pass each other, vessel B called 'port to port' on the VHF and altered starboard to cross ahead of vessel A. The distance between the two vessels was about 0.5 NM when vessel B called port to port. The sudden starboard alteration by vessel B changed a safe starboard-to-starboard passing to a risk of collision. Vessel B caused a risk of collision to arise.

Rule 9 - Narrow channels: *(a) A vessel proceeding along the course of a narrow channel or fairway shall keep as near to the outer limit of the channel or fairway which lies on her starboard side as is safe and practicable.*
(d) A vessel shall not cross a narrow channel or fairway if such crossing impedes the passage of a vessel which can safely navigate only within such channel or fairway. The latter vessel may use the sound signal prescribed in Rule 34(d) if in doubt as to the intention of the crossing vessel.

Vessel A was sailing on the starboard side in the fairway/narrow channel with constrained draught. Vessel B was outside of the fairway and then suddenly altered to starboard at a distance of 0.5 NM and tried to cross ahead of vessel A, which is in violation with (d).

Rule 18 - Responsibilities between vessels: *(a) A power-driven vessel underway shall keep out of the way of:*
(d)(i) Any vessel other than a vessel not under command or a vessel restricted in her ability to manoeuvre shall, if the circumstances of the case admit, avoid impeding the safe passage of a vessel constrained by her draught, exhibiting the signals in Rule 28.

Vessel B should stay clear of vessel A.

What can we learn?

- Vessel A was a huge vessel, constrained by her draught and was assisted by tugboats which made it difficult for her to manoeuvre. To enter the fairway, vessel A needed to be lined up at an early stage. The agreement between the two vessels was to pass 'starboard to starboard'. This meant that vessel B would keep sailing outside and to the north of the fairway (B was already sailing outside the fairway) whilst A would proceed in the fairway. If vessel B had not altered to starboard there would not have been a collision.

- The pilots on vessels A and B made a verbal agreement to pass 'starboard to starboard'. This was also confirmed later between the pilot on vessel A and an officer on vessel B. The VTS was also in contact with vessel B and informed them that vessel A was an incoming vessel. They also did not raise any concerns about the 'starboard to starboard' passing.

- Collisions between vessels in a narrow channel are one of the few scenarios in collisions between two vessels underway where one vessel can be held solely at fault for not maintaining position on its starboard side of the fairway. These are issues that Masters need to be aware of.

Pilot comment - local laws

When examining COLREGs you may ask why traffic (pilots) use starboard to starboard. In reality, in busy waters, it is impossible to make any progress without this manoeuvre. Indeed you need to be aware that this may be a part of local laws. Importantly however, once an agreement is made it cannot suddenly be changed by the counterparty.

5.3.6 Collision in restricted visibility

Vessel A was a 2,692 TEU container vessel underway. Shortly after commencing the sea passage, visibility worsened. The vessel was sailing through dense fog with SW winds at Beaufort scale 6.

On the bridge were the Master, OOW and a lookout. The Master had the conn. At 20:00 the Second Officer took over the watch from the Third Officer. The visibility was only 0.1 NM and the fog was persistent into the evening. The Master stayed on the bridge the entire time.

Vessel A was maintaining a speed of 17 knots on a course of 240 degrees, the vessel was sounding fog signals. Both the ARPA X-band and S-band radar were used and the ranges were changed between 3 NM and 6 NM.

C-12 minutes: Vessel B was on the port bow about 3 NM from vessel A, making a speed of 6 knots on a 010 degree course according to the ARPA. Vessel B was about 11 o'clock from vessel A and crossing from port to starboard. The CPA was 0.0 NM and so a risk of collision existed.

C-10 minutes: The Master saw the name of vessel B on the AIS and called it on VHF channel 16 but had no response. He also used the searchlight to flash at the direction of vessel B as a warning signal. It is unlikely that vessel B would have seen this.

C-5 minutes: The Master ordered hand steering and an alteration to port to 210 degrees, in order to let vessel B pass ahead of vessel A. Shortly afterwards vessel B started to alter to starboard, resulting in s distance of 0.5 NM between them. The Master on vessel A ordered hard to port.

Collision: The vessels collided, and vessel B struck the starboard side of vessel A. The Master on vessel A now saw that vessel B was a fishing vessel.

However, the Master of vessel A continued the voyage at the same speed and course. After a while the VTS called vessel A and told them to stop and await the coast guard. At the time of the collision the fishing vessel was fishing by casting fishing pots overboard.

COLREGs

Rule 5 - Look out: *Every vessel shall at all times maintain a proper look-out by sight and hearing, as well as by all available means appropriate in the prevailing circumstances and conditions, so as to make a full appraisal of the situation and of the risk of collision.*

The bridge was manned sufficiently and the bridge team on vessel A plotted vessel B at an early stage. However, the bridge team did not act on their observations.

Rule 6 - Safe speed: *Every vessel shall at all times proceed at a safe speed so that she can take proper and effective action to avoid collision and be stopped within a distance appropriate to the prevailing circumstances and conditions. In determining a safe speed, the following factors shall be among those taken into account. [(a) By all vessels:]*
(i) the state of visibility:
(ii) the traffic density including concentrations of fishing vessels or any other vessels:

A speed of 17 knots in restricted visibility in an area with fishing boats can be considered unsafe.

Rule 7 - Risk of collision : *(a) Every vessel shall use all available means appropriate to the prevailing circumstances and conditions to determine if risk of collision exists. If there is any doubt [then] such risk shall be deemed to exist.*

The CPA was 0 when vessel A plotted vessel B at C-12 minutes. It should have been apparent to those on the bridge of vessel A that there was a risk of collision.

Rule 8 - Action to avoid collision : *(a) Any action to avoid collision shall be taken in accordance with the Rules of this Part and shall, if the circumstances of the case admit, be positive, made in ample time and with due regard to the observance of good seamanship.*

There was sufficient time for vessel A to take appropriate action to increase the CPA and avoid the collision.

Rule 19 - Conduct of vessels in restricted visibilit y: *(a) This Rule applies to vessels not in sight of one another when navigating in or near an area of restricted visibility.*
(b. Every vessel shall proceed at a safe speed adapted to the prevailing circumstances and conditions of restricted visibility. A power-driven vessel shall have her engines ready for immediate manoeuvre.
(d) A vessel which detects by radar alone the presence of another vessel shall determine if a close-quarters situation is developing and/or risk of collision exists. If so, she shall take avoiding action in ample time, provided that when such action consists of an alteration of course, so far as possible the following shall be avoided:

> *(i) an alteration of course to port for a vessel forward of the beam, other than for a vessel being overtaken:*
> *(ii) an alteration of course towards a vessel abeam or abaft the beam.*

Vessel A altered to port, which is in contravention of rule 19 as vessel B was on the port bow of vessel A. At no time did the Master on vessel A reduce speed.

What can we learn?

- The Master and OOWs must always consider the safe speed of the vessel. The crew may be under the impression that they have to maintain a high speed to meet a schedule and this can create conflicts of interest between meeting a schedule and sailing at a safe speed. This is something that the Master and Owners must deal with in their safety management procedures to ensure that the vessel is navigated safely. In addition, the greater risk of sailing at a high speed must always be evaluated by the Master and instructions conveyed to the bridge officers. Rule 6 advises that a vessel needs to be able to avoid a collision as per the prevailing situation. Proceeding at higher speeds will also attract a higher degree of blame when the courts apportion liability between the vessels involved in collision.

- The bridge team on vessel A was aware of vessel B for about 12 minutes before the collision. Despite the clear indication that the vessels were on collision courses, the Master of vessel A altered to port, towards vessel B and in contravention of rule 19. Under no circumstances should a vessel alter to port towards a vessel on its port bow in restricted visibility as vessel A did in this collision. The Master on vessel A stated that this manoeuvre was because he believed that vessel B was the give-way vessel and that vessel B would pass forward of vessel A. Under Rule 19, both vessels have an equal obligation to avoid a collision.

- It is not acceptable to continue a voyage after a collision and this was a very bad decision by the Master. He should have ensured that all crew on vessel B were safe before continuing the voyage, which he did not do.

- The Master had been on the bridge for five hours when the collision occurred. It is unknown how long he had been awake prior to this. However, according to the flag state investigation it is unlikely that the Master suffered from fatigue.

- In this case vessel B was plotted but the bridge team on vessel A did not act on the information and assumed that vessel B would alter course. It is important to ensure that bridge officers are well trained so that they can take critical decisions quickly and correctly. They must understand the consequences of their actions, appreciate when no action needs to be taken, and know how to prevent a close quarters situation.

- Some safety management systems stipulate minimum CPA limits and manning levels in the navigation policy, depending on visibility and during critical operations such as approaching or leaving a port. However, generic requirements in the navigation policy may not illustrate to officers what are acceptable limits and what are unacceptable limits. Many of these issues are covered in our Bridge Instructions booklet (see Appendix (i)).

6. Contact

6.1 Introduction

In many of the contact cases we have handled, our statistics give us concern that vessels approach the berth at excessive speed. There is also a failure in efficient communication within the bridge team, and especially between the Master and pilot. We have also seen a number of cases where the bridge team has been surprised by strong currents and heavy weather.

It is advisable to use all available bridge equipment to monitor the vessel while berthing or manoeuvring in the port. In some cases, tugs have been available, but have not been utilised, which is a wasted opportunity to ensure best practice safety during the manoeuvre.

Port cards

An efficient tool to increase safety is the use of 'port cards' which should include:

- Specific risks for the particular port
- How to approach the port and designated berth
- Radar map overlays
- No-go areas
- Turn radius
- Rate of turn
- Defined under-keel clearance
- Maximum speed on the different legs
- Radar overlay on the ECDIS
- Index lines
- Defined parameters for all navigational equipment e.g. ECDIS, Radar, autopilot, AIS.

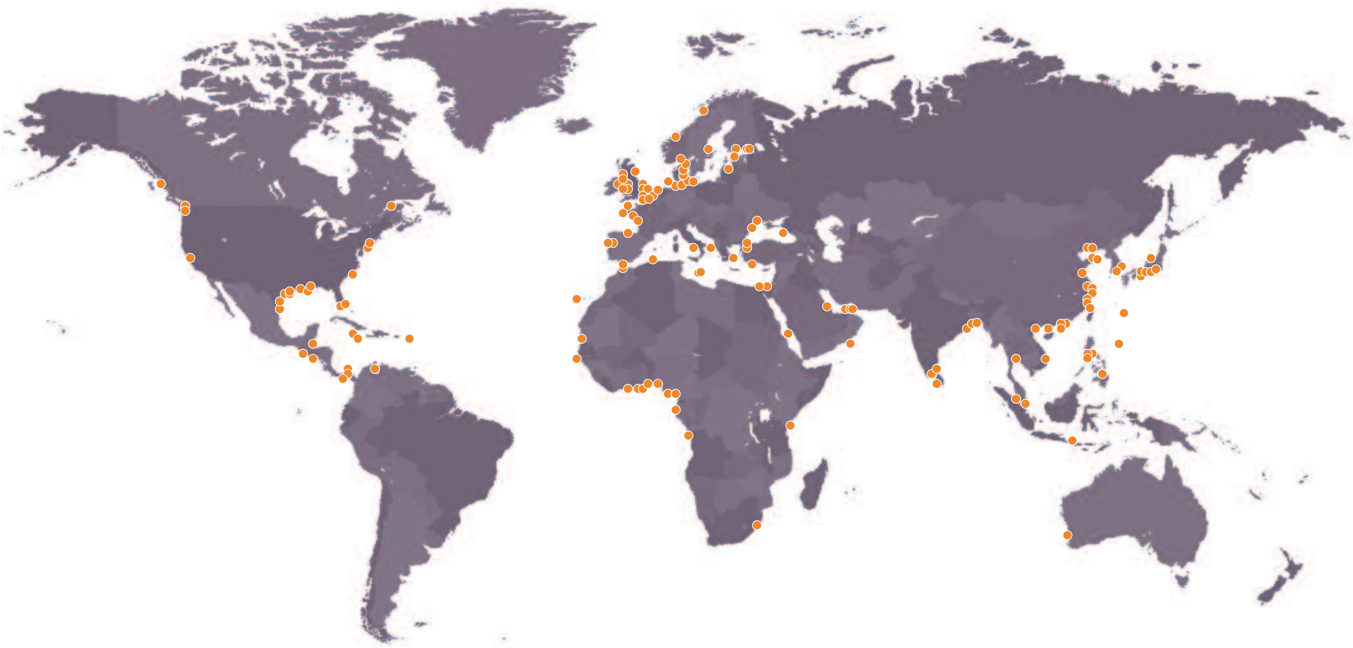
Many companies have implemented these in their navigational procedures. We believe this will increase safety and situational awareness for the bridge team and so would like to see them in more common use.

6.2 Statistics

GRAPH 12

World map of contact

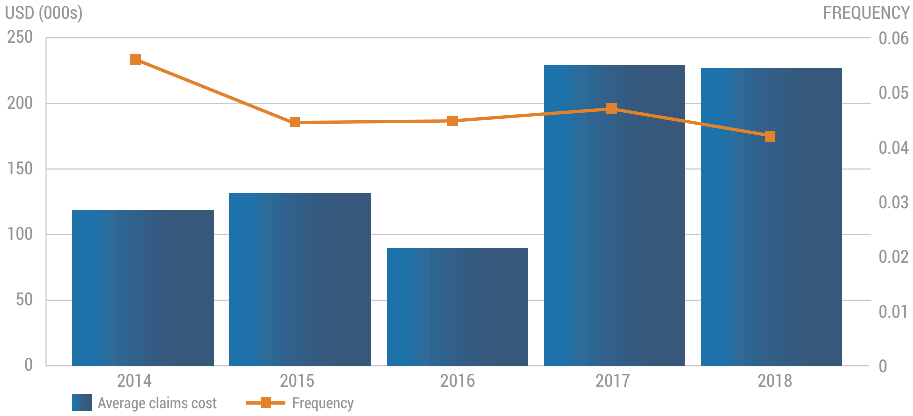
The contact map shows the location of contact claims between 2014-2018



GRAPH 13

H&M contact: Average claims cost & frequency *(2014 – 2018)*

Claims cost > USD 1 – non capped
All vessel types
As per 4/2/2019

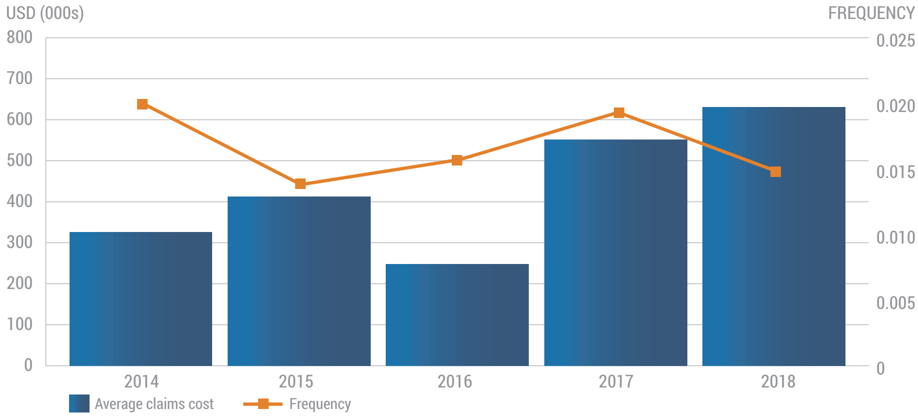


We can see from the profile that the frequency of claims has decreased from 0.057 in 2014 to 0.043 in 2018. However, the average claims cost >USD 1 – non capped has increased since 2016. This was caused by two expensive claims, one in 2017 and another in 2018.

GRAPH 14

H&M contact: Average claims cost & frequency *(2014 – 2018)*

Claims cost >USD 10,000 – non capped
All vessel types
As per 4/2/2019



We can see that the average claims cost for claims over USD 10,000 has increased considerably. This is due to two expensive claims in 2017 and 2018. The average claim cost for 2018 was USD 650,000. Over the five-year period the average claim cost was USD 430,000.

GRAPH 15

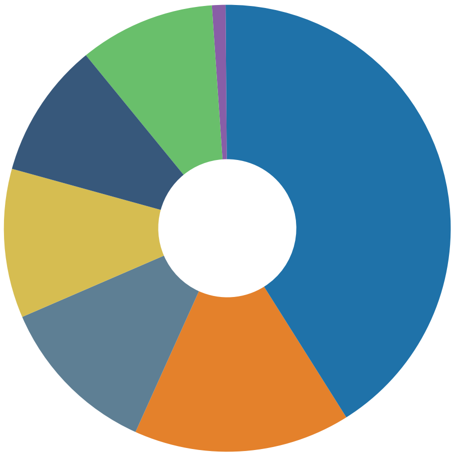
H&M contact: Most common vessel types *(2014 – 2018)*

Claims cost > USD 10,000 – non capped

All vessel types

As per 4/2/2019

Container	41%
Bulker	16%
Tanker	12%
Dry Cargo	11%
Pass./Ferry	10%
Roro	9%
Offshore	1%



Container vessels are responsible for about 42% of all contact claims followed by bulk carriers at 16% and tankers at 12%.

Container vessels also seem to carry out manoeuvres close to the berth at a higher speed than bulk carriers and tankers. The speed that container vessels should have for the different legs when approaching the berth is something that needs to be discussed during the pilot briefing. It is also advisable to have this defined in the passage plan.

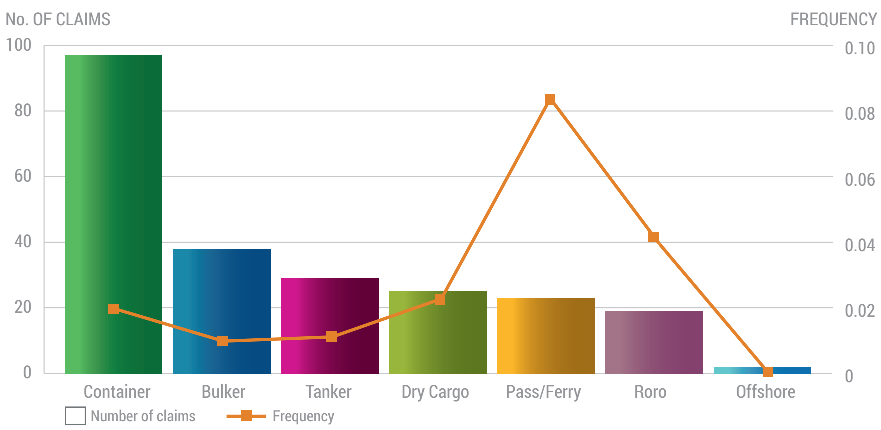
The most expensive claims occur when a vessel hits a gantry crane or the quay at high speed, and we often see gantry cranes at a container berth. This is a potential hazard that must be discussed with the pilot during the pilot briefing, as this is a major issue with container vessels. It is suggested that the gantry crane is positioned midship when berthing. This should be discussed with the pilot and terminal before berthing

GRAPH 16

H&M contact: Number of claims and frequency by vessel type *(2014 – 2018)*

Claims cost > USD 10,000 – non capped

As per 4/2/2019



Container vessels experience most contact claims followed by bulkers and tankers. Passenger ferries and RoRos show the highest frequency which is similar to collision graph 8. It is no surprise that the risk for a contact will increase for a vessel the more it sails in and out of port, and this has been highlighted in our statistics. Some RoRo and passenger ferries depart and arrive at a port several times a day.

GRAPH 17

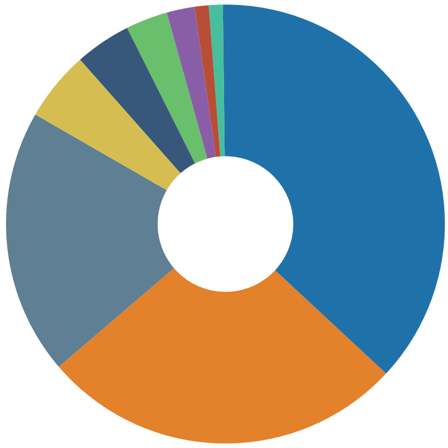
H&M contact:
Most common immediate cause *(2014 – 2018)*

Claims cost > USD 10,000 – non capped

All vessel types

As per 4/2/2019

Underestimating natural forces (interaction)	37%
Navigational error from Master/Officer	27%
Navigational error from Pilot	20%
The ship losing her manoeuvrability	5%
Not applicable	4%
Losing control of vessel	3%
Vessel dimensions excessive	2%
Manoeuvring to avoid collision with other ship	1%
Navigational error from tug	1%



The most common cause of contact, at 36% of all claims, is an underestimation of the environmental factors such as wind and current by the bridge team. This often happens because the bridge team, including the pilot, has planned for one set of conditions and has been caught by surprise. The pilot's local knowledge regarding currents and winds need to be discussed at the pilot briefing. It is also the responsibility of the officers on the bridge to monitor how the vessel is setting, the impact of the currents and wind, and to ensure that the entire bridge team is advised.

However, navigational error can be seen as the biggest cause overall - at 46% - if errors by both the pilot and the Master are combined. Of course this immediate cause is very broad, as it will include mistakes that were made by the bridge team, excessive speed when approaching and the bridge team not communicating effectively between themselves and third parties.

Interestingly it is not that common for a vessel to make heavy contact with a berth because of equipment or machinery failure.

GRAPH 18

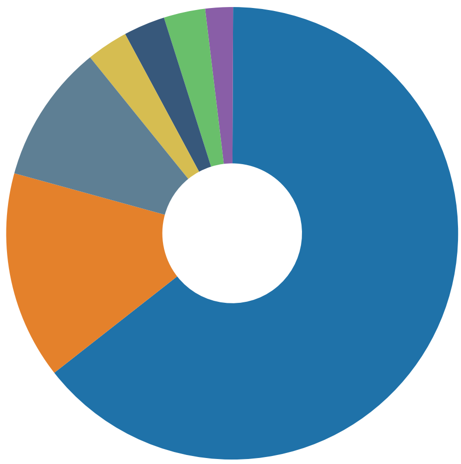
H&M contact:
Most common location *(2014 – 2018)*

Claims cost > USD 10,000 – non capped

All vessel types

As per 11/2/2019

Port	65%
Lock	15%
Port approach	10%
River	3%
Coastal water, within 12 NM	3%
Anchorage area	3%
Single mooring buoy, SMB	1%



It should be remembered that a claim is classed as a contact claim when the vessel makes contact with an object that is not a vessel e.g. a quay, buoy, fenders or a crane. It is not often, therefore, that a contact claim will happen outside a port area.

6.3 Cases

6.3.1 Contact while berthing

It was early morning and a 150 m LOA and 14,900 DWT general cargo vessel, vessel A, was sailing up a South American river with a pilot on board. The Master and pilot had carried out a pilot briefing where the pilot presented the plan for berthing. The vessel would be berthed portside alongside, between two vessels which were already berthed. The Master asked the pilot if any tugboats would be necessary, but the pilot did not believe so as there would be a 200 m gap between the berthed vessels, giving vessel A about 50 m clearance from the berthed vessels.

During the berthing the Chief Officer was by the radar and ECDIS on the bridge, monitoring progress. The vessel had a speed of about 2 knots over the ground in the river and was on a NNW course. There was a strong SSE current at around 2-3 knots and a NE wind at Beaufort scale 3. During the final berthing manoeuvre the vessel passed one of the berthed vessels with only 20 metres clearance on the portside. The wind set the vessel towards the berthed vessel. The Master had the conn and was positioned on the port wing. As he was manoeuvring the vessel, the pilot gave him advice and instructions. When the Master noticed that his vessel was very close to the berthed vessel he ordered full power to starboard on the bow thruster.

Despite the Master's efforts to turn the bow to starboard the vessel continued turning to port and the bow collided with the berthed vessel. The vessel's superstructure was forward, so the bridge wing also caused damage to the berthed vessel.

The Master finally managed to gain control of the vessel and berth it. Upon berthing the vessel, the Master noted that the distance between the two other vessels was 10 metres forward and 20 metres aft.

What can we learn?

- When the Master approached the berth, he should have evaluated if the available tugs should be used or not. If he was unsure about the clearance, he should have asked the pilot for tug assistance before berthing.

- It is important that the Master and pilot discuss what is anticipated and how to carry this out in the safest way When the vessel was sailing up the river there were strong currents and some wind. During the manoeuvre the Master had the conn but needed constant updates from the pilot and Chief Officer about how strong the current was. These discussions should also have taken place during the pilot briefing. Having an NNW course and NE winds on the starboard bow will push the bow to port, especially when the vessel is lining up for the final approach and altering slowly to port and slowing down. The current will also make the approach more difficult as more power must be used during the final manoeuvre as the current would push the bow to starboard.

- The entire bridge team should be involved in berthing. In this instance the Chief Officer was by the radar and ECDIS and was the person who could have informed the Master about changing current or wind. The current also took the pilot by surprise. An efficient bridge team are assigned roles where they all know what they are expected to do and what the other persons are supposed to do. If someone makes a mistake this should be identified by a member of the bridge team. The Chief Officer was on the bridge and he should have supported the Master with information. This is further explained in our Bridge Instruction booklet (see appendix (i)).

Pilot comment – roles and responsibilities
In this discussion it should be clear who is responsible for the manoeuvring. If it is the Master, then it is his decision regarding the minimum number of tugs. He must be happy and at ease. Again, if a pilot feels a tugboat is required, he will advise the Master to order one. Normally a pilot's minimum requirement is the requirement of the Master.

6.3.2 Excessive speed when approaching berth

It was morning with clear skies and NW winds at Beaufort scale 7. A 200 metre RoRo vessel had picked up the pilot. There had been a short pilot briefing where the bridge team were advised that that the vessel would berth starboard side at berth A which had a course of 285 degrees. The approach in the fairway was 090 degrees. This meant that the vessel had to make a large port alteration of 165 degrees to line up with the berth. The port had no breakwater and was open to the sea.

The pilot had the conn and the vessel was sailing down the fairway on a 90 degree course and a speed of 9 knots over the ground. Two tugs were standing by but were not connected. At the position where the pilot decided to begin the alteration there was less than 500 metres of space between the quays in the port basin. The pilot ordered the vessel to come around to port and stop the engines. The vessel was still making 9 knots. The vessel was sensitive to the wind because of the large hull and superstructure. This caused the NW wind to push the vessel away from the berth.

The vessel started to alter to port and the vessel was facing the berth at a 90 degree angle when it was only 50 metres away. The pilot realised the danger and ordered slow astern and hard to port, followed instantly with full to port on the bow thruster. As the speed was excessive for the bow thruster nothing happened.
At the same time the Master realised that the vessel was not slowing down so he ordered the port anchor to be dropped and full astern on the engines. It was too late, and the bulbous bow hit the quay at a 90 degree angle.

After the contact the tugs were connected and berthed the vessel.

The vessel had to dry dock and repair the bulbous bow. The berth also needed extensive repairs.

What can we learn?

- The vessel was approaching at excessive speed. Maintaining a speed of 9 knots when starting to swing around and as close as 50 metres highlights that the berthing plan was not safe and that the bridge team had not planned it accordingly regarding wind and speed.
- The Master did not challenge the pilot until it was obvious that the vessel would make heavy contact with the quay. It is imperative during the pilot briefing that the approach is discussed in detail with the entire bridge team, so orders can be challenged if there is concern.
- Two tugs were standing by but were not connected. Once again, if the vessel had slowed down and had the tugs connected the berthing manoeuvre would have been controlled. If tugs have been ordered why not use them?

7. Grounding

7.1 Introduction

In many of the grounding cases that we have handled, there are recurring deficiencies such as:

- Poor passage planning - the route was planned over a dangerous area.
- The OOW did not check the parameters of the ECDIS, radar and autopilot – this can lead the OOW to assume all inputs are correct and that the information observed is accurate - but it is not.
- Not all navigation equipment is used and so the vessel's position is not confirmed by multiple options e.g. ECDIS, radar, index lines and visually.

It is essential to verify that the ECDIS and GPS are displaying the correct information. This can be done by:

- Visual means, ensuring islands and navigational marks are where they are supposed to be.
- Confirming position with the radar.
- Verifying the gyro compass with the magnetic compass. This is important as GPS jamming is something that can occur.

Technology will improve safety only if the officer knows its limits and how to verify that the correct parameters and settings are entered and displayed. This applies to the GPS, ECDIS and all other navigational equipment. It is important to not just rely on the ECDIS.

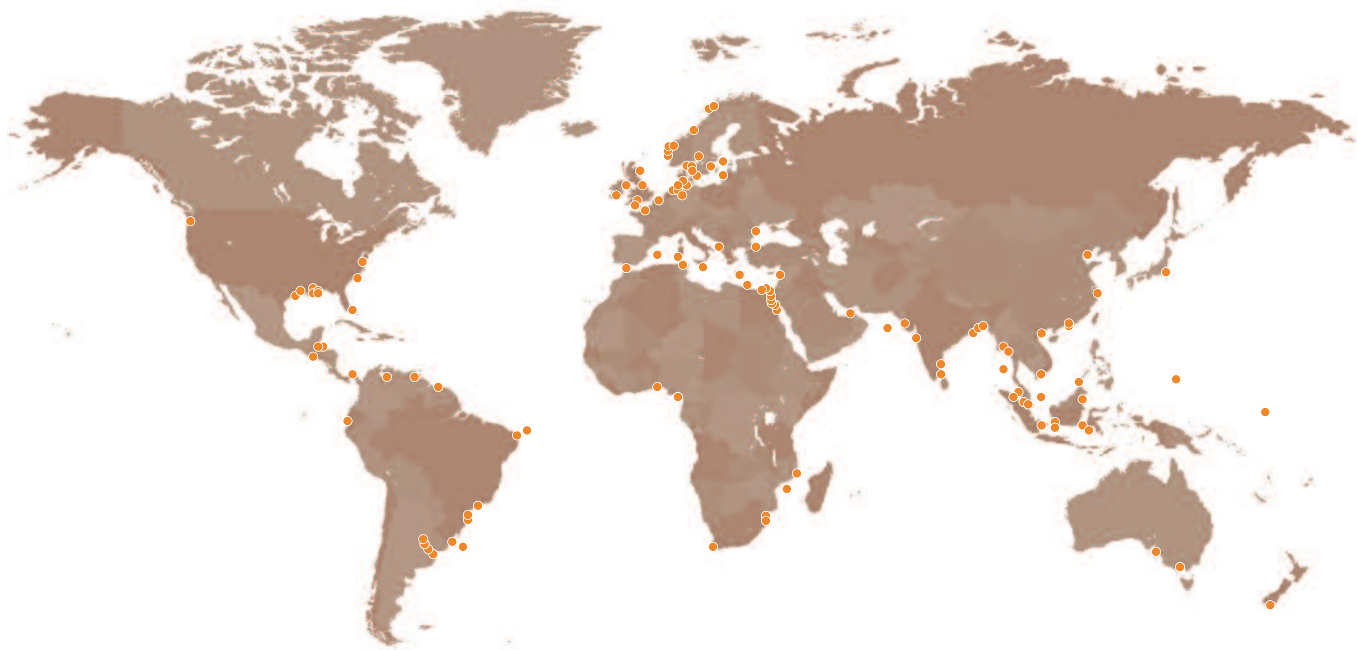
The big concern is that very often the bridge team does not work efficiently as the different members don't discuss the plan - or sometimes don't even have a plan. The pilot must be included in the bridge team and anything unclear about the vessel's progress or deviation from the plan needs to be voiced within the bridge team at once. To have efficient communication is one of the most important factors for a functional bridge team.

7.2 Statistics

GRAPH 19

World map of groundings

The groundings map shows the location of grounding claims between 2014-2018



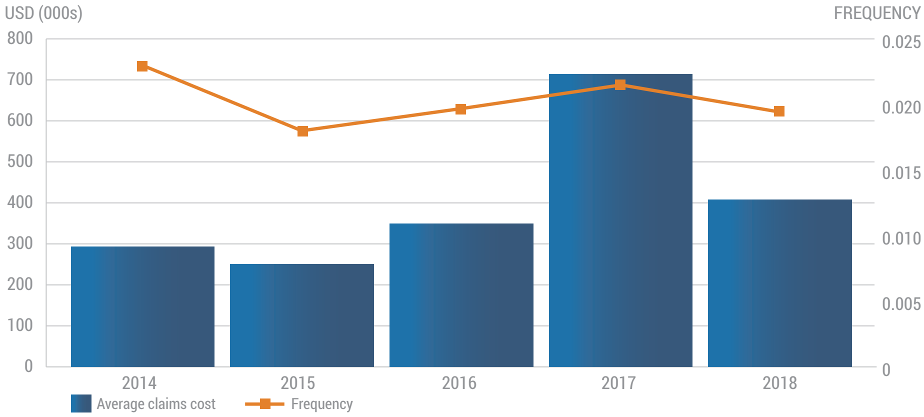
GRAPH 20

H&M grounding: Average claims cost & frequency *(2014 – 2018)*

Claims cost => USD 1 – non capped

All vessel types

As per 11/2/2019



From 2015 to 2017 there was an increase in frequency from 0.018 to 0.02. The average claims cost for 2017 increased considerably due to two unusually costly claims. Looking at specific claim types and especially navigational claims, which are expensive by default, the cost can be volatile hence both frequency and cost decreasing in 2018.

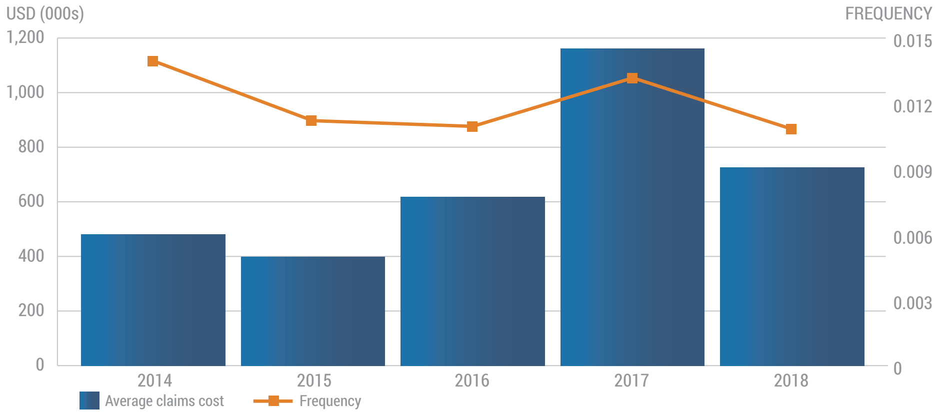
GRAPH 21

H&M grounding: Average claims cost & frequency *(2014 – 2018)*

Claims cost >USD 10,000 – non capped

All vessel types

As per 4/2/2019



In the category >USD 10,000 we can see that both cost and frequency can be volatile – for example, as mentioned previously, 2017 had a high frequency and high average cost caused by two unusually expensive claims. The average claim cost for the five-year period is more than USD 650,000.

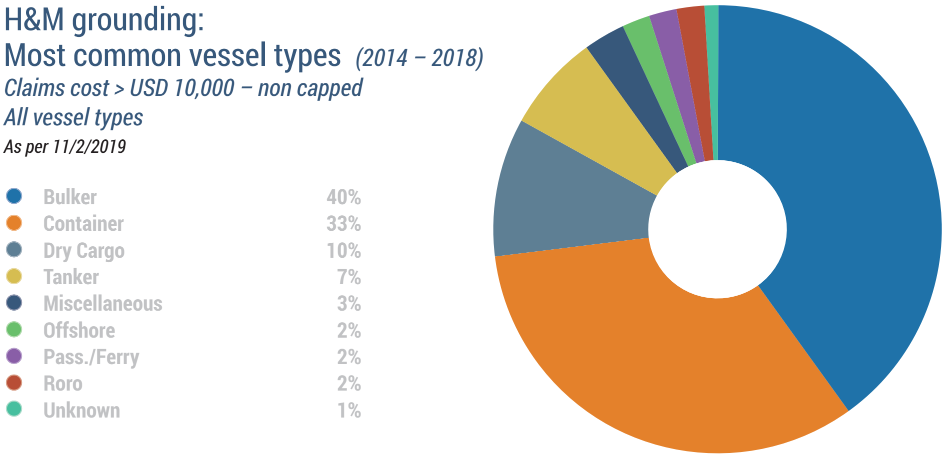
GRAPH 22

H&M grounding: Most common vessel types *(2014 – 2018)*

Claims cost > USD 10,000 – non capped

All vessel types

As per 11/2/2019



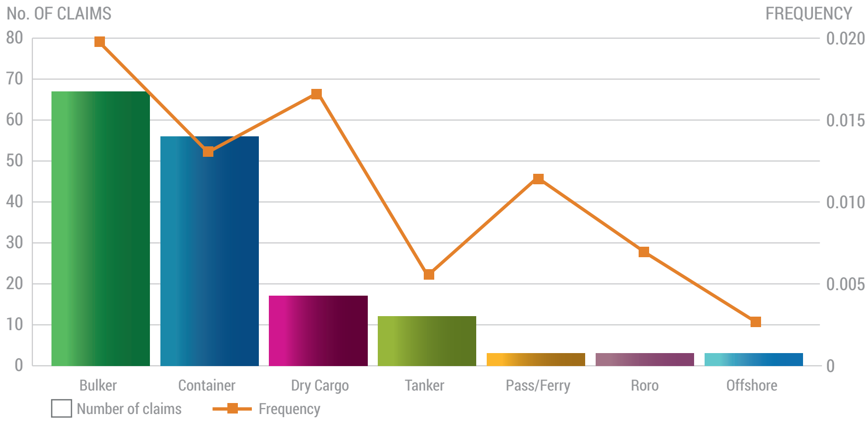
Bulk carriers are seen to run aground the most often followed by container vessels, dry cargo and tankers.

GRAPH 23

H&M grounding: Number of claims and frequency by vessel type *(2014 – 2018)*

Claims cost =>USD 10,000 – non capped

As per 11/2/2019

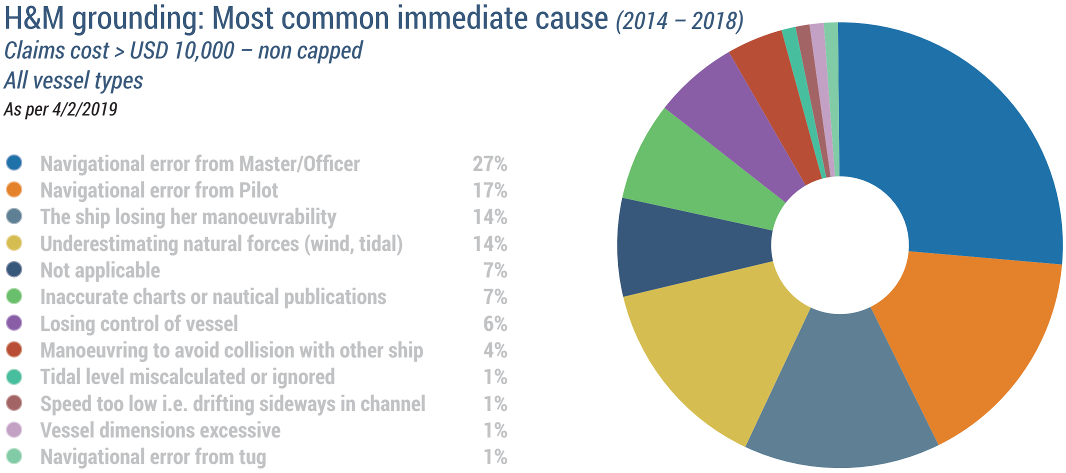


Most groundings happen on bulk carriers, container vessels and dry cargo vessels, and they also have the highest frequency. Our statistics show that most groundings are caused by a navigational error by the Master or pilot.

GRAPH 24

H&M grounding: Most common immediate cause *(2014 – 2018)*

Claims cost > USD 10,000 – non capped
All vessel types
As per 4/2/2019



Navigational error contributes to 42% of claims, followed by the vessel losing its manoeuvrability and the bridge team underestimating natural forces.

Navigational error is often caused by the bridge team, including the pilot, being unable to utilise all the information that is available to them through ECDIS, radar and publications. We have seen the following:

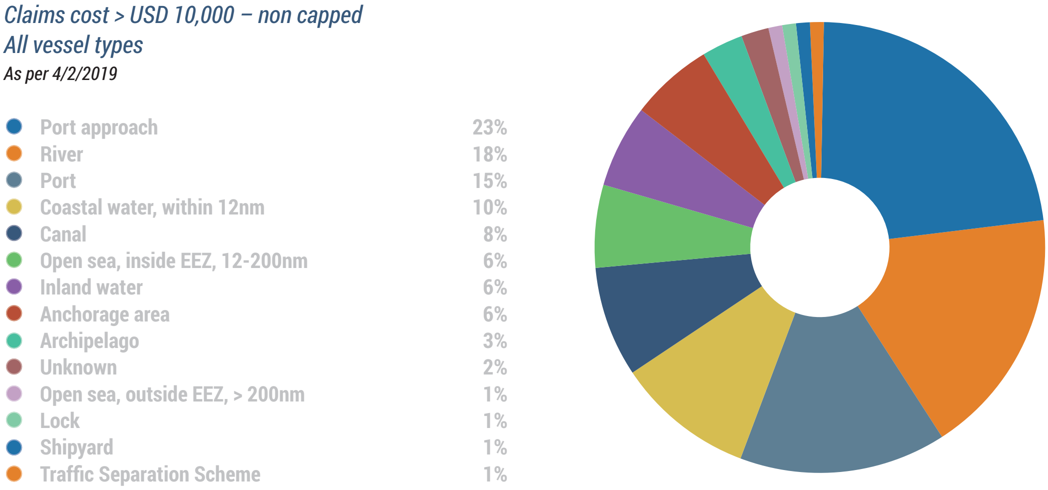
- The passage plan is not always updated when the vessel deviates
- The OOW frequently did not realise that the parameters were wrong on the ECDIS
- The bridge team's communication was not efficient as the Master did not challenge the pilot or ask for clarification
- The officer who had information that could have prevented the grounding did not speak up
- The pilot made his alteration too late or had excessive speed

Of course the causes are numerous, but many of them can be prevented by efficient communication, planning, and understanding the limitations and risks with the navigational equipment.
Losing manoeuvrability happens when the vessel loses propulsion or steering. This usually occurs because of some faulty part in the affected machinery.

GRAPH 25

H&M grounding: Vessel common location *(2014 – 2018)*

Claims cost > USD 10,000 – non capped
All vessel types
As per 4/2/2019



The main locations for running aground are of no surprise. It is most common to run aground while approaching the port, or in a port, accounting for 38% of all groundings.

7.3 Cases

7.3.1 Grounding in unsurveyed waters

A 50,000 GT RoRo vessel had been loading in a European port and the Navigation Officer had prepared the passage plan for the voyage to the next port of call which was in central America. Prior to departure the Master received weather routeing for the passage, which suggested a route over the Silver Bank and via the Windward Passage.

The Navigation Officer planned the route in the ECDIS and on paper charts and discovered that the minimum depth the vessel would encounter was at the Silver Bank where the water depth was 16 metres according to British Admiralty chart 3908.

The vessel's draft was 7.5 metres, so a 16-metre water depth was considered acceptable as per the company's ISM under keel clearance procedure. The procedure stated that there had to be a minimum of 20% under keel clearance of the maximum draught.

On the British Admiralty chart the Silver Bank is marked 'Inadequately surveyed' in three places. On the route planned by the Navigation Officer there was no specific mention of inadequately surveyed waters. The Navigation Officer did not consult the Admiralty Sailing Directions when preparing the passage plan.

After checking the entire route on the ECDIS and on the paper charts, the Master decided to follow the route suggested by the weather routeing company. The passage was uneventful over the Atlantic from Europe and the vessel maintained a speed of 13.5 knots. Shortly after entering the Silver Bank the vessel's bow suddenly swung to starboard, which caused a list for about 3 to 5 seconds, with excessive vibration. The OOW changed to hand steering. A couple of minutes later the vessel's bow swung to starboard, but this time with less vibration. The vessel's bow swung a third time to starboard and listed for about 3 seconds, with vibrations. The vessel continued the voyage to the next port of call after carrying out a damage assessment. It was found that the forepeak tank and a water ballast tank had water ingress. All the fuel tanks were intact.

The vessel arrived at the destination port, discharged the cargo and carried out an in-water survey. It was found that the tanks had been punctured as the vessel had touched bottom.

The vessel had to be repaired in dry-dock.

What can we learn?

- The vessel had on board the Admiralty Sailing Directions NP 70, West Indies Pilot, where it is stated that Silver Bank has been inadequately surveyed and it is not advisable to attempt to cross it. The sailing directions had not been reviewed before or after making preparing the passage plan. It is important to ensure that all reference literature is used when making a passage plan.

- It is important to perform a two-person check for critical operations such as a passage plan. It is more likely that another person will find a mistake rather than just carrying out your own double checking.

- The ECDIS chart information is based on data from the paper charts. If the quality of the data in the paper charts is poor, then so will the data in the ECDIS charts cell be. Each chart cell contains a CATZOC code (Category Zone of Confidence), which indicates the accuracy of the data in the cell. As part of the passage plan appraisal the navigation officer should check the quality of the data. The sailing directions will give good information about routeing and will also mention recommended routes. There are many areas in the world where the chart data is uncertain so even if the chart is vectorised as per IHO standards, it is necessary to check the quality of the data used.

7.3.2 Channel buoys in wrong position caused grounding

A 20,000 DWT dry cargo vessel had picked up the pilot and was approaching the fairway to the port. It was morning with clear skies and light winds.

On the bridge were the Master, the pilot the OOW and the helmsman. The Third Officer was the OOW and had completed the pre-arrival checklist. The vessel was in hand steering mode and the pilot had the conn. The Master had given the pilot a pilot card, but they had not carried out a pilot briefing. The pilot asked for 7 knots in the fairway and lined up the vessel between the buoys.

The OOW was monitoring the vessel's position on the radar and the ECDIS and was also filling out the logbook. The vessel passed the first buoys, and everything seemed in order to the Master when he looked outside.

Suddenly the vessel vibrated heavily and the speed fell rapidly until the vessel completely stopped. The Master realised that the vessel had run aground. He told the pilot that the vessel was aground but the pilot did not believe him as the vessel was in the middle of the fairway.

When the pilot also realised that the vessel had run aground he started to talk on the VHF in the local language. The vessel had run aground on a bank which was outside the fairway. The vessel was clearly visible outside of the channel on the ECDIS and radar. This was also confirmed when the position was plotted.

The Master began to deballast the vessel and carried out engine manoeuvres in an attempt to get the vessel off the bank. Subsequently the Chief Engineer called the Master and told him that the steering gear was not responding. The Master immediately stopped the engines and asked the Chief Officer to sound all tanks and also take soundings around the vessel.

The pilot told him that two tugs were coming from the port to assist the vessel.

The Master had not signed any salvage contract, but the two tugs began to attempt to refloat the vessel with the assistance of the pilot and authorities. The tugs managed to remove the vessel from the bank the following day.

What can we learn?

- The bridge team did not check the position of the vessel on the chart, radar, or by any other means than visually.
- The passage plan should be berth to berth, so there should have been a planned route into the port which would have highlighted the discrepancy in the vessel's position on the ECDIS.
- The vessel had an ECDIS, but it appears no one was monitoring the display during the approach.
- There was a leading line for the approach, but for some reason it was disregarded. The bridge team did not monitor the vessel's progress with all the available navigational equipment.
- It is important that the shipowner has a navigation policy that details which navigation equipment should be used and how the bridge should be manned efficiently at different stages of the voyage. Leading lines should always be used, and the vessel's position should be confirmed by radar, GPS and visually. This was not done.
- In addition, the passage plan should be berth to berth and it should detail how to conduct a pilot briefing. It is obvious that the pilot should have known that the buoys were out of position. It is important that the bridge team follows the passage plan and monitor the actions of the pilot.

- It is not advisable to try to refloat a vessel until a proper assessment of the grounding location has been performed. The situation needs to be assessed by professionals in cooperation with the insurer, class, authorities and salvors. The Master should not permit local authorities to board the vessel and start a salvage operation without the involvement of the owner.

Pilot comment

- *If one buoy is out of position and a leading light is available any pilot should be able recognise the offset position.*
- *The bridge team should have been concerned when the vessel was not following its intended track. The position of the vessel should have been verified with alternative means (radar, ECDIS and/or GPS) and without reference to the buoys.*
- *If this is a VTS monitored area, the VTS operator should have noticed that the buoys were out of position and they should have informed the pilot about the buoy position beforehand. Also a warning should have been given when the vessel was deviating from the channel.*

7.3.3 Missed waypoint caused grounding

It was night and the 700 TEU container vessel was sailing near the coast towards the next port. It was raining, so visibility was reduced.

On the bridge was the Second Officer who was OOW. The passage plan had been approved by the Master and the bridge team and entered into the GPS and radar.

Suddenly the vessel vibrated heavily and veered strongly to port. The OOW was confused about what had happened. Soon afterwards the bow thruster room high level alarm sounded. The Master came to the bridge and when he asked what had happened the OOW was still confused.

The Master called the Chief Officer and asked him to check the forepeak and bow thruster room. A couple of minutes later the Chief Officer informed him that there was water ingress in both locations.

The Master stopped the engines and the vessel drifted until the situation could be assessed. The Master realised that the vessel had hit the bottom and contacted the nearest JRCC and informed them that the vessel had grounded and was taking on water. The Master asked for assistance as he was unsure what had happened.

Fortunately there was no pollution and no injuries, and the steering gear, engines and bow thruster were all operational. A rescue vessel from the nearest port came out to the vessel but no assistance was needed, and the vessel sailed to the nearest port and berthed without incident to assess the damage.

The vessel frequently traded in the area, so the voyage was not unusual. It was found that the Navigation Officer had forgotten to insert a waypoint in the GPS. This meant that the course took the vessel straight over a shallow area where it ran aground.

What can we learn?

- When preparing a passage plan it is suggested that the plan is double-checked by another officer to ensure all waypoints have been entered into the navigation equipment. It is prudent to perform a two-person check of the passage plan and all critical navigational equipment, such as the GPS, before departure. The passage plan needs to be signed by all bridge officers and the Master.
- It is also suggested that every officer taking over the watch ensures that the passage plan is correct and that all the correct parameters are included in the GPS, radar and ECDIS. Any deviation from the passage plan during the watch needs to be reported when handing over to the next watch officer.
- If the passage plan is entered in the ECDIS and the correct safety depth is entered in the system, the software can check that the passage plan is not crossing any area with less depth than the safety depth. If any shallow areas or any other dangers are detected a warning will be triggered, which the Navigation Officer must check and rectify. In this case the passage plan was not entered into the ECDIS and was only entered into the GPS and radar.
- Once again, we highlight that all navigation equipment should be used and checked during the voyage.

7.3.4 Grounding in heavy weather

It was an autumn night, and strong winds of Beaufort scale 10 hit a Handysize bulk carrier. The vessel was in ballast condition and sailing through an archipelago.

The Third Officer, acting as OOW, and a helmsman was on the bridge. The vessel was in hand steering mode and was only making 2 knots over the ground. It was difficult to maintain course and the wind was blowing in on the port bow. The helmsman had put the rudder hard to port but the vessel began to alter to starboard. The OOW called the Master and informed him that it was difficult to maintain course. The vessel was between two islands, which made the winds even stronger as the islands were creating a wind tunnel.

The Master came up on the bridge and ordered the OOW to go to the emergency steering room.

The vessel was classed to have the engine control room constantly manned. The Master called the duty engineer and asked for the engine controls to be transferred to the bridge. When transferring the engine controls the engine had to be put on standby.

The Master made an announcement on the PA system and asked all crew to come to the bridge. The Chief Officer was told to prepare the anchors.

The OOW was now in the steering gear room and confirmed that the rudder was hard to port.

The Chief Officer informed the Master that it was impossible to enter the main deck as large waves were washing over the deck.

The duty engineer called the Master and informed him that the bridge now had the engine controls. However, the vessel had drifted very close to an island during the engine transfer. Before the Master managed to increase the engine speed the vessel hit rocks.

What can we learn?

- In heavy weather it is important to reduce speed, but this can only be done if the steering can be maintained. To put the engines on standby to transfer the control to the bridge was a poor decision, as the vessel was then drifting between the islands in heavy weather. If the Master wanted the bridge to have the engine controls, it would have been safer to shift the controls when the vessel was in open water and not battling heavy weather.
- The vessel was in ballast condition and if heavy weather is anticipated the vessel should be ballasted in such a way to increase the draft and reduce the wind area.
- The bridge team was not prepared for the heavy weather and did not amend the route. It would have been possible to remain in open waters and not pass between the islands.
- Why the Master sent the OOW to the steering gear room is unclear. It seems that the Master did not trust the rudder indicator and wanted to confirm the angle.

7.3.5 High speed caused grounding

A Suezmax oil tanker loaded with crude oil was transiting the Suez Canal from North Africa to India. On the bridge were the pilot, Master, helmsman and Chief Officer. It was morning and a second set of pilots had just boarded the vessel. The pilots carried out a handover on the bridge – this was carried out in Arabic. After the handover the new pilot ordered the vessel to increase to full speed ahead. The Master asked the pilot if full speed was really necessary as the vessel was fully loaded and had a draught of 14.5 metres. The pilot replied that there were strong currents ahead and that full speed was required. The vessel managed to achieve a speed of 9 knots over the ground.

About one hour later the vessel had to alter course to port from 171 degrees to 154 degrees. The pilot ordered port 20 to the helmsman, and the vessel began to alter at a rate of turn of 15 degrees per minute and was rapidly closing the distance to the eastern canal bank at full speed. To counteract this the pilot ordered hard to starboard. This caused the vessel to swing to starboard at a 25 degree rate of turn, and the vessel listed heavily.

The Master asked the pilot if the western branch of the channel was safe. The pilot stated that it was not. At this point the Master took over and relieved the pilot as he determined that the pilot had lost control of the vessel. The Master ordered hard to port and the vessel just missed the buoys by the centre embankment. The vessel was again heading for the west bank and the Master initially reduced the engine speed to slow ahead, but realised that he needed to turn more quickly, so he ordered full speed ahead to increase the rate of turn. Unfortunately, the Master could not avoid the bank and made contact a couple of times before ending up in the middle of the canal where the vessel finally stopped.

About an hour later the vessel anchored in the Bitter Lakes and informed the Suez Canal Authorities about the incident. There was no pollution and divers inspected the vessel and found several dents in the hull.

The vessel had to dry dock to repair the damage to the hull at a substantial cost. The vessel was out of service for over a month

What can we learn?

- This was a fully laden tanker, and increasing the speed to full ahead in the Suez Canal caused the stern of the vessel to swing towards the near bank (the Bank effect). Neither the pilot or the bridge team discussed this possibility as the pilot increased the speed. It is obvious that the Master was uncomfortable with the pilot's decision, but he still accepted it.
- The reality was that there were no strong currents at the time. If the bridge team had checked the current this could have been brought to the pilot's attention.
- The pilot's action was not up to the expected standard and to relieve a pilot is an unpleasant and stressful experience. It is essential that managers train their Masters to challenge a pilot who does not comply with the vessel's SMS and company's ISM regulations. However, there should have been a proper pilot briefing where the pilot and the rest of the bridge team discussed the upcoming pilotage and what to expect. This should have included expected environmental conditions, what speed and what rate of turn would be suitable, how the vessel performed when it was fully laden and any upcoming traffic. If these issues are discussed it is likely that all involved parties can give their input on why a suggested action is advisable or not.

Pilot comment

The pilot is the adviser to the Master, and the Master remains responsible. A pilot cannot force a Master to go full speed if he has grounds not to do so.

8. Sea Traffic Management

8.1 Introduction

The Swedish Club has observed that about 70% of all collisions occur in congested waters. These are defined as waters encountered when departing or approaching the port, navigating in the port, or by an anchorage. If we also include coastal waters, it is about 79%.

What can be done about this? A great deal of focus has been on improving the use of technology to assist the crew. However, the human factor is the main reason for most accidents, and so emphasis has also been put on training and improving operational procedure.

Sea Traffic Management (STM) is a new concept, which introduces standardised real-time information sharing in the shipping industry. Transparency leads to better overall decisions resulting in increased efficiency and, in the maritime industry, improved safety as well.

The Swedish Club has been part of the STM Validation Project, joining nearly 80 partners in a consortium aimed at developing STM. The aim of the group is to 'think outside the box', to look at traditional practices and procedures and question whether they can be done better. For example, many collisions occur when navigating in and near anchorages. If the industry could reduce, or ideally eliminate, anchoring outside ports, those accidents would disappear as well. There is a need to 'decongest' the waters.

8.2 Anchorage

Anchoring occurs mostly just outside ports in designated areas or 'anchorages'. The main reason for anchoring is that a vessel is contractually obliged to be at the port at a certain time, but when it arrives the port[4] is not ready to receive it. Other reasons can be that the vessel is waiting for services, waiting for cargo, or avoiding bad weather.

If the port is aware that they cannot receive the ship, systems today exist that can provide this information to the vessel in advance, allowing it to slow down, and in an ideal situation arrive just-in-time. If the ship arrives just-in-time anchoring is then eliminated.

There are two reasons that this is not happening today. Firstly, there is no standardised information format or method to exchange the information. The second is that the contracts stipulate arrival time to the port area, not to an available berth.

Standardised information sharing

Edition 4 of the IEC 61174 standard on Route Exchange, which was elaborated by STM partners, enables the desired information exchange. The port can recommend a new arrival time and the ship can adjust. This works both ways. If the ship informs the port of a change in the estimated arrival time, the port can adjust its plans, whether the ship comes in earlier or later than previously communicated. The technology exists and it is operational. 300 vessels are currently equipped with STM-compatible ECDIS that can communicate with ports, among others. Many ports in Europe have participated in the STM Validation project 2015-2018 and demonstrated this synchronisation – the port of Rotterdam has recently implemented an operational system which is STM-compatible.

Contractual requirements

It should be noted that there are benefits when a ship avoids anchoring. In most cases this is due to reduced fuel consumption as the vessel travels at a slower speed during the voyage. The issue is calculating how to split these benefits between the parties. A first step is the recently approved BIMCO STM clause, which can be used in the standard contracts that BIMCO supplies to the majority of the shipping industry.

[4] "Port" in this sense refers to the cluster of port players who all need to be ready and available for a port call to happen. Berth availability, approach conditions and service availability all play a role.

8.3 Decongestion

There are two ways to reduce congestion: Reduce traffic or redistribute existing traffic geographically and time-wise. Traffic can be reduced by shorter port calls thanks to STM-related services, but this will take time to implement and has a long-term effect.

The issue of traffic distribution is being addressed by an ongoing project, STM Efficient Flow. This is currently looking at how to avoid ships meeting in narrow passages in the archipelago between Finland and Sweden, where large RoRo ferries sail. There at least 10 locations where two ships cannot meet at all, and 20 locations where meetings are very tight. Today, ships try to time these passages by using VHF-contact with each other but there are cases when ships have to wait at almost zero speed next to narrow passages. This is not optimal for safety and efficiency reasons.

STM-enabled ECDIS on board and STM-enabled VTS-services onshore will lead to better planning of ships' meeting. The vessels can adjust their speed between the narrow locations to ensure that all meetings happen in the less narrow passages. The VTS will send out route recommendations including recommended times for the different waypoints.

The same principle can be applied in other congested waters. The Master and the VTS can together plan the routes well beforehand to avoid potential risk situations by adjusting routes geographically and/or time-wise. This would be based on factors like traffic density, fairway restrictions and required arrival time.

8.4 Decision support

STM-enabled VTS and STM-enabled ECIDS will have future functions which assist operators to identify risk situations and to suggest mitigating actions. They will provide assistance both when planning the route in an area (see Decongestion) and identifying unforeseen situations that happen despite good planning. Some products today offer COLREGs advice, but the decision support envisioned by the STM team comes in to play long before COLREGs apply, and are not meant to replace COLREGs in any way.
See attachment (ii) for more examples of decision support.

8.5 Conclusion

Sea Traffic Management will help seafarers with improved decision support on board in three ways:

- Establishing a common situational awareness
- Easier access to shore-based services
- Eliminating risk situations before they occur


FUR

9. Pilotage

9.1 Introduction

The pilot joins a vessel to increase safety on board and to assist the Master and the rest of the bridge team by providing local knowledge. It should be remembered that most of the time vessels berth or unberth without any problems.

So, why do navigational accidents happen when the pilot is on board? A recurring problem that the Club sees is that the pilot has not been integrated efficiently into the bridge team.

The pilot's role is to advise the Master on how to take the vessel safely to and from the berth. However, if this is not shared then the pilot's plan may be unknown to the rest of the bridge team. This is usually because there has not been a pilot briefing between the pilot and bridge team. If a plan is discussed and agreed, it is easier to amend the plan if there are complications.

Another issue is that in some of the cases included in this publication the Master has been uncomfortable with the pilot's orders but has not questioned them. It is important for the Master to be polite but assertive when he feels that the vessel's safety might be at risk. To avoid such a situation occurring the Master's expectations and the plan need to be discussed during the pilot briefing. The Master should inform the pilot of any parameters e.g. the rate of turn and speed he is comfortable with, and the pilot should explain to the Master what the plan is to ensure the operation is safe. This is what we would consider having good situational awareness.

If the pilot is not included in the bridge team and the pilot's plan is not discussed and agreed, the pilot will operate alone and make the rest of the bridge team irrelevant. The Bridge Instructions booklet (see attachment (i)) details what we believe is a safe and efficient bridge organisation.

In an excellent initiative the Swedish Maritime Administration is planning to make all pilot passage plans public and available to be downloaded for any vessel. This means that the navigation officer can download the routes and install them before the pilot boards. This will ensure that the vessel's bridge team have the same plan as the pilot, and it will be easier to discuss and adjust the plan when needed.

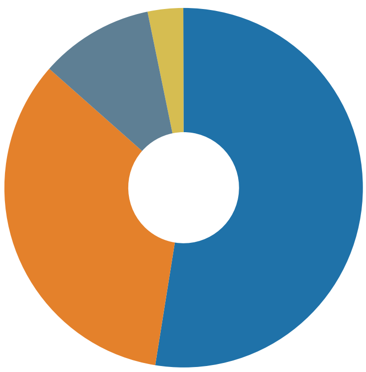
It would be positive to see more pilot associations making their routes official as this will improve safety.

9.2 Statistics

GRAPH 26

H&M collision: Pilot on board *(2014 – 2018)*
Claims cost > USD 10,000 – non capped
All vessel types
As per 4/2/2019

No	53%
Yes	34%
Unknown	10%
Not applicable	3%



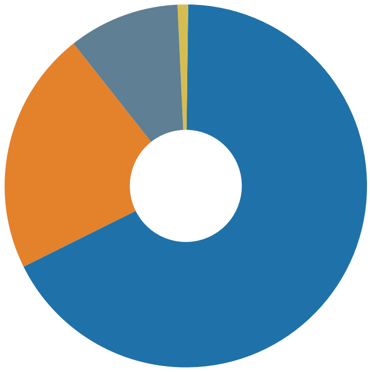
Most vessels need a pilot when they are approaching or leaving a port. Graph 11 shows the location of most collisions - about 27% happen in a port, 18% in an anchorage area, 13% when approaching the port, 4% in a river and 6% in a canal. About 68% of all collisions happen in or close to the port where it is common that a pilot is on board. As per our statistics about 35% of all collisions occur with a pilot on board.

GRAPH 27

H&M contact: Pilot on board *(2014 – 2018)*

Claims cost > USD 10,000 – non capped
All vessel types
As per 4/2/2019

- No 67%
- Yes 22%
- Unknown 10%
- Not applicable 1%



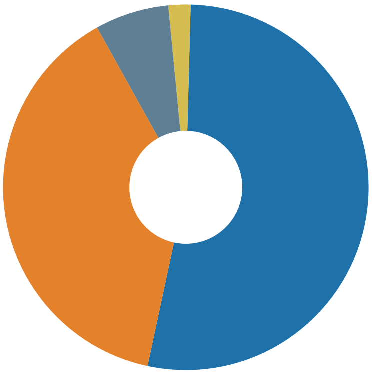
There is no surprise that a pilot is on board in 68% of all contact claims as we can see from Graph 17 that 65% of contacts happen in port, 15% in a lock and 10% when approaching the port. About 88% of all contact claims happen within the port area where it is common that a vessel has a pilot on board.

GRAPH 28

H&M grounding: Pilot on board *(2014 – 2018)*

Claims cost > USD 10,000 – non capped
All vessel types
As per 4/2/2019

- No 53%
- Yes 39%
- Unknown 6%
- Not applicable 2%



A pilot is on board in 53% of all groundings. Graph 25 shows that a total of 38% of all groundings occur in the port area where it is common that the pilot is on board.

9.3 Conclusion

At The Swedish Club we believe that it is essential to have a pilot on board to increase safety. Almost all pilotages are successful, and so most of the time these operations are carried out correctly. However, in some parts of the world the pilotage is not up to an acceptable standard, and in combination with an untrained crew, accidents will happen. This has been highlighted in the cases included.

The responsibility of the vessel always remains with the Master. The pilot is there to assist. To make the pilotage as safe as possible it is imperative that a pilot briefing is held where the environmental conditions, traffic, local regulations and berthing arrangements are discussed. The pilot should be included in the bridge team which means that the pilot and bridge team are constantly updating each other on what is happening and what the plan is.

If this is not done there is a greater risk that an accident will happen. This is highlighted in our statistics and case studies.

"A pilot is on board for an extra layer of safety, for the part of the voyage where ships are most vulnerable for damage. Yes, pilotage organisations should improve themselves and should be aiming at zero incidents. Ships' crews and pilots should have a shared mental model and should challenge whenever outside the agreed envelope. Not having a pilot on board would not make things any better."

Marcel van der Horst, pilot

10. Preventive measures

To navigate a ship safely from A to B should not be an overly complicated process. This is especially true if the individuals involved have the same kind of training, knowledge and plan. The problem is that most officers have very different backgrounds, experience and knowledge.

In many of our cases officers have not followed the COLREGs, or they assumed that the information they were viewing on the ECDIS was correct without checking the settings or parameters – indeed it is possible that they did not know how to check.

It is also common that the bridge team do not work as a harmonised team. For example the OOW lets the Master and pilot make all the decisions and does not question or raise any concerns which could have highlighted a mistake made by the Master or pilot. On the other hand, the Master might not encourage challenges or assertiveness, and may not include the rest of the bridge team in the navigation process.

It is worth noting that there are no officers in the case studies included that have not complied with the required training as per the STCW regulations. This highlights once again the importance of verifying the competence of crew members before they are hired. It is not sufficient for a manager to ensure only that crew members have the required certificates and then assume that the bridge team will work efficiently. They need to be provided with proper training.

To rectify many of the highlighted issues we would suggest that technical managers focus on training that covers the following points:

- Enhances the bridge officer's knowledge regarding the company's navigational policy that defines how the bridge should be manned efficiently, CPA requirements, that the passage plan is berth to berth and explains how to conduct a pilot briefing.
- Advises that all bridge equipment should be used during the voyage.
- The OOW needs to be proficient about the bridge equipment and its limitations.
- That a two-person check of the passage plan and all critical navigational equipment e.g. GPS, radar and ECDIS is always carried out before departure.
- Sets defined parameters for all navigational equipment e.g. ECDIS, radar, autopilot, AIS.
- When taking over the watch, the OOW should check the passage plan and ensure that all the correct parameters are included in the GPS, radar and ECDIS.
- Simulator training that focuses on how to use specific bridge equipment.
- That specific bridge team roles as described in the Club's Bridge Instructions booklet (see Appendix (i)) are implemented. It is also effective to train in these roles during simulator training.
- That the OOW knows to call the Master and ask for extra support when the situation dictates. This should be defined in the navigation policy and be based on visibility, distance to shallow water and traffic density.
- It is essential that the OOW ensures that a proper lookout is maintained all round the vessel.
- That safe speed is maintained when approaching the berth, in congested waters and in restricted visibility. By reducing the speed, it is likely that this will increase the officer's situational awareness as there is more time for making decisions.
- Ensure that the passage plan is followed and understood by every bridge officer.
- Implement 'Port cards' which should include information on any specific risks for the particular port, how to approach the port and designated berth, radar map overlays, no-go areas, turn radius, rate of turn, defined under-keel clearance, maximum speed on the different legs, radar overlay on the ECDIS, index lines etc.
- During the pilot briefing the Master should ask the pilot about local regulations, concerned traffic, expected currents and winds, passing requirements and how the pilot plans to approach the arrival/departure. If the local language is spoken the pilot should be asked to explain the conversation, in English, to the bridge team.
- Being assertive with fellow officers and pilots if the agreed plan is not followed.
- Focus on training that highlights why procedures are in place, so the crew members believe in the process. For this to work the crew members' feedback needs to be evaluated and if useful, also implemented.
- If tugs are available there is seldom a reason not to use them.
- MRM training so the bridge team works more efficiently.

We would suggest that this is verified during the annual internal audit of the vessel and that required training is based upon those findings.

11. Conclusion

It should be remembered that people generally come to work to do a good job. When we look at an accident in hindsight the decisions might look poor, but we have to ask ourselves why the person thought the decision at that time made sense to them, and not just quickly blame them. People should, however, be held accountable for the decisions that they make. For this to work the technical managers have to show that they have given the crew trust and authority to make decisions. Technical managers should also show that they have provided training to crew members for the bridge equipment and procedures that they expect them to follow.

If a crew member is dismissed immediately after an accident it sends the signal that if you mess up, you will be punished. This may lead to people hiding their mistakes instead of voicing them and asking for help to rectify the problem. Of course this does not mean that if a crew member has been found to have committed a serious breach they should not be dismissed, but before acting it is important to establish exactly what has happened and why.

Simply adding new procedures after an accident without consulting the people on board can also prove inefficient. It may ensure that existing practices continue to be carried out secretly. It is essential that the procedures are in line with how the job is really being done. If the company wants real change it needs to emphasise transparency and training.

It is important not to put the blame for an incident on a specific person but try to see why this accident happened and why the system allowed it to happen.

The problem with hindsight is that it makes it easy to point out the problems and what went wrong. The chain of errors is a popular tool when looking at an accident in hindsight. Unfortunately, an accident is usually not simple - it is complex and removing one error has never proven to prevent any accident.

Dr Sidney Decker states in his book The Field Guide to Understanding Human Error, that when talking about human factors we need to look at the entire system that was involved and try to understand why the system failed. Not just point fingers but improve the system that allowed the accident in the first place.

It is not the system that is safe, it is the people in the system that make it safe. If we have this approach, we believe it is likely that it will improve safety. In highlighting why accidents happen, we aim to assist shipowners and managers to examine their own systems and procedures, and use the case studies to ask: Could this happen on my vessel?

12. Abbreviations and terms

AB: Able seaman

Abaft: In or behind the stern of a ship.

Abeam: At right angles to the fore-and-aft line:

ARPA: Automatic Radar Plotting Aid

Beam: The overall width of the ship measured at the widest point of the nominal waterline.

Beaufort: An empirical measure that relates wind speed to observed conditions at sea or on land

Cable: Nautical unit of measure equal to one tenth of a nautical mile

CATZOC code: Category Zone of Confidence

COLREGs: International Regulations for Preventing Collisions at Sea

Command: Command of the Watch

Conn (or Conning Officer): In operational control of the watch

CPA: Closest Point of Approach

C-X: The time in minutes before the collision.

DWT: Deadweight Tonnage

ECDIS: Electronic Chart Display and Information System

ETA: Estimated Time of Arrival

GPS: Global Positioning System

GRT: Gross Register Tonnage

GT: Gross Tonnage

IHO: International Hydrographic Organization

IMO: International Maritime Organization

ISM: International Safety Management (Code)

JRCC: Joint Rescue Co-ordination Centre

LOA: Length Overall

Lookout: AB on watch reporting visible traffic or objects to the Conn

Monitor: Monitors progress of the vessel

MRM: Maritime Resource Management

Nav: Plots position and associated paperwork

NM: Nautical miles

OOW: Officer of the Watch

SMS: Safety Management System

STM: Sea Traffic Management

TEU: Twenty-foot Equivalent Unit

VDR: Voyage Data Recorder

VHF: Very High Frequency Radio

VTS: Vessel Traffic Service

Appendix (i) Bridge Instructions

The Swedish Club 2011, Edition 2

The Bridge Instructions are based in acccordance with IMO's International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978, as amended in 1995 and 2010 as per the Manila amendments (STCW-Convention), ICS' Bridge Procedures Guide and The Nautical Institute's Bridge Watchkeeping.

1. The Master

1.1 has the ultimate responsibility for the safe and efficient operation of the vessel and always has overall command.

1.2 shall ensure that each officer of the watch (OOW) is sufficiently familiar with the ship's navigational equipment, parameters to be used, manoeuvring capabilities and all safety equipment.

1.3 shall ensure that the OOW is prepared and ready to assume sole operational responsibility for the watch at sea.

1.4 shall expressly inform the OOW when he assumes control of the vessel's navigation as well as when he returns the responsibility for the navigation of the vessel to the OOW.

1.5 shall ensure that all communication is done by closed loop.

1.6 shall organise the watchkeeping, ensuring that the bridge team members (himself included) are allowed sufficient rest periods in accordance with the STCW convention and/or national rules and regulations.

1.7 shall issue written standing orders and special instructions as necessary.

1.8 shall at least assess traffic density, danger zones, weather conditions, experience of the Officer and ensure that sufficient crewing for the safe navigation of the vessel is never compromised and that all factors regarding the safe navigation of the vessel are prudently assessed. This is not an exclusive list.

1.9 shall ensure that all members of the bridge teams are properly trained regarding all steering modes.

1.10 shall ensure that all bridge team members are familiar with the company's SMS.

1.11 shall only allow the OOW to be sole watchkeeper if the situation has been carefully assessed. Assistance should be available immediately to assist the OOW if the situation changes.

1.12 shall ensure that there is a climate onboard that encourage challenges and assertiveness.

2. The Officer of the Watch (OOW)

2.1 is the Master's representative and his primary responsibility at all times for the safe navigation of the vessel. The OOW shall comply at all times with the applicable regulations for preventing collisions at sea.

2.2 shall ensure that a good lookout is maintained at all times using all means available, including but not limited to, visual, audible and electronic.

2.3 shall ensure that all communication is carried on by closed loop.

2.4 shall always comply with the Master's written standing and special orders.

2.5 shall ensure that members of the bridge team are informed and updated on occurrences during the watch that are of significance to the safe navigation of the vessel.

2.6 shall always comply with the vessel's SMS.

2.7 shall check during every watch at least the following list, which is not exhaustive:

- latest weather
- reporting points
- compliance with environmental regulations
- autopilot parameters
- ECDIS parameters
- radar parameters
- AIS is updated

- check the different steering modes
- GPS signal strength and accuracy
- the gyro and magnetic compass errors and the synchronisation between the compass repeaters and the main gyro;
- lights and signals
- the operation of the GMDSS equipment.

2.8 shall call for reinforcement of the watch whenever required.
2.9 shall use SMS-approved checklists for critical operations.
2.10 shall not use any distracting devices i.e. mobile phones or computers that are not related to the safe navigation of the vessel or the operation.
2.11 shall immediately call the Master:

- in accordance with the Master's standing orders and as per the company's SMS
- when visibility deteriorates below the limit stated in the Master's standing orders
- when in doubt regarding the intentions of other vessels
- if there is the slightest doubt of the vessel's true position
- when there is an engine breakdown, when steering gear or any essential navigational equipment not working properly, and for any other reason causing doubt about the safe navigation of the vessel

If you are thinking about calling the Master, you should call the Master.

3. The Lookout

3.1 A good lookout shall be maintained at all times using all means available, including (but not limited to) visual, audible and electronic means.
3.2 The duties of the lookout shall be clearly communicated to the AB assuming the watch.
3.3 shall use closed loop communication.
3.4 should be briefed about what to expect during the watch, such as lights i.e. changing visibility conditions, traffic density, distracting light from shores.
3.5 shall report all visible lights and objects.
3.6 should be positioned so his/her night vision is not affected.
3.7 shall be trained to use basic functions of the radar.
3.8 shall not be occupied on activities that may impede the lookout.

4. Bridge Team

To have an efficient and safe Bridge team, it is very important that all tasks are well defined and familiar. In a well-functioning system, all team members should know what to expect from each other and who is responsible for what; the goal is to eliminate assumptions.

The advantages of the system will be obvious in situations requiring a high degree of attention and close monitoring of the navigation, such as navigating in waters with dense traffic, fog and during arrival and departure.

In the ideal system, there will be several Officers and Lookouts but this is not always achievable with smaller crews. This system should still be capable of being implemented with team members having several roles.

The definition of the duties is;
COMMAND
The Master has always overall command of the vessel but not necessarily the Conn.

CONN

- will be in operational control
- informs all team members about planned manoeuvres and actions

- delegates defined tasks to team members
- shall request challenges from team members when limits are exceeded

MONITOR
- shall monitor the progress of the vessel and ensure that actions
- of the Conning officer have the desired effect
- shall challenge the actions of the Conning officer when limits in the passage plan are exceeded or when in doubt about the Conning officer's actions
- shall be updated on the progress of the vessel to the extent that he/she can assume control of the vessel at any time
- under most circumstances, it is an advantage if the more senior officer acts as the Monitor

NAV
- Plotting position
- Completing the logbook
- Completing Checklists

LOOKOUT
- Reporting visible traffic or objects
- Hand steering

It is prudent to rotate the different tasks between the team members, so that all are familiar with every task. Before arrival and departure a pre-arrival and pre-departure meeting should be held. During this meeting what to expect and how the operation should be executed safely should be discussed and tasks should be delegated.

During a normal sea watch it is common to have one officer on the bridge and one lookout. The officer will monitor the vessel's progress. This system requires that the bridge is manned with a minimum of two officers. The officer with the Conn will be in operational command of the vessel and ideally will be in the cockpit all the time, whilst the Monitor will monitor the vessel's progress and the effect of the Conning officer's actions, and that orders are given and executed correctly. The Monitor should be assertive and question orders. The level of attention and follow-up by the Monitor shall be such that he/she can assume control of the navigation of the vessel at any given moment. The officer with the NAV task should plot the vessel's position, fill out the checklist and the logbook and deal with issues that the conning officer cannot handle from the cockpit.

The Lookout should report all visible traffic and objects, and be on standby for hand steering at anytime. In an ideal world each separate duty should be handled by one team member only. This is not always possible, and a team member can have several duties.

Command = Master
Conn = Master, Pilot, OOW
Monitor = Master, OOW
Nav = OOW
Lookout = AB

For this system to work it is imperative that correct information is received by all team members and that closed loop communication is used. It should always be clear who has the Conn i.e. if the OOW has the Conn, the Master must clearly inform the bridge team when he takes the Conn.

5. Navigation

5.1 The OOW must be familiar with the operation of the engine controls including, but not limited to, limiting and override functions.

5.2 The OOW and the helmsman must be familiar with the changeover between manual/automatic steering. In addition, the OOW needs to know the characteristics of the steering system including:

- the emergency steering system;
- all automatic steering settings and override functions;
- and all other different steering modes and their capabilities and limits

5.3 The OOW must understand the factors influencing the manoeuvring characteristics of the vessel such as squat and the propeller rotation.

5.4 The OOW shall refer to the wheelhouse poster and learn the vessel's stopping distances and turning characteristics.

5.5 The anchors shall be ready for immediate use during arrival and departure.

5.6 The use of automatic or manual steering mode should be dictated by e.g. visibility, traffic situation and the Master's standing orders.

5.7 Special consideration needs to be taken aboard vessels with high efficiency rudders or azipods.

5.8 Course alterations should be ordered by indicating to the helmsman the direction and rudder angle that is desired to execute the turn (see IMO Standard Marine Navigational Vocabulary).

5.9 The execution of helm orders shall be closely monitored by the OOW.

5.10 All orders and courses should be repeated loud and clear.

5.11 Closed loop communication should be used. A closed loop sequence of orders may be illustrated as follows – the pilot orders – "starboard, steer three-five-five". The helmsman repeats the order verbatim – "starboard, steer three five-five". The pilot then closes the loop by confirming to the helmsman that the order was correctly repeated.

5.12 Ensure that correct parameters on the ECDIS, DP and autopilot are chosen.

5.13 Ensure that proper radar scale is chosen and be aware of the limits and errors in the radar. Use different scales on the radars and change the range frequently to detect targets both far and close.

5.14 Ensure that the GPS is working properly and check the signal strength. Be aware of the position error of the GPS even if DGPS is available.

5.15 Have planned RoT or turn radius for next alteration.

5.16 Plan for squat and bank effect in shallow waters.

5.17 If the bridge is ECDIS-approved, verify that the electronic chart uses an approved ENC; if not paper charts should be used.

5.18 Never use the AIS for navigation or collision avoidance.

5.19 Never be reliant on one system; always double check, if possible to do a two-person check for critical operations.

5.20 Visitors should not be present on the bridge during critical operations unless with the Master's approval.

6. On Passage - Voyage Planning

6.1 Suggestions on how to execute good voyage planning can be found i.e. in the Bridge Procedures Guide published by the International Chamber of Shipping.

6.2 Information about the most favourable route should be gathered from officially updated charts, pilot books, tide tables and tidal current tables, notices to mariners and radio navigation warnings; all possible means are to be used.

6.3 Ensure that all charts, publications and ENC's are updated for the current voyage.

6.4 Courses should be laid down in the charts and, where appropriate, wheel over position and turning radius should be marked on the chart. PI to be used when possible. Keep only the present voyage track in the chart. Plan should be berth to berth.

6.5 Maximum allowable cross track margin should be indicated on the chart as well as danger zones with minimum clearing distances. Environmental areas should be marked in the plan as per MARPOL regulations, port state regulations, i.e. SECA area or other local regulations, to be aware when discharge is allowed and not or any other special regulations for the current trading area.

6.6 Information about reporting points, relevant VHF channels as well as required speed changes should also be indicated in the passage plan and MARSEC levels as per flag regulations for different port and areas.

6.7 The OOW shall frequently verify the vessel's position. When using electronic positioning aids, such as GPS, independent positioning methods should be used to verify that the instruments are functioning properly. In proximity to land GPS should ideally not be used for verification of the position; radar is to be preferred.

6.8 The passage plan should be signed by all Officers and the Master.

7. Collision Avoidance

7.8 The use of whistle signals in accordance with the COLREGS is obligatory in situations where a vessel creates uncertainty about the vessel's intentions and should, therefore, take priority over attempts to contact the vessel by other means such as VHF.

7.9 In restricted visibility:

- Proceed at safe speed adapted to the circumstances and the vessel's capability.
- Keep the engines ready for immediate manoeuvre.
- Post a lookout.
- Sound fog signals.
- Inform the Master when visibility deteriorates below the limit specified in the Master's standing orders.
- Use all radars.
- Determine the risks of close quarter situations by plotting and other systematic observations.
- Be aware of the requirements under Rule 19 of the Collision Regulations.

8. Avoid Close Quarter Situations

8.1 Use long-range scanning to obtain early warning of risk of collision.

8.2 Change range on the radar frequently to detect objects both close to and at a distance.

8.3 Use systematic observation and plotting of detected objects to determine closest point of approach and if any risk of collision exists.

8.4 Do not make assumptions based on unreliable information, in particular unreliable radar information.

8.5 A risk of collision shall be deemed to exist if the compass bearing of an approaching vessel does not change appreciably.

8.6 Inform bridge team members when the range is changed on the radar.

8.7 Consider adding additional members to the bridge team.

8.8 Consider the present situation when deciding the appropriate crewing level and constantly revaluate the situation.

9. Relief of the Watch

9.1 The OOW should not hand over the watch if there is any reason to believe that the relieving officer is unfit or temporarily unable to carry out his duties effectively.

9.2 Before taking over the watch, the relieving officer must be satisfied that the ship's position is correct and that the intended track, course and speed are appropriate.

9.3 The OOW is to supply information to the relieving watch about important developments during the watch, such as the proximity to navigational dangers, traffic situation, course changes, weather information, navigational warnings and the Master's special orders.

9.4 The relieving watch must arrive on time to the bridge so their eyes have time to adjust to night vision before they assume responsibility of the watch.

9.5 The handing over of the watch should be done at a time when the vessel is not involved in manoeuvring or taking action to avoid a hazard.

10. Navigation with Pilot on Board

10.1 The presence of a pilot on board does not relieve the Master or OOW from their duties and obligations for the safety of the ship.

10.2 Upon boarding, the pilot should be handed a completed pilot card with details of drafts and a summary of the vessel's manoeuvring information as illustrated in the Bridge Procedures Guide (IMO Resolution A.601(15)).
10.3 When the pilot boards the vessel, the bridge team shall require information about the passage plan, expected traffic, tugs, speed reductions and other important information concerning the passage.
10.4 During pilotage, the OOW is to continuously monitor that the vessel is proceeding according to the passage plan and to record positions in the chart at frequent intervals.
10.5 The OOW shall ensure that steering orders and engine movements are executed ccording to the pilot's orders.
10.6 The OOW must cooperate closely with the pilot and, if in doubt as to the pilot's actions or intentions, he must immediately seek clarification from the pilot. If doubt still exists, the Master should be called and the OOW should take whatever action is necessary.
10.7 If the pilot is executing course changes on the autopilot, the OOW must require the pilot to inform him of any course changes and to inform the pilot to use closed loop communication

EMBARKATION AND DISEMBARKATION

10.8 Before the pilot disembarks, the bridge team should obtain information about the expected traffic situation in the vicinity of the pilot station and other information relevant for the safe passage from the pilot station.
10.9 Before a pilot is to embark or disembark, the boarding arrangements should be prepared in accordance with the pilot's instructions and the requirements of the International Maritime Pilots Association. Ensure there is sufficient lee during embarkation and disembarkation.
10.10 Ensure that a lifebuoy with light, heaving line, manropes and appropriate lighting are positioned at the pilot ladder.
10.11 An officer who is able to communicate with the bridge is to supervise the embarkation and disembarkation of the pilot.

11. At Anchor

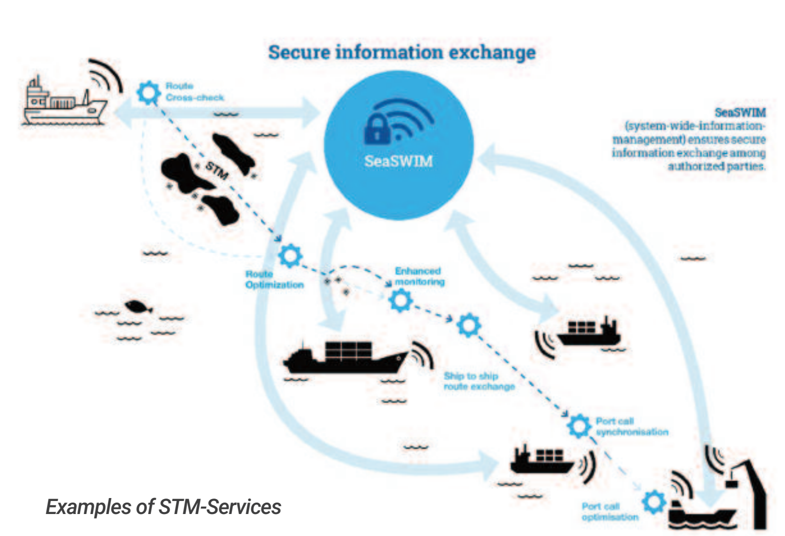
11.1 When at anchor, the OOW needs to consider i.e. the condition of the holding ground, weather and tidal conditions as well as traffic flow.
11.2 On anchoring, the position and swing circle should be determined.
11.3 To detect dragging, the vessel's position should be checked frequently, preferably by different methods (visual bearings, radar bearing, GPS, ECDIS and distance).
11.4 Distances to surrounding vessels and navigational dangers should be recorded.
11.5 Proper lights and shapes should be displayed.
11.6 Monitor the movements of other vessels in the anchorage.
11.7 Observe changes regarding weather, tide and currents.
11.8 If the weather deteriorates or there is a risk of dragging, inform the Master and make the engines ready for manoeuvre. If necessary, consider lowering a second anchor but be aware of the extra risk of the anchors being entangled.

Appendix (ii) Sea Traffic Management

Triton 3/2017

Sea Traffic Management (STM) is a new concept, which introduces simplified, realtime information sharing in the shipping industry. It will help seafarers' decision making on board in three ways:

- Establishing a common situational awareness
- Offering easier access to shore-based services
- Eliminating risk situations before they occur



Examples of STM-Services

Today's bridge officers use a great deal of digital information to build their situational awareness - GPS, radar, AIS, and ECDIS. However, one important piece of the jigsaw is missing - the intentions of the other ships in the area. Whilst mind reading could come into play, STM uses an easier method: information sharing. The intended route in the ECDIS of the ships is shared over AIS, allowing officers an insight into the intentions of all ships in the vicinity.

As all vessels have access to the same information, a common situational awareness is established. Instead of worrying what others might do, the crew actually knows their planned route, and can choose to receive a notification if other vessels deviate from their plan. In order to avoid information overload, the officer can also choose which ships' intentions todisplay.

Sharing voyage plans

In addition to opening up a whole new universe of possible services, the technology can improve many existing services. One benefit is that a ship can receive voyage plans as routes displayed in the planning station or ECDIS instead of as coordinates in an e-mail. Weather optimisation provider, Swedish Meteorological and Hydrological Institute (SMHI), estimates that by sending three alternatives in the route format, along with upporting text, the bridge officer will take the correct action without need for further consultation.

Improved fuel efficiency

The system also improves fuel efficiency, allowing the port to communicate berth UN-availability well in advance, allowing the vessel to slow down, saving fuel and reducing unnecessary anchoring time. 13 European ports within the STM Validation project are working to optimize the port call process, using standardised message formats which convey real time information to ships planning to berth.

Improved safety

In addition to route exchange between ships STM has identified two services that are directly safety related. The first is route cross-check. Although this is carried out automatically by the ECDIS when route planning, the human factor still comes into play. For a number of years the Finnish VTS has asked ships entering the Gulf of Finland to submit their routes for verification, and twice in four years, the VTS has spotted routes over too shallow water. This service could be extended to wider areas and could also be automated. It could even be provided by ship operators or insurance companies as a way to increase safety among 'their' fleet and reduce the number of groundings.

Potential risk reduction for navigational accidents caused by human errors

Risk reduction rate	Collisions	Groundings
Flow Management by flow optimisation	58%	6%
Flow Management by enhanced monitoring	5%	64%
Dynamic Voyage Management by route exchange	52%	8%
Weighted combined rate	81%	69%

(Source: MONALISA 2.0 – Formal Safety Assessment, SSPA)

In areas with dense traffic and shallow waters like the North and Baltic Seas, groundings are quite common, and larger fleets have the services of a Fleet Operations Centre to help avoid common mistakes such as missing, or taking the wrong course at a waypoint. An enhanced monitoring service can contact the ship in the case of immediate danger, or according to the guidelines set by the ship. Thus even smaller companies would have the same assistance as the larger ones have today.

Using Flow Management to eliminate risk

Imagine a traffic planning function, which can foresee risk situations many hours ahead based on the planned and shared routes of the ships.The planners could support the bridge officers and operations departments at shipping companies by advising ships on minor speed changes and in exceptional cases alternative routes in order to reduce the number of potential risk situations. This system of Flow Management is already widely used in both aviation and in the logistic field.

Pilot testing

Early calculations based on the traffic in the Kattegat show huge potential in reducing the number of groundings and collisions, see table 1. A multitude of different implementations and providers of this service can be envisioned. Insurance companies could play an important role, perhaps not as direct providers but as advocates and influencers, creating incentives for shipping companies to sign up for the range of safety initiatives offered by the STM system.

The STM Validation project

An EU-project with more than 50 partners in 13 countries, and a budget of 43M euro – 300 ships and 13 ports are involved with testing the system using real-time information sharing to authorised relevant parties in the maritime transport chain. The STM Validation project builds on the preceding MONALISA projects.

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