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LASH FIRE

Deliverable D06.3

Development of guidelines for communication of fire confirmation

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Abstract

This document is an output of the LASH FIRE Project, within the Work Package 6 – Effective Manual Operations. Its main goal is to report the progress on the work conducted in developing guidelines for communication of fire confirmation within the context of ro-ro and ro-pax vessels.

The development of the work and the elaboration of this deliverable involved the participation of several partners of Work Package 6, who contributed with their own expertise, along with the research and field visits conducted. Furthermore, the data gathered from work done in other Actions of the Project was another form of input towards this task.

The overall result of Deliverable 06.3 are proposals for guidelines to be implemented by operators in their onboard routine operations, leading to more efficient communication of fire confirmation, which ultimately will result in quicker response time and a safer environment abord this type of ships. This involved understanding the state of fire confirmation and communication, and looking for ways to develop methods or tools in which crew members can establish quick and efficient ways to share fire-related safety status updates to command.

D06.3 is also a part of a set of reports that aim to propose guidelines to onboard activities that aim, as a whole, to increase fire safety by improving the efficacy of manual operations in ro-ro/ro-pax scenarios. Furthermore, Work Package 6 will continue to strive towards these objectives.

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Content

1 Executive summary

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Problem definition

This Deliverable has the aim of observing the progress within Action 6-B, “Quick manual fire confirmation and localization”. The objective is to understand what sort of improvements can be proposed in the case of fire communication when instances are confirmed.

As identified by the Project and the work conducted, currently this is an area with potential for improvement and in which the partners feel that more efficient ways of operating can be implemented.

Technical approach

The approach to the Action and this activity in particular was to clearly establish the challenges facing the communication of fire instances onboard this type of vessels, and then from there develop proposals for how to improve them from the point of view of the crew members.

As such, the expertise of the partners and the thorough research conducted, along with the field work that facilitated a more detailed assessment of real scenarios, were the main ingredients in the development of the proposed guidelines.

Towards the elaboration of this report, input was also gathered from different internal and public documents of LASH FIRE, namely D06.1 “Development of and guidelines for quick manual fire confirmation and localization”, as well as Internal Reports 06.2 “Definition of conditions for manual fire confirmation and localization”, 06.4 “Onboard trials to identify requirements for manual fire confirmation and localization”, and 07.9 “Development of design guidelines and procedures for extinguishing system activation”.

Results and achievements

The main result of this document was a set of guidelines that the partners feel can contribute to more efficient ways of communicating fire confirmation, which is a very important aspect of fire safety onboard in the extent it improves response times and capacity. These improvements fall in line with the objectives of the Project as stated below, especially when considered together with the other outputs from Work Package 06, which as a whole contribute to the enhancement of manual operations in these environments.

Contribution to LASH FIRE objectives

This Deliverable provides contribution towards the following LASH FIRE Specific Objectives:

- Objective 1: LASH FIRE will strengthen the independent fire protection of ro-ro ships by developing and validating effective operative and design solutions addressing current and future challenges in all stages of a fire.

- Objective 4: LASH FIRE will propose new regulations and guidelines founded on common positions by drawing upon global research and experience and by facilitating international cooperation.

Exploitation and implementation

The outcomes of this Deliverable, along with the rest of the ones resulting from Work Package 06 and the Project as a whole, are intended to serve as recommendations for implementation by international ship operators, as well as regulatory and standardisation bodies. The proposed guidelines are the product of the expertise, research and work conducted by the partners, and their dissemination aims to kickstart a process of adoption by important players in the maritime industry, specifically in the ro-ro and ro-pax sector. As such, the exploitation of these outcomes is of the utmost importance, and the Project has the tools in place to make sure that the entities concerned will be able to pick up on these results easily.

2 List of symbols and abbreviations

AB - Able seaman

DEC - Digital enhanced cordless

EMSA - European Maritime Safety Agency

IACS - International Association of Classification Societies

IMO - International Maritime Organization

ISM - International Safety Management

MSC - Maritime Safety Committee

NATO - North Atlantic Treaty Organization

PPE - Personal protective equipment

SOLAS - International Convention for the Safety of Life at Sea

3 Introduction

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Within manual operations related to fire safety onboard ro-ro vessels, one of the most important activities is the ability to confirm and communicate fire occurrences effectively. LASH FIRE considers that there are improvements to be made in this context, and as such hopes to develop suggestions of guidelines to for communication of fire confirmation.

3.1 Scope and objectives

The scope of the guidelines presented in this Deliverable is the communication of fire confirmation onboard ro-ro/ro-pax vessels. The impact that the Project intends this document to have is mainly on some perceived gaps on the rules and legislation on the correct and efficient actions to communicate fire occurrences. As such, the main objectives will be

- Report on work done within the Project
- Understand current state and necessities of communication of fire confirmation
- Establish suggestions for guidelines on communication of fire confirmation

3.2 Methodology and structure

The partners hope to analyse what the situation is in terms of communication of fire occurrences, by studying the state of the art, using their own expertise, and also practical trips onboard selected vessels, to gain a sense of baseline towards developing the suggestions of improvements. Furthermore, the guidelines themselves follow a proposed structure based on a standard format utilized by EMSA, which is defined by an Introduction with Short Description, the Purpose, its Application, and the Audience it will impact.

3.3 Relations to other deliverables / activities in the project

This Deliverable is developed within the Effective Manual Operations Work Package of LASH FIRE, more specifically its objective of “to set a standard for quick manual fire confirmation, localization and assessment”. Its most direct relation in terms of public deliverable documents is D06.1 “Development of and guidelines for quick manual fire confirmation and localization”, but the input from other internal documentation was certainly also very beneficial to the development of this task and document.

4 Manual Fire Confirmation

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In this Chapter we hope to first establish an understanding of what we want to discuss when we talk about Manual Fire Confirmation, the current status of this operation in the industry, to then develop more efficient ways of communicating these situations onboard.

4.1 State-of-the-art of Manual Fire Confirmation

An overview on the current situation of rules and regulation regarding fire confirmation can be helpful to understand the main strengths and limitations, as well as establish where to go from there.

Current applicable legislation can be seen in the table below:

IMO Documents	SOLAS Convention, as amended
	ISM Code – International management code for the safe operation of ships and for pollution prevention
	MSC.1/Circ.1615, Interim Guidelines for minimizing the incidence and consequences of fires in ro-ro spaces and special category spaces of new and existing ro-ro passenger ships
IACS & Class Rules	IACS Blue book dated January 2019
	BV Rules for Steel Ships (NR467), as amended in July 2019
Flag Administration Rules	SOR/2017-14 - Vessel Fire Safety regulations published by the Minister of Justice of Canada, Current to March 19, 2020
	UK MSIS 12 - Statutory guidance for fire protection arrangements, dated June 2014

4.2 Empirical Results regarding Manual Fire Confirmation

The activities developed in the context of the Project led to the examination of a series of investigation reports in order to gain insights about how manual localization and confirmation phase is done in practice and how it can be improved. A total of 19 reports were examined, including both ro-ro and ro-pax fire incidents, as well as, a report examining casualty statistics and investigation analyses. The reports have been analysed by searching for the following keywords: “manual detection”, “identification”, “communication”, “confirmation”, “localization”, “runner” and “AB”. Furthermore, sections dealing directly or indirectly with the phase between the sounding of an alarm the and identification of fire have been carefully examined.

More detail can be found in Annex A, but in summary, one of the most striking findings from the analysis is the diversity regarding not only terms to refer to the person in charge to manually localize and confirm the fire, but also in relation to the different practices through which fire is localized and confirmed in the different incidents studied. It is also worth noticing that even in the investigation reports where the “runner” is described as having a significant role, the measures proposed to prevent these kinds of events happening again are seldom directed towards the role of the runner.

4.3 Guidelines for Quick Manual Fire Confirmation and Localization

As we have stated, work conducted within Deliverable D06.1 resulted in the development of suggestions to improvements on fire confirmation. Below are the main outputs of that Deliverable, that naturally can be consulted for further detail into how these results were achieved.

Improvement of current signage and marking standards/conditions to support effective wayfinding and localization

- The identification of signage and marking mismatches between the different marking and signage systems and different fire management system interfaces available on the vessel.
- The alignment of marking and signage systems in vessels with the different fire management system interfaces available
- The replacement of challenging readable position descriptions for ones that support effective wayfinding and orientation (Placing and design based on real use cases or best practice for design)

Standardization and formalization of manual fire confirmation and localization

- Description of the role, the activity and the conditions for performance
- Practical measures to ensure a clear communication between bridge and runner during the performance of the task
- A description of the practical measures to ensure familiarization with the task

5 State-of-the-art of Communication of Fire Confirmation

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It is paramount to overview the main operations and concerns regarding current communication of fire confirmation, to be able to develop suggestions on how to make efficient improvements.

5.1 Limits and difficulties in communication, specifically in emergencies

A common problem on ro-pax vessels is blind spots in radio communication. It is essential that fire patrol can be in direct contact with the bridge at all times and all location onboard. If not, time is spent on moving into radio coverage area, real time information exchange is lost and a feeling on uncertainty may arise. Within WP06 a quick questionnaire was prepared to evaluate signal coverage onboard real ships known to the partners, one of which is presented in Annex B as an example.

Repeaters are in many cases installed but some vessels still show poor coverage. This may partly be overcome by use of additional systems such as DEC Telephone system or fixed emergency phone system with loss of positive overhearing and increased equipment complexity.

Always, but in cases of poor voice transfer especially, predictability of messages is important for instant understanding and to avoid ambiguity. Also of value is mutual knowledge of what information is important for decision making.

Language is also an issue and should be duly considered in multi-native language crews. The conversation should be kept in mother tongue, if possible, unless a multi-language crew and English must be used. The communication should be loud and clear and excessive talking should be avoided.

5.2 Effective communication protocols with the bridge

Along with language, it is important to be quick and efficient in *what* it is being said, as well. As such, besides utilizing "Simplified Technical English" (in case of multi-language crews) and as few words as possible, it is important to establish efficient phrases and vocabulary to quickly establish clear and concise communication in these occurrences. In Annex C is available a detail on Standard Marine Communication Phrases as based in IMO's resolution A.918(22)[1]. Some quick examples may be:

"Deck 3 Port side, drencher zone 24, Fire in reefer confirmed"
"Fire patrol, report status"
"Vehicle on fire identity WGS 133, open flames from left side mid trailer"
"Fire party 2 entering dk 2 starboard side"
"Weather deck aft, starboard side, dense smoke confirmed"
"Activate drencher zone 14 dk 4, repeat activate drencher zone 14 dk 4"
"Can you use carbon dioxide once again?"
"Can you show me exactly where the fire is?"
"Please give me exact information about the cargo in this hold."

5.3 Input from interviews of/response from ship operators.

Several interviews were conducted within the work of the Project with operators/crew members relating to communication on board. In Annex D we go into further detail on them, but below we try to emphasize some pertinent points of information gathered from these inquiries.

[1] https://wwwcdn.imo.org/localresources/en/OurWork/Safety/Documents/A.918(22).pdf

- Walkie-talkies work well (no blind spots if signal is increased)
- Communication of the crew during debriefing is very important
- Reality is different from formal requirements
- Language is not enough, trust for instance is paramount
- New technology can be helpful – good camera and radio coverage
- Everyone should have access to the available radio channel used for emergencies
- Having multiple codes, to make sure there is no panic
- Internal telephone system also may be helpful
- PPE is getting better (e.g., radio integrated into helmets), but can be improved
- Coordination between bridge and teams is essential
- Informal information is also helpful (e.g., if a person is more reliable or not)
- Regularity of crews is also beneficial – helps with a more relaxed and cold-header approach in emergencies

6 Guidelines for Communication of Fire Confirmation

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6.1 Introduction

In approaching the development of these guidelines proposals, the main tools used within the development of this task and deliverable was the knowledge gathered by research for this specific task, the work done through research in other activities of the project, the expertise of the partners involved, as well as some trips onboard real vessels of different operators within the network of the partners, and inquiries, conversations and interviews conducted thereof.

As mentioned in the Methodology section, the presentation of the suggested guidelines follows a simple yet effective line, informed by EMSA and typical maritime guidelines[2]:

- Short Description
- Purpose
- Application
- Audience

This allows us to formulate our suggestions in an efficient and understandable way, which is important when trying to share new ideas and proposals such as is the case.

Having analysed the different inputs from other tasks and deliverables of LASH FIRE, along with the data gathered from the inquiries and incident reports done within Work Package 06, it becomes clearer and clearer what can be easy, quick ways of improving current communication of fire confirmation.

The research to *status quo* shows that the sector does not look very deep into the importance of an efficient communication, due perhaps to fortunately not many fire instances existing, and also to the fact that modern equipment and crews already communicating fairly efficiently.

This, along with the opinions of crewmembers interviewed, start taking us through paths that lead us to efficient ways of putting crew members in contact with each other *technically*, in terms of *language*, and from *anywhere* in the vessels. This has informed the suggestions done below, which are indeed proposals that intend to be easily applied to real scenarios.

"These guidelines are developed in the project LASH FIRE.

The project has received founding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 81497.

The Agency (CINEA) and the members of the consortium of LASH FIRE are not responsible for any use that may be made of the information in these guidelines."

[2] MSC.1/Circ.1500/Rev.1 GUIDANCE ON DRAFTING OF AMENDMENTS TO THE 1974 SOLAS CONVENTION AND RELATED MANDATORY INSTRUMENTS; MSC/Circ.930 GUIDELINES ON METHODS FOR MAKING REFERENCE TO IMO AND OTHER INSTRUMENTS IN IMO CONVENTIONS AND OTHER MANDATORY INSTRUMENTS

6.2 Suggested Guidelines for communication of fire confirmation

6.2.1 Guideline for common communication channel

The need for quick communication was pointed out during the interviews and trips conducted during development of this Deliverable, and it becomes clear that it is something that can help improve this operation.

6.2.1.1 Description

Implementation of common radio channel for crew. The onboard crew, and specifically the person assigned as the "runner" – who will confirm fire at the signal of alarm, for example, will not lose time in connecting appropriate channel. But particularly, by having every AB seaman having access to the channel, fire instances closer to any member can be communicated as quickly as possible. The need for quick communication was pointed out during the interviews and trips conducted during development of this Deliverable, and it becomes clear that it is something that can help improve this operation.

6.2.1.2 Purpose

To facilitate quick communication of fire confirmation, and consequent first response – essential in mitigating fire hazards.

6.2.1.3 Application

Ro-ro/ro-pax vessel trips.

6.2.1.4 Audience

Every ro-ro/ro-pax crew member, carrying portable radio or walkie-talkie.

6.2.2 Guideline for frequency-cleaning/blind-spot elimination

Technological improvements are constantly advancing these matters, yet amongst the issues raised in research and inquiries done, the need for better equipment and/or improvements to the current ones are referred.

6.2.2.1 Description

Elimination of radio blind-spots onboard. The operator should ensure through thorough analysis that there are no blind spots for the equipment used in crew communication, particularly the one used for fire and safety communication. Radio coverage should be widespread throughout the ship, but if not 100% available, there should be a minimum coverage of 95% in all areas of the ship. Which is to say, the ship should be regularly tested to confirm it complies with this minimum, and if not, steps should be made to ensure it. Larger bandwidth, signal amplifiers/repeaters, antennas, or physical solutions such as internal phones shall be installed in order to achieve the maximum possible coverage onboard.

6.2.2.2 Purpose

Making sure communication is possible no matter the location within the ship is crucial for quick response, fire mitigation and fighting. Not having communication "shadows" can therefore avoid problems in communication of fire confirmation and also

6.2.2.3 Application

Ro-ro/ro-pax vessels with deficient radio coverage.

6.2.2.4 Audience

Ro-ro/ro-pax ship operators.

6.2.3 Guideline for dialogue standardization

The natural suggestion offered by the partners is the usage of the English language, along with the standard phrases as proposed by IMO.

6.2.3.1 Short Description

Normalizing the use of single language and standard phrases. *What* is said and *how* it is said are the key aspects of communication, and so when dealing with safety it becomes clear that a uniformization of the phrasings and language used is the most efficient approach. The natural suggestion offered by the partners is the usage of the English language, along with the standard phrases as proposed by IMO[3].

Together with these, the NATO Phonetic Alphabet[4] should also be used whenever there is need to clarify or quickly transmit information paramount to communicating fire confirmation.

6.2.3.2 Purpose

Having an onboard standard for safety communication, specifically relating to fire confirmation will make this operation clearer, safer and much more efficient, thus improving fire safety onboard.

6.2.3.3 Application

Training/preparation of crewmembers of Ro-ro/ro-pax vessels.

6.2.3.4 Audience

Ro-ro/ro-pax ship operators and crew members.

[3] [3] https://wwwcdn.imo.org/localresources/en/OurWork/Safety/Documents/A.918(22).pdf

[4] https://www.nato.int/nato_static_fl2014/assets/pdf/pdf_2018_01/20180111_nato-alphabet-sign-signal.pdf

7 Conclusion

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With the development of Deliverable 06.3, the partners have tried to analyse the progress of Action 6-B, “Quick manual fire confirmation and localization”, and understand the type of advances can be proposed in the context of communication of fire confirmation onboard ro-ro/ro-pax vessels.

LASH FIRE’s goals of improving safety in this type of ships have everything to gain from looking at the importance of proper, efficient communication onboard and how new and different methods can be harnessed to improve it.

Within the various activities conducted, the partners identified an opportunity for improvement in this area, noting that it is possible to come up with better and more effective ways of communicating fire confirmation. As such, they aimed to develop a few simple but efficient suggestions for new guidelines which can potentially be part of future implementation by operators in real scenarios.

For this, a couple of field trips were organized in which currently used methods were analysed, and questionnaires were also done to try to gather accurate data (mostly due to the impossibility of more thorough field-work due to the covid-19 pandemic). All this work aided in the development of these suggestions which will certainly be subject to improvements themselves, but the partners believe these really can help increase fire-related safety onboard ro-ro and ro-pax vessels.

7.1 Next Steps

The partners will now naturally look to improve the developments already achieved, with the aim of perfecting any suggestions already made and potentially look towards new ones. WP06 in particular, but also in tandem with other Work Packages such as 04 and 05, will be fundamental to this, as the work done so far and reflected above will add to the compendium of information being gathered, shared and worked on by the partners of the Project.

7.1.1 Outputs within the Effective Manual Operations Work Package

Work Package 06 is developing several activities related to typical operations onboard ro-ro/ro-pax vessels, each of them focusing on one or two specific tasks but all of them working towards the same common goal of improving fire safety onboard. As such, the collaboration of the partners working in WP06 in the various activities and reports will continue, reinforced by the findings shared in this Deliverable which itself has been informed by some that came prior.

These and other developments shall continue to be integrated into a broader, more encompassing picture of safer, more efficient and enhanced manual operations onboard, towards reducing risk and improving fire-related safety in these contexts.

7.1.2 Outputs towards LASH FIRE

One of the ways that the work reported in this document can be improved is through impact and cost assessment which can be done via collaboration with WP04 and WP05, and which can help give a better idea of the concrete influence that these suggestions would have in practical terms.

As such, the discussion with the partners from those Work Packages, the Project as a whole, as well as LASH FIRE’s stakeholder community will continue, with the ultimate goal of improving communication of fire confirmation onboard ro-ro/ro-pax vessels.

8 ANNEXES

8.1 Annex A – Accident Investigation Reports

The main purpose of investigating a marine accident is to identify the factors causing the accident, with the aim of improving the safety of lives of personnel and passengers at sea, preventing similar accidents in the future and enhancing safety of navigation. It is not the purpose to apportion liability, nor apportion blame to anyone or any party.

We have examined a series of investigation reports in order to gain insights about how manual localization and confirmation phase is done in practice and how it can be improved.

In this chapter we will identify which personnel on board that operate as “runners”, look at how they are referred to and also review how "runners" appear in the investigation reports when it comes to the description of the event, the analysis on what happened and the measures proposed. First, however, we will summarize how the phase of manual localization and confirmation of fire on board is treated in the SOLAS convention.

Method

To do so, we have examined a total of 19 reports including both ro-ro and ro-pax fire incidents, as well as, a report examining casualty statistics and investigation analyses. The reports have been analysed by searching for the following keywords: “manual detection”, “identification”, “communication”, “confirmation”, “localization”, “runner” and “AB”. Furthermore, sections dealing directly or indirectly with the phase between the sounding of an alarm the and identification of fire have been carefully examined.

List of investigation reports examined

- Fire on Vehicle Deck - Roll-on/Roll-off Passenger Ferry- Joseph and Clara Smallwood 2003
- Preliminary investigation report M/V Al Salam Boccaccio 2006
- Fire on board Und Adriyatik 2008
- Fire aboard Vehicle Carrier Pyxis 2008
- Brand ombord på Queen of Scandinavia 2009
- Fire on the ro-ro passenger vessel Lisco Floria 2010
- Report on the investigation of the fire on the main vehicle deck of Commodore Clipper 2010
- Fire aboard Pearl of Scandinavia 2010
- Fire on a semi-trailer on board the ferry MECKLENBURG_VORPOMMERN 2012
- IMO – Casualty Statistics and Investigation. Report of the Correspondence Group on Casualty Analysis, National Transportation Safety Board 2012
- Fire Aboard Vehicle Carrier M/V Alliance Norfolk 2012
- Fire aboard Victoria Seaways 2013
- Marine accident report Britannia Seaways 2013
- Fire on Corona Seaways 2013

- Marine accident report Urd 2014
- Marine Accident Brief Fire aboard Vehicle Carrier Courage 2015
- Fire aboard Ro-PAX ferry Stena Spirit 2016
- Fire aboard Vehicle Carrier Honor 2017
- Norman Atlantic report

Who are the “runners”?

Current praxis to localize and confirm a fire on board is usually to send a “runner”. In some of the investigation reports these “runners” are mentioned when it comes to describing the event, in the analyses of the event and the measures suggested for improvement sometimes addresses them. The various investigation reports refers to the "runner" in very different terms. In addition, there are differences between the various boats / shipping companies which of the employees on board hold the role of a "runner". Below we will list all the different names and actors mentioned in connection with the role of "runner" from the investigations that mention this role. As the list shows, it is only a few of the investigation reports that mentions the “runner”. The reason for this is most likely that the nature of the fire investigated has had no need for manual detection and localization.

Naming of the “runner”:

- Watchkeeping crew member (Und Adriyatik)
- On-watch AB (Corona Seaways)
- Fire patrol (in swedish “runderingsmann”) (Queen of Scandinavia)
- Watchman and Person sent (Stena Spirit)
- VDW (Vehicle Deck Watchman) (Joseph and Clara Smallwood)
- The Lookout (Commodore Clipper and Pearl of Scandinavia)

The position on board with the role of the “runner”:

- The AB (Carrier Courage)
- The third officer and The Master (Carrier Pyxis)
- Ship’s assistant (Pearl of Scandinavia)

How investigation reports deal with manual localization and confirmation

As the previous section shows, this phase is usually addressed only on the description of events. Many of the reports do not properly describe this phase in any of their sections. In very limited cases, manual localization and confirmation is included in the analysis, evaluation nor recommendation. Below we will summarize how manual localization and confirmation are addressed in the investigation reports.

In the description of the event

- *Watchkeeping crew member was sent to the alarm scene and he noticed the fire on the trucks, which were parked inside the main deck.* (Und Adriyatik)
- *The AB opened the main deck port aft door but did not enter the space because of the tightly packed vehicles. He reported to the OOW on his Very High Frequency (VHF) radio that he could not see any evidence of a fire, and he then closed the door. (Corona Seaways)*

- *The fire petrol who performed the nightly fire rounds was on the bridge on his lap, and the navigator immediately sent him down into the engine room to check the fire alarms.* (Queen of Scandinavia)
- *The watchman reported to the bridge by phone that he had located smoke above and around a refrigerator truck parked in front of the stern ramp (door), on the port side next to the central bulkhead (….) . when the ship was entering breakwater heads of the port of), the watchman noticed flames on the truck roof (photograph No. 7). He tried to call the bridge on the VHF operating channel, but did not succeed (…..) The watchman, not being able to contact the bridge via radio (VHF), started to extinguish the fire with a 50 kg transportable powder extinguisher.* (Stena Spirit)
- *The third mate instructed the AB to investigate the alarm. The AB departed the bridge after obtaining a radio and conducting a radio check. He travelled from the bridge down to the weather deck and went to the access trunk aft on the starboard side of the vessel (…..) The AB told investigators that as he got to the entrance of the ladderways he began to smell smoke. He passed the elevator, went down a ladderway one deck to Deck 12, and saw heavy smoke coming up from below. He immediately radioed up to the bridge, informed the mate about the smoke, and told him to sound the alarm. He then exited the space and returned to the bridge.* (Carrier Courage)
- *The master rushed into the wheel house, confirmed the location of the fire on the fire detection system and instructed the third officer to identify the site of the fire. The third officer (…..) went down to Deck No. 10, opened the fire door at the entrance of DK 10, saw a bright yellow light and reported to the master with transceiver.* (Carrier Pyxis)
- *At 0243, the second officer instructed the lookout to take a portable very high frequency (VHF) radio and go and check the main vehicle deck to confirm if there was a fire. (….) The lookout knew that the portable radio that he was assigned was not reliable, and was concerned that he might become injured or trapped near the fire and not be able to summon help. (……)….They could smell smoke in the area, and the lookout returned to the bridge. (…..) The lookout reported to the second officer that he had smelled smoke in the accommodation area, but that he had only been as far as the restaurant. The second officer told him to go to the main vehicle deck* (Commodore Clipper)
- *A ship's assistant who was the look out on the bridge was immediately sent to the car deck to make observations. She opened a door to section 5 on the car deck and observed heavy smoke and flames. She saw a trailer on fire close to the flooding control door. At 06.00 she informed the bridge that there was a fire in a trailer on the car deck in section 5.* (Pearl of Scandinavia)

In the analysis of the event

- *An additional visual check caused a delay, which ended up with an uncontrollable fire. (Und Adriyatik) (det virker som om de mener at visual check ikke bør finne sted, men at det i dette tilfellet var nødvendig pga flere falske alarmer tidligere, og at det er denne visuelle sjekken som førte til forsinkelse.)* (Und Adriyatik)
- *The OOW's decision to send the on-watch AB to check the status of the main deck after the first fire alarm was reasonable and appropriate. He had no indication of a fire on the CCTV monitor, and he needed to clarify the situation. The AB also reasonably opted to check the main deck from the door.* (Corona Seaways)

- *Lack of detailed procedures for the crew in the event of a refrigerator truck fire resulted in a situation that crew activities to detect the source of the smoke was carried out at discretion of person sent for this purpose to the car deck and was inadequate to the hazard existing upon detection of the smoke from the refrigerator unit in the truck.* (Stena Spirit)
- *The master, upon receiving the report from the third officer of the fire breakout, decided to confirm the situation of the fire himself and control the fire in the initial stage.* (Carrier Pyxis)
- *In the event of an anomaly, the VDW (Vehicle deck watchman) was to report it immediately to the bridge. Communications between the VDW and the bridge were conducted using fixed telephones connected to the vessel's internal communications system. On each vehicle deck, there were two such telephones, one forward and one aft. VDWs were not equipped with a portable means of communication, nor were they required to be by regulation. (…..) The absence of feedback at the pull station, coupled with the VDW's lack of understanding of the fire detection system, had the potential to generate confusion leading to an inappropriate response or a delay in commencing a response, thereby placing passengers and crew at risk*. (Joseph and Clara Smallwood)
- *The second officer on the bridge made the correct response in sending the lookout to investigate the first response in sending the lookout to investigate the first fire alarm. (……) The second officer's and the third engineer's mistaken opinions could have been changed by either a report from the lookout or by the second officer looking at the CCTV picture of the main vehicle deck. (…..) The lookout had smelled smoke in the restaurant, but when he returned to the bridge, the second officer was in conversation with the third engineer, and he waited before making his report rather than interrupt. The lookout's report started to challenge the second officer's perception of the problem but lacked urgency, an as the lookout had not actually seen a fire, this was not enough to persuade the second officer to start alerting the rest of the crew. (….) He sent to lookout away again to check if there was a fire, and decided to take no further action until he had a definite report. The lookout's faulty radio meant that confirmation was further delayed.* (Commodore Clipper)

In the measures proposed

- *The company made an agreement with professional support and training organization in order to improve fire response abilities of the crew.* (Und Adriyatik)
- *All crew must be vigilant when on duty, if fire is detected raise the alarm and then fight the fire after help arrives*. (Carrier Pyxis)
- *To avoid delays in raising the alarm in a real fire situation, fire patrol should have an efficient direct Radio communication with the bridge and all crew members must have familiarization training with the alarm system on board their vessel and for alternate communication arrangements. Manual pull stations with a time delayed alarm should be appropriately labelled*. (Joseph and Clara Smallwood)

Examples where "runners" are not used (but should have been):

- *The fire alarm detected at the panel was reset before the response teams were in place, perhaps because the crew members on watch in the bridge assumed it was*

part of the trouble stemming from auto-pilot dysfunction, or perhaps to avoid sounding the alarm. (Al Salam Boccaccio)

CONCLUSIONS AND LESSONS LEARNED:

One of the most striking findings from the analysis is the diversity regarding not only terms to refer to the person in charge to manually localize and confirm the fire, but also in relation to the different practices through which fire is localized and confirmed in the different incidents studied. It is also worth noticing that even in the investigation reports where the "runner" is described as having a significant role, the measures proposed to prevent this kind of events happening again are seldom directed towards the role of the runner. To sum up, analysis of the different reports provides us with valuable insights on:

- Quality and thoroughness of incident investigation reports vary to great extent
- Different terms to refer to the 'runners'
- Great heterogeneity regarding practices as well
- Communication problems are common
- Combination of manual detection with the use of existing technology for localization and confirmation of fire
- Great degree of improvisation (lack of detailed procedures and training)
- This phase is black-boxed in the reports: Manual detention, localization and confirmation activities are rarely properly addressed/described/problematized, nor analysed/evaluated on the reports.
- Reports rarely include recommendations to improve the phase of manual detection and confirmation.

Something important to have in the ship's procedures and emergency task lists are the scopes of responsibility of individual crew members and additional tasks to be undertaken by the crew when fighting a fire while the ship is in different situations such as preparing for manoeuvres or undertaking port entry manoeuvres. There are also a need for alignment when it comes to naming the runner and the describing the phase of manual localization and confirmation.

COMMUNICATION – RELATED EXTRACTS FROM ACCIDENT INVESTIGATION REPORTS

From NORMAN ATLANTIC report:

EVENT (p.21)

The interviews carried out with the deck staff and in general with the staff who participated to the initial emergency phases, as well as the evidence gathered during the investigation, show that a first fire alarm was activated approximately at 04:15.

In that moment, the second mate and a seaman were on duty. In addition, considered the difficult conditions of the navigation, after departing from Igoumenitsa, the Captain decided to remain here and keep on monitoring (see. par. 4.1.8). The deck officer on the bridge, applying the correct procedure, immediately sent the seaman to the area concerned by the alarm to check its conditions, but the seaman said that in the signaled position there was only a refrigerated truck, whose combustion generator for the cooling system was working and there was no incipient fire. After about 15 minutes a fire pre-alarm was heard again and a Fire Alarm followed.

Thereafter, the Captain, who already was on the navigation bridge, after seeing the flames on the starboard flying bridge deck coming out of the windows (the great side openings) of deck 4, ascertained that a fire was developing on board, ordered to transmit the fire alarm (serious gravity) and to issue the "crew call". In the immediately following minutes, he ordered the first mate to go on the spot (deck 4 frame 156) to check the situation and the deck officer on the navigation bridge to immediately activate the Drencher (04:30) system. Based on the evidence gathered, following our inspection on board, in the Drencher room the valves of deck 3, instead of those of deck 4 (which was affected by the fire) were open.

"In view of the above, although the general management of the operations on the ship seems to be performed overall safely, a review of the mentioned SMS procedures is to be evaluated, with more frequent internal audits to check the implementation of the operational procedures established and/or a specific training by the Company for the staff in charge of these operations, clearer procedures for loading - lashing - socket connection operations. Similarly a review of the way patrols during navigation are performed should be considered, in particular roles shall be better defined, and - ***the knowledge of the English language, among the staff in charge of these operations, shall be better checked by the Company (both the ship owner and the charterer)"(p.153).***

RECOMMENDATIONS (p.161):

004/2015-04 Implementing measures aimed at ensuring that the staff on board is actually familiar with the working language and that this language is really used on board.

RO-PAX ferry Stena Spirit

(1) Term: watchman

(2) Sent by the officer of the navigational watch

(3) Aprox. 5 min, communication via radio and phone, wrong assessment of the situation, lack of attention to cameras, communication issues (insufficient range of VHF radios), lack of detailed procedures

(4) Description of events, analysis, evaluation and recommendations

Extracts from the report:

<u>Description of events</u>

The officer of the watch, watchman (helmsman) and chief officer were present on the bridge.
At **06:38:54** an alarm was triggered in the fire alarm control panel on the bridge as a result of activation of a smoke detector in zone 110 located on the car deck No. 3 in the aft part of

the ship.
The officer of the navigational watch instructed the **seaman (watchman)** responsible for waking up the crew before manoeuvers via the radio (UHF) to go to a car deck No. 3 and to check the situation in the aft part of the ship.
At 06:41:00 the engineer on watch from the engine control room reported to the bridge via telephone that a fire detector was activated on the car deck. In response, the watch officer informed him that a watchman had already been sent to check the car deck No. 3 at the ship's stern.
At **06:43:10** the watchman reported to the bridge by phone that he had located smoke above and around a refrigerator truck parked in front of the stern ramp (door), on the port side next to the central bulkhead.
Instructed by the officer of the watch, the watchman disconnected power supply of the truck's refrigerator unit from the ship's electrical system in the distribution cubicle located on the wall of the companionway to the steering room.
The officer of the watch informed the ship's electrical engineer by phone to come to the car deck to check the cause of the smoke coming from the refrigerator truck.
After passing the "GD" buoy at 06:47:34, the master came to the bridge. The chief officer and the officer of the watch reported to the master on the activation of the fire detector and presence of smoke on the car deck No. 3.
The master ordered another, detailed inspection of the area from which the smoke originated to check for any smouldering fire. Additionally, he instructed that the inspection be assisted also by the ship's safety officer who, by then, had also come to the bridge.
At 06:48:09 the officer of the watch managed to separate the fire zone 110 in the fire alarm control panel on the bridge and, thus, to deactivate the fire alarm (photograph No. 5).
Next, the watchman present on the car deck, together with the officer of the watch on the bridge, attempted to switch on the ventilation in the cargo hold to remove the smoke that was present there. The captain stopped these activities and instructed them to wait until the ship safety officer completes the inspection ordered by the captain.
At 06:50 the electrical engineer arrived at the scene on deck no. 3 next to the refrigerator truck; the safety officer arrived soon after. Neither of them found any signs of fire, except for presence of smoke. After several minutes, they reported to the bridge that the smoke originated from the refrigerator unit, more specifically its drive's v-belts and that burnt rubber can be smelled, as well las that there was no fire hazard on the car deck.
When the crew members were checking the deck in the area of the refrigerator truck, the smoke grew thicker and flames could be seen on the image recorded by CCTV camera No. 07 which were reflected by the ceiling on the right side of the truck (photograph No. 6).
At around 06:54 fans were switched on at car deck no. 3 to remove the lingering smoke from the area.
At 07:00:41 when the ship was entering breakwater heads of the port of Gdynia (photo No. 48), the watchman noticed flames on the truck roof (photograph No. 7). He tried to call the bridge on the VHF operating channel, but did not succeed. After several seconds, the VDR recorded activation of a fire alarm which switched off the ventilation on the ship.
Meanwhile, the officer of the watch and the senior officer attempted to switch on the ventilation on deck no. 3. Furthermore, the officer of the watch tried for almost 2 minutes to contact the watchman in the cargo hold, but he did not succeed. The fire developed considerably and covered the entire width of the truck's roof
The watchman, not being able to contact the bridge via radio (VHF), started to extinguish the fire with a 50 kg transportable powder extinguisher. He attempted to put out

the fire approaching from the rear, left side of the truck, but powder jets did not reach the area of the flames.
At 07:03:15 the officer of the watch noticed major smoke presence on the CCTV display and suggested that the ventilation be switched off.
Due to dense smoke, the watchman was forced to leave the car deck and, at 07:03:44 informed the bridge via radio (VHF) that the refrigerator truck was on fire. Before that, he also managed to activate two manual fire alarm call points.
At 07:04:00 the master instructed the officer of the watch to send immediately the crew to start the fire fighting operation and, subsequently, to man the drencher system stations at the stern.

Organizational factors

The organizational factors that affected the course of events related to detection, spreading and extinguishing of the fire were, in the Commission's view, as follows: lack of detailed procedures for the crew in the event of a refrigerator truck fire, lack of (interruptions in) communication on the VHF radio operating frequency in the vehicle spaces at the ship's stern, equipment of this space with only smoke detectors, lack of device onboard of the ship to adequately assess fire hazard, such as IR imaging camera and lack of adequate escape routes from the vehicle spaces.

Conclusions and recommendations

In the ship management system, there were no procedures for emergency situations such as fire during port entry manoeuvres. There were procedures for a fire in the port (included in , but these related mainly to establishing communication with third parties (fire service, port authorities, shipowner) and evacuation of passengers and crew from the ship.
The Commission concluded that the fact that the ship's crew did not interested in the CCTV system for a considerable period of time after fire alarm release and did not observe the images from the camera located in the room in which the flames on the truck roof were visible may suggest the lack of adequate risk management procedures in emergency situations. The Commission is of the opinion that the ship procedures should include an obligation to regularly check the CCTV camera images after activation of any significant alarm, including fire alarm.

IMO – Casualty Statistics and Investigation. Report of the Correspondence Group on Casualty Analysis

The document contains the report of the Correspondence Group on Casualty Analysis:

The group also noted that providing just a list of questions which could be posed to crew members, witnesses or ships company representatives may have limitations, including the following, affecting the quality of the investigations:

.1 a list of specific questions tends to be treated as a checklist, resulting in most, if not all, of the questions being asked, regardless of the relevance to the investigation being undertaken;

.2 there may be issues related to the absence of a common language. Interviewers need to have regard to language barriers as well as cultural differences when posing questions, and to find the appropriate tone and level at which to pitch the questions; and

.3 a list cannot include questions to cover every possible area of human factors inquiry. There will always be something that was not thought of.

The dual-command organizational structure under which the offshore installation manager was in charge when the vessel was latched onto the well, while the master was in charge when the MODU was underway between locations or in an emergency situation, led to a command confusion at a critical point at the time of the emergency and may have impacted the decision to activate the emergency disconnect system;

Vehicle Carrier PYXIS – October 14 2008

(5) Information available on the car decks
According to 2.6.11, it is considered probable that, on the car decks of the Ship, communication by transceiver with the wheel house was available. However, neither fire alarms nor PA announcements were audible there.

Fire on Vehicle Deck - Roll-on/Roll-off Passenger Ferry- Joseph and Clara Smallwood

12 May 2003

Two heat detection alarms sounded on the bridge. Almost simultaneously, the vehicle deck watchman (VDW),while making his rounds on vehicle deck 1, discovered a fire around a tractor-trailer (seeFigure 1). The VDW exited the deck through the forward-most door on the port side and proceeded directly to a manual fire alarm pull station located just outside the door. He activated the pull station, but no audible alarm sounded; he then proceeded up to deck 3 and activated a second alarm. Still hearing no audible alarm, he ran aft to the VDW's station on deck 3, where he contacted the bridge by telephone and informed them of the fire.

When the first two heat detector alarms rang on the bridge, the officer of the watch (OOW) went to the fire detection panel to determine the origin of the alarm. While in the process of silencing and accepting both heat detector alarms, one manual pull station alarm, followed quickly by a second, registered on the panel. Shortly afterwards, the telephone rang on the bridge with the call from the VDW. In accordance with the vessel's Emergency Response Manual (ERM), the OOW commenced the emergency response for fire.

1.8.6 Communications
1.8.6.1 Fire Party
Communications between the fire party and the bridge were conducted using a portable, very high frequency (VHF) radio. During the occurrence, communications were intermittent, requiring the SCO, who was the officer in charge of the fire party, to continuously move around in order to establish and carry on communications with the bridge—a process disruptive to the coordination of the firefighting effort.

While a VHF radio is an established method of ship-to-ship and ship-to-shore communications, it is not well suited where radio waves must penetrate steel structures, as with internal shipboard communication. Instead, portable, ultra high frequency radios are accepted and widely used devices for such communications.

1.8.6.2 Vehicle Deck Watchman
When the vessel was in transit, one person was assigned to patrol the perimeter of each vehicle deck approximately every 30 minutes. During these rounds, the VDW was responsible for monitoring the vehicle deck for such things as fire, loose or shifting cargo (vehicles), vehicles

and trailers leaking fluids, security of lashings on the vehicles (if fitted), security of the forward and after loading doors, and passengers who may have remained with or returned to their vehicles. In the event of an anomaly, the VDW was to report it immediately to the bridge. Communications between the VDW and the bridge were conducted using fixed telephones connected to the vessel's internal communications system. On each vehicle deck, there were two such telephones, one forward and one aft. VDWs were not equipped with a portable means of communication, nor were they required to be by regulation.

1.9.4 Emergency Communications Equipment

Throughout the occurrence, the SCS and the master communicated without difficulty by the ship's internal telephone system. As a contingency, both were equipped with portable, two-way VHF radios. PSD crew communicated with each other and with the SCS, either face-to-face or by relaying information through "runners"; they were not provided with portable communications equipment.

2.2 Communications Not during manual confirmation though

In an emergency, effective and timely communication is essential for a coordinated and effective response – an essential element to the success of a mission.

The following difficulties were experienced in on-board communication during the emergency:

• **Adequacy/Lack of Equipment** – The fire party was not provided with an adequate method of portable communications to exchange information with the bridge. Neither the VDW nor the PSD crew were provided with a portable means of communication. The PSD crew relied, in part, on "runners" to communicate messages, which resulted in a delay in relaying important information and necessitated the use of a valuable resource for repetitious work.[33] Such a delay in assisting a potentially incapacitated person may place his or her safety, as well as the crew member's safety, at risk. Furthermore, the lack of portable communications equipment prevents a crew member from calling for help or assistance if needed.

Without the benefit of portable, two-way communication, there is the potential that critical information transmitted through a third party will be misinterpreted or misrepresented. It also precludes the ability to ask questions or receive clarification regarding the information and has the potential to generate confusion, speculation and inaccurate information. Additionally, it prevents a team leader from communicating important instructions or information simultaneously to all crew members, who may be spread throughout the ship.

Very high frequency (VHF) radio communications between the bridge and fire party were intermittent during the firefighting effort.

There was a general lack of understanding by many of the vessel's crew members with respect to the operation of the fire detection system.

4.0 Safety Action

4.1 Action Taken

4.1.1 Fire Detection and Internal Communications TC has indicated that it considers this item to be one of proper training rather than an inadequacy of equipment.

The SSB states, among other things, the following:

To avoid delays in raising the alarm in a real fire situation, fire patrols should have an efficient direct *Radio* communication with the bridge and all crew members *must* have familiarization training with the alarm system on board their vessel and for alternate communication arrangements. Manual pull stations with a time delayed alarm should be appropriately labelled

such that those activating them will know if an alarm should be sounding.
TC has further indicated that, under the International Convention for the Safety of Life at Sea (SOLAS), 1974, and its Protocol of 1988, Chapter II-2, Regulation 7.8.3, the fire party is required to be in contact through two-way communication. As part of TC's regulatory reform, this requirement will be included in the proposed Fire Detection and Extinguishing Equipment Regulations.

Report on the investigation ofthe fire on the main vehicle deck of Commodore Clipper (very interesting case where detention and confirmation is extensively discussed)

16 June 2010

1.4.2 Initial response

The ship's fire detection system had control stations on both the bridge and in the engine control room (ECR). The system had no particular history of spurious, nuisance alarms, and company procedures allowed either the OOW or duty engineer to respond to an alarm and co-ordinate the initial response. The alarm activated in both locations at 0242:36, indicating that sensor D24 on the port side at the midships section of the vehicle deck had detected smoke. Sensors on either side of D24 activated within the next 30 seconds **(Figure 3)**. The third engineer had gone to the auxiliary engine room and he returned to the ECR to investigate the alarm. He silenced the alarm and contacted the second officer on the bridge by telephone, to report the alarm. At 0243, the second officer instructed the lookout to take a portable very high frequency (VHF) radio and go and check the main vehicle deck to confirm if there was a fire.
The third engineer had not smelled any smoke and suspected that the alarm might be due to a faulty component in the detection system. After calling the bridge, he telephoned the electrical fitter and asked him to investigate if there was a fault with the fire detection system. The third engineer continued to silence the alarm a further six times during the next three minutes before resetting the system at 0245:42. After the fire detection system had been reset, the sensors reactivated and the fire alarm sounded again. The second officer silenced the alarm on the bridge at 0246:20 and reset the system from his control station immediately afterwards. By the time the fire detection system had reactivated, 10 different sensors on the port side of the main vehicle deck, ranging from the original location midships, all the way aft to the stern ramp, had detected smoke.

1.4.3 Confirmation

The lookout knew that the portable radio that he was assigned was not reliable, and was concerned that he might become injured or trapped near the fire and not be able to summon help. After leaving the bridge, rather than go straight to the main vehicle deck he went to the passenger restaurant on deck 7 and met the two night stewards. They could smell smoke in the area, and the lookout returned to the bridge at 0248. Meanwhile, the second officer was talking to the third engineer in the ECR using the bridge telephone. It was possible to determine, from listening to the second officer's side of the conversation on the voyage data recorder (VDR), that the two officers had concluded that the likely cause of the fire alarm was a problem with the detection system. The third engineer subsequently telephoned the chief engineer to report that there was a problem with the fire detection system and that it could not be reset.
The fire detection system ceased to function at 0249:12; 6 minutes and 54 seconds after the first alarm. During this period, 16 sensors detected smoke, activating a combined total of 81 times. The system had been silenced 11 times and reset 7

times by the combined inputs from the bridge and ECR control stations.
The lookout reported to the second officer that he had smelled smoke in the accommodation area, but that he had only been as far as the restaurant. The second officer told him to go to the main vehicle deck; the lookout left the bridge at about 0250. Over the next 7 minutes, the second officer received 8 distorted and unreadable calls on his portable VHF radio, all of which he thought were likely to have been from the lookout.
Throughout this period, the electrical fitter had been attempting to gain access to the main vehicle deck to check the fire detection sensors. He was beaten back by smoke, and went to the ECR instead. The electrical fitter reported the smoke to the third engineer, and the two men isolated the electrical power supplies to the refrigerated trailer units on the main vehicle deck. The third engineer also started an auxiliary generator to take the electrical load from the shaft generator.

The lookout had smelled smoke in the restaurant, but when he returned to the bridge, the second officer was in conversation with the third engineer, and he waited before making his report rather than interrupt. The lookout's report started to challenge the second officer's perception of the problem, but lacked urgency, and as the lookout had not actually seen a fire, this was not enough to persuade the second officer to start alerting the rest of the crew. There was no other information that could make the second officer change his mind about what was happening, and he was also frustrated that the lookout had not gone to the vehicle deck in the first instance. He sent the lookout away again to check if there was a fire, and decided to take no further action until he had a definite report. The lookout's faulty radio meant that confirmation was further delayed.
The delay in verifying that there was a fire on the main vehicle deck had allowed the fire to escalate, and by the time the chief engineer left his cabin there was a strong smell of smoke in the accommodation.
Given the potential for rapid fire development on vehicle, ro-ro and special category decks, it is essential that crew react positively at the first indications of a fire and initiate the proper emergency response. Detection systems must be reliable and incorporated into training drills so that crew can become confident with the system and trust the information that is provided. While obtaining confirmation of the location and extent of a fire from an eye-witness is important, it must be understood that this information could come at a high cost. Firstly it could take time to obtain and, secondly, it may well put the eye-witness at risk. The lookout entered a potentially dangerous, smoke-logged compartment with a faulty radio and an EEBD; equipment that is designed solely for emergency escape and is not suitable for investigating fires.
Activation of a smoke detector, unexplained electrical faults, and a smell of smoke high in the accommodation should be enough information to persuade duty officers that emergency response plans should be activated.

Safety issues identified during the investigation which have been addressed or have not resulted in recommendations

Although both the second officer on the bridge and the third engineer responded to the fire alarm very quickly, both initially interpreted it as being due to a technical fault, delaying the response to the fire. Given the potential for rapid fire development on vehicle decks, it is essential that crew react positively to fire

alarms and initiate the proper emergency response. [2.3.1]

Early communication from the master created the impression that the incident was relatively minor, and did not generate the level of response from the emergency services and shore authorities that was later found to be necessary to deal with the incident. [2.6.2]

This is a quite interesting report, because although the delay on the confirmation had a great impact on the development of the fire, the report is much more focused on the structural and technical coordination with serveral centers, but it des not pay much attention to improve the manual confirmation protocol.

MECKLENBURG_VORPOMMERN

At 2037 the second officer was informed by iternal ship telephone that a trailer was burning on deck 4 by a crew member who passed this deck while proceeding to the manoeuvring station. The second officer immediately forwarded this message to the master on the forward bridge and the chief officer.

At 2039 the fire was also identified by the fire detection system and an alarm followed. On the forward bridge attempes were made to obtain an aoverview of the situation using the surveillance camaras, which were also installed on deck 4. However only smoke was visible. Since the fire detection system indicated the area concerned, attempsts were made to start the drencher system in this area (sections 8 and 9). This did not work immediately due to the stiffness of a control valve.

At the same time the second officer informed the crew aout the fire with an announcement and the general alarm was sounded.

Analysis: Due to the manner in which the trailer was loaded with three vehicles, the trailer doors were secured in the folded positions, which permitted a view o f the load space. Therefore, it was possible for a member of the vessel's crew to detet the fire early on and for the shipboard firefighting operation to be initiated promptly.

Despite the high-qulaity handheld transceivers and the training carried out by the shipping company for the crew on means and channels of communication, internal communication deficits of a technical nature were repeatedly experienced in the course of the emergency situation. This agitated the situation further and hampered coping with the operation effectively (it does not say anything about communication challenges during the fire confirmation).

The fire was not discovered by the crew member responsible for patrolling the vessel while making a safety patrol (due to the time the fire broke out), but by a crew member proceeding to the manoeuvring station. According to the ISM manual of Scandlines, patrols are carried out in the area of the deck immediately after setting sail. During the scheduled passage to Trelleborg, at least two complete patrols (entire vessel) must be carried out and reported to the bridge. The master may order additional patrols at nay time. What the inspection actually consist of is dealt with extensively in the ISM manual.

However, while evaluating the existing ISM manual, it was noted that there is no provision for the crew member responsible for patrolling the vessel to make a physical inspection of the space between vehicles in heightened swell for reasons of safety. On this point a purely visual inspection is referred to (the crew member responsible for patrolling the vessels does not enter the space between vehicles and trailers for reasons of safety). Based on the length of the vehicle deck as well as possibly existing light conditions and way shadows are cast, this could prove to be quite difficult.

BRITANNIA SEAWAYS Fire on 16 November 2013

3.4 The outbreak of the fire and the firefighting

Just before 1900 hours, the master and the chief officer who were both on the bridge observed sparks/flames from two lorries that were stowed on the starboard side of the weather deck. One lorry was carrying a plug-in reefer unit, so the sparks/flames were believed to originate from dam- age to the power supply cable for that unit. Therefore, the duty engineer was requested to switch off the power for reefer plugs on the weather deck in order to reduce the risk of this unit igniting any leaked fuel. Hence, no more sparks were observed from that part of the weather deck.

However, bearing in mind the sparks and the leaking jerrycans on the deck, the sprinkler system was started for the section under the shelter of the forward weather deck in order to wash away any fuel that may have leaked from damaged jerrycans. This section of the sprinkler system was then kept operating continuously.

At 1910 hours, the master and the chief officer could clearly observe from the bridge that the con- tainers on the forward part of the weather deck were sliding across the deck, some of which hit into the flatracks with jerrycans.

As the containers slid across the deck, steel against steel, they created powerful sparks that in- stantly ignited leaking fuel from the jerrycans and created high flames. Within a few seconds, some jerrycans exploded and fuelled the fire. The scenario was also observed from the drivers' mess room by the military personnel.

The chief officer left the bridge and went to the deck office to lead the firefighting.

3.5 Disturbances by alarms

Throughout the entire course of events, the bridge team was disturbed and highly stressed by the sound of countless fire alarms, which made it extremely difficult to concentrate.

Even though the alarms were acknowledged continuously on the bridge, it was not possible to keep up paying attention to the incoming alarms.

Because of the very high pace of incoming alarms and the distracting noise, there was a desire to be able to switch off the alarm sounders for the sake of effective communication and not being unduly stressed. But there was no such possibility. For a period, a crewmember was engaged in acknowledging fire alarms only to stop the sound without being able to reflect on any other possi- ble alarms.

D

It takes manpower and concentration to operate and acknowledge alarms, and in this case the multiple alarms were a distraction more than an aid to officers and crew. It illustrates that the design feature

of the monitoring and alarm systems that perform well in normal situations is not necessarily a help when handling a complex emergency situation – to some degree quite the contrary.

URD (Stena Line)

Fire on 4 March 2014

Hendelsesforløpet:

On 4 March 2014 at 0320, URD departed from Liepaja, Latvia, with fully loaded car decks and 110 passengers on board, bound for Travemünde, Germany, according to the ship´s regular schedule. At 0740, two crew members, randomly passing the main car deck, discovered a fire on top of a lorry. The bridge was alerted and the car deck sprinkler system was quickly activated. Ten minutes later, the sprinkler system was stopped in order to allow the crew to assess the effect of the extinguishing operation. As the fire was not completely extinguished, the firefighting crew tri ed to extinguish it by means of a fire hose. Meanwhile, assembly of the passengers was initiated in the ship´s reception area on deck 6.

4.2.3 Management and organizational flexibility The decision-making behind the initiatives taken during the events was, to a great extent, charac-terized by local action taken by the officers present on the bridge and the officers at the scene of the fire as well as by the master. Despite a hierarchical system, the normally prevailing informal interaction between the crew members is considered to have remained relatively unaffected during the fire incident and was likely to have encouraged local adaptation and decision-making. The random discovery and presence near the sprinkler station made the engineers adapt to the situation at hand. This form of adaptive behavior required that the crew was well familiar with the operations and features of the ship. On the other hand, unfamiliar crew members would have a stronger need for structure and guidance by procedures and instructions. The ability to adapt to the situation on board URD and early actions may well have given the crew an essential advantage in the firefighting efforts. Training and experience are likely to be key elements to a successful adap-tive behavior.

8.2 Annex B – Study of the wave propagation limits and coverage requirements of radio signal

Aim: To find blind spots for communication with the bridge during the process of confirming or dismissing the presence of a fire

Do you have any radio blind spots on your vessel? Please specify below.

NUMBER	LOCATION	VHF SIGNAL (Y/N)	UHF SIGNAL (Y/N)	IS AVAILABLE OTHER MEANS OF COMMUNICATION LIKE INTERNAL TELEPHONE (SPECIFY)
1	EMERGENCY GENERATOR	Y		
2	BATTERY LOCKER (GMDSS)	Y		
3	PAINT LOCKER	Y		INTERNAL TELEPHONE
4	FIRE PUMP	Y (poor)		
5	LAUNDRY	Y		
6	PAX CABIN CORRIDOR	Y		
7	GALLEY	Y		INTERNAL TELEPHONE
8	COMPRESSOR ROOM	N		INTERNAL TELEPHONE
9	ENGINE CONTROL ROOM	Y (poor)		INTERNAL TELEPHONE
10	SOPEP	Y (poor)		MANUALLY CALL POINT
11	DRENCHER ROOM	Y		INTERNAL TELEPHONE
12	HYDRAULIC ROOM	Y		
13	RAMP. ACCESS CONTROL	Y		
14	CAR DECK	Y		
15	MAIN CARGO DECK	Y (see note)		MANUALLY CALL POINT
16	WEATHER DECK	N/A		
17	LOWER HOLD	Y (can be poor)		MANUALLY CALL POINT
18	UPPER DECK	Y		MANUALLY CALL POINT

NOTES: Radio signal may depend on number of cargo vehicles. The larger number cargo, the poorer signal

NAME OF PERSON (S) INVOLVED (voluntary):

NAME OF THE VESSEL/LOCATION: BAHAMA MAMA (BALEARIA) Port of Melilla (Spain)

DATE AND SIGN: 10th July2021

8.3 Annex C – Standard Marine Communication Phrases

1)

Introduction to the Standard Marine Communication Phrases (SMCP = IMO-English)

Listen to the VTS Controller and the Master. Answer the following questions.

1) What is the vessel‘s ETA at the pilot station?
2) What was the vessel‘s last port of call?
3) What is the vessel‘s port of destination?
4) What is the vessel‘s present draft?
5) What dangerous goods does the vessel carry?
6) How many persons are on board?
7) What is the security level on board?

2)

A Container vessel is on fire off the coast.

The Master asks the Maritime Authorities for fire-fighting assistance.

MV: Information: MV Icebird Charlotte on fire. I repeat. I am on fire.

VTS: Information received. You are on fire. Question: Where is the fire?

MV: Answer: Fire is in hold in hold number 2. I repeat. Fire is in hold.

VTS: Answer received. Fire in hold. Question: Are dangerous goods on fire?

MV: Answer: Negative. No, dangerous goods are not on fire.

VTS: Answer received. No dangerous goods on fire. Question: Is there danger of explosion?

MV: Answer: According to my information no danger of explosion.

VTS: Answer received. No danger of explosion. Request: Report injured persons.

MV: Information: Two persons slightly injured. No medical assistance required.

VTS: Information received. Two persons slightly injured. No medical assistance required. Question: Are you under command?

MV: Answer: Positive. I am under command. Information: I have reduced speed.

VTS: Answer received. You are under command. You have reduced speed. Question: Is fire under control?

MV Answer: Yes, fire is under control at the moment. Information: We have closure condition in hold number two. Power supply to hold switched off. We have used carbon dioxide in hold number two. Result is not clear. Temperature is still high. Smoke still leaving hold. We are cooling hold with water from outside.

VTS Information received. Closure condition for hold on fire. Power supply switched off. Result of use of carbon dioxide not clear. Temperature still high. Smoke still leaving hold. You are cooling hold with water from outside. Question: What kind of assistance is required?

MV: Answer: I require fire-fighting assistance.

VTS: Answer received. You require fire-fighting assistance. Stand by on this channel. Request: Call me immediately if present situation on board is changing. I will call you back.

MV: Standing by on this channel. Request received. I will call you immediately if present situation on board is changing. You will call me back. Thank you.

3)

The Maritime Authorities send a shore-based fire-fighting team to the vessel.

The leader of the fire-fighting team speaks with the Master about the situation on board during the approach to the vessel on fire.

Good morning, sir. This is the team leader of the fire-fighting team on MV … .

I want to ask you some questions about the fire on board.

Do you speak …… ?

What is the present situation on board?

How many persons are on board?

How many persons are injured?

Are there any missing persons?

Do you require medical assistance?

Where is the fire?

Is there a closure condition for … ?

What fire-fighting measures did you take?

Did you use CO2 for fire-fighting?

How much carbon dioxide is left?

Is the fire spreading?

Did you start cooling measures?

Are you still cooling?

What cargo do you carry in (hold …)?

Do you carry dangerous goods in (hold …)?

What type of hose connection system do you have on board?

Do you have power supply?

Are your fire pumps operational?

Is it safe for us to embark?

We are a team of ten fire fighters. How can we embark?

Where is a safe area for the fire-fighting team?

Where is a safe place for our fire-fighting equipment?

What means of communication can we use?

If the VHF communication breaks down, how can I contact you?

I require a fire and safety plan when I am on board. Please have one ready for me.

Please send two guides to (…) to wait for us.

4)

The team leader of the fire-fighting team is on the bridge, speaking with the Master about the fire-fighting.

Please give me a report about the present situation.

Are you still under command?

Is there still power supply?

Are you fighting the fire at the moment?

Are your fire-fighting measures efficient/successful?

Is there a drenching system in hold number (…)? (Can you use it?)

Where is the smoke coming from?

Can you use carbon dioxide once again?

Can you show me exactly where the fire is?

Please give me exact information about the cargo in this hold.

Is there any dangerous cargo in the vicinity of the hold (on fire)?

What is the temperature in hold number (…)?

How did you take/measure the temperature?

Is the temperature in hold number (…) increasing?

How many breathing apparatuses do you have on board?

Do you have any spare bottles for the breathing apparatuses?

How many fire pumps are you using now?

Do you know where the hottest part in the area is?

Is there a stability problem if we pump water into the hold?

I require one of your crew members with a fireman's outfit to guide my team to the fire.

Can we enter hold number (…) and look inside?

Please advise an area where a helicopter can winch down more special equipment.

8.4 Annex D – Relevant data on communication gathered in interviews by NTNU Social Research

Interview 2. Contact person in shipping company

Communication between chief officer and the AB seaman by means of walkie-talkie*: " I am entering the deck, I am checking this and that , there is not fire…" When they is an actual fire they do not go very far because they can smell the smoke or feel the heat and that's a clear indication of fire. But you still want to know the exact location of the fire but at the same time you don't want to put lives on risk. They do not have special equipment.*

She portrays communication as unproblematic – walkie-talkies work also well (not blind sports due to extra boosts to increase signal).

She argues that people spend too long time working in the same vessel and that can be problematic cause you don't learn from others. At the same time, some affordances. Communication can be better with people you know well. They do not have to say each other what to do, commands will be less because they know what to do and each other very well. Feeling. Which it can be difficult for someone new, to understand what is it going on. She has not observed that but she can imagine that.

Interview 3 Officer and AB

We instruct people that when they know a fire, they should give all information regarding how big, have they closed the doors, all these things they should give to the bridge. So we can respond.

Recently, or not recently, we have handheld heat cameras, one is big, and the other is infrared mobile phone size, so the watchman can switch on the smoke and have a better understanding of the fire, and identify the area under the truck. Communicate to the bridge through telling of the radio … would be amazing to get the picture on the bridge. Tricky with communication, also radio, on the lower decks. But who knows, with 5 G. Wifi spots would work.

The communication of the crew during the drill and debriefing is important. Let them ask question. Answer and explain later. We have a safety officer, and I or the captain also do this.

Interview 4 – First officer

I will leave the things I do. I will go to the cabinet. I will tell the sailor, we are minimum 2 sailors on bridge. The other person is a AB, has a certificate for watch keeping. I go to cabinet and check exactly the position. I tell the watchman. I know he is out. Normally he goes from top to down. I do not know exactly where he is. He is always the person I contact. If he cant' – no battery in the radio, I have the second person on the bridge – I can send the second guy. One person at least will always go. The sensors is checked once a week because the position is very important. For maintenance the change one and one. If they send wrong location we are loosing time.

Communication: reality is different does not always match formal requirements. To have a good communication language is not enough. Trust is for instance important.

Use English in fire situation*. In logbook, the authority takes the black box and this book. All operations everything needs to be recorded in that book. Every signature. And in the first page it says that the language on board. A ship with Spanish flag, all communication can be in Spanish. 80% of the crew has to be Spanish. Every other flag the language is English. Big companies have a convenience flag.*

No problem with language in case of fire. Automatically if you don't speak english you can´t be employed. I reality – there are some crew members can not speak English at a deacent level.

Scandinavian star – old ship, not modern system, but one of the problems was communication.

Yes I have experiences a watchman which did not speak English good enough, so we had to change him. Also problem with English speakers who did not the safety rounds properly. It is not easy to find the right watchman.

Interview 7 - Officer

New technology can help a lot, good camara coverage and radio coverage

Everybody can listen to the radio channel, an advantage, cause someone else can check quicker if they are in the location (flexibility)

Interview 8 -AB nightshift

Things that have improved recently : a common radio channel where everybody receive the information. This improves coordination and reduce time.

Everyone on the same radio channel. We know where to go.

Before, not on the same channel, didn't know where to go or what happened.

Works faster now.

Before had different channels, because the one team had to communicate on one channel.

The attack team can have one separate channel – initial response, not in fire suits. We can have one separate channel.

Interview 11 - officer

On communication:

Two codes, not to make the passengers scared. Code blue, code red

Communication important

Main control is bridge, engine, first aid team, evacuation team.

Too many interfere, difficult to maintain overview, difficult to communicate, casuality

Too many talking at the same time

Will use internal telephone

Interview 12 – RISE researcher

A talk with a researcher from RISE about a boat visit for other project studying equipment and evacuation. She observed the weekly fire drill during the visit.

What kind of technology were they using to communicate with the runner? Radio

Was there any problem (such as for example blind spots)? No, they said that radio is usually working really good. They have a separate channel for fire, and another one for evacuation

Regarding equipment: do they have what they need? Wishes? Satisfied with the way radio is integrated in their masks, and the way you have to press the bottom on the front, easy to press with globes. The want to be able to attach the flashlight

Who is having access to that channel? She thinks that everybody, it is not restricted, they have it for practical reasons