PROJECT DELIVERABLE REPORT

Introducing advanced ICT and Mass Evacuation Vessel design to ship evacuation and rescue systems

D9.6 Report on PALAEMON training activities – PALAEMON training concept implementation

A holistic passenger ship evacuation and rescue ecosystem

MG-2-2-2018

Marine Accident Response

"This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 814962"

Document Information

Grant Agreement Number	814962	Acronym	PALAEMON
Full Title	A holistic passenger ship evacuation and rescue ecosystem		
Topic	MG-2-2-2018: Marine Accident Response		
Funding scheme	RIA - Research and Innovation action		
Start Date	1st JUNE 2019	**Duration**	36 months
Project URL	www.palaemonproject.eu		
EU Project Officer	Georgios CHARALAMPOUS		
Project Coordinator	AIRBUS DEFENCE AND SPACE SAS		
Deliverable	D9.6 Report on PALAEMON Training Activities (V2)		
Work Package	WP9 – Raising Awareness, Standardisation and Exploitation Roadmap		
Date of Delivery	**Contractual** M36	**Actual**	M36
Nature	R - Report	**Dissemination Level**	PU-PUBLIC
Lead Beneficiary	JOAFG		

Responsible Author	Pia Ferner Yvonne Prinzellner Alisa Simon Sabrina Scheuer Andreas Peer Veronika Simanko Georg Aumayr	Email	Georg.aumayr@johanniter.at
	Further Authors: Alexandros Michelis (NTUA) Marios-Anestis Koimtzoglou (NTUA) Alexandros Koimtzoglou (NTUA) Cristian Ancuta (RNA) Marina Papaioannou (DNV)	Phone	+43 676 83112814
Reviewer(s):	Fotis Oikonomou (DANAOS) Carmen Perea Escribano, David Gomez Fernandez (ATOS)		

Keywords	learning concept, eLearning, blended learning, mixed reality approach, ship evacuation training, educational technology, eDidactics, VirtualReality

Revision History

Version	Date	Responsible	Description/Remarks/Reason for changes
0.1	2021/04/15	JOAFG	Table of Contents Draft
0.2	2021/04/30	JOAFG	Table of Contents Final
0.3	2021/06/18	JOAFG	Report write-up
0.4	2021/06/25	DANAOS/ATOS	Internal Review
1.0	2021/06/29	JOAFG/AIRBUS	Review and Release
1.1	2022/04/04	JOAFG	Integration of Updates
1.2	2022/05/20	JOAFG	Integration of Updates
1.3	2022/06/03	JOAFG	Integration of updates
1.4	2023/01/26	DANAOS/ATOS	Review
1.5	2023/01/31	JOAFG/AIRBUS	Release
1.6	2023/02/16	DNV	Providing Annex II
2.0	2023/02/20	JOAFG	Integration of Annex II and upload to ECAS

Contents

Abbreviations

AR	Augmented Reality
BL	Blended Learning
CMS	Course Management System
CVS	Concurrent Versioning System
GDPR	General Data Protection Regulation
HUD	Heads-Up Display
LMS	Learning Management System
MEV	Massive Evacuation Vessel
Moodle	Modular Object-Oriented Dynamic Learning Environment
MR	Mixed Reality
NPC	Non Personal Character
PaMEAS	Passenger Mustering and Evacuation Automation System
PESS	PALAEMON Evacuation System Simulator
PLATO	Programmed Logic for Automated Teaching Operation
SCORM	Shareable Content Object Reference Model
SEM	Smart Evacuation Management
SHM	Structural Health Monitoring
SIMAVI	Software Imagination and Vision
SST	Ship Stability Toolkit
STCW	Standards of Training, Certification and Watchkeeping for Seafarers Convention
ToT	Training of Trainer
UAV	Unmanned Aerial Vehicle
VDES	VHF Data Exchange System
VLE	Virtual Learning Environment
VR	Virtual Reality

For Annex II

AES	Anti- Exposure Suit
CSO	Company Security Officer

CSS	Cargo Stowage and Securing
ERS	Emergency Response Services
DPA	Designated Person Ashore
IMDG Code	International Maritime Dangerous Goods Code
IMO	International Maritime Organization
ISM Code	International Safety Management Code
ISPS Code	International Ship and Port Facility Management Code
LSA	Life-Saving Equipment
MES	Marine Evacuation System
PFSO	Port Facility Security Officers
PPM	Parts Per Million
Ro-Ro	Roll-on/Roll-off
ROPAX	Roll-On Roll-Off Passenger
SAR	Search and Rescue
SMS	Safety Management System
SOLAS	International Convention for the Safety of Life at Sea
SSO	Ship Security Officer
STCW	International Convention on Standards of Training, Certification and Watchkeeping for Seafarers
SWL	Safe Working Load
TPA	Thermal Protective aid
VHF	Very High Frequency

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Summary

Del.9.6 is the update to former D9.11 from the proposal section. In the Amendment process, both deliverables have been merged to a final report. The writing process started in 2021 and was finalized after the pilot actions in Jan 2023. The constant development and practice of the pilot actions have been summarized in this report.

Content

The PALAEMON Academy and related training concept is a crucial component in order to prepare staff as well as passengers for emergency procedures on board of a cruise ship and therefore increase overall safety on board large cruise vessels. It also provides an opportunity for crew members to familiarize themselves with the PALAEMON ecosystem through a specific briefing component and PALAEMON system components that can be featured in practical trainings in a virtual environment.

The PALAEMON training concept draws on didactical training approaches with regards to eLearning, Blended Learning and innovative Virtual and Augmented Reality approaches combined into Mixed Reality approaches.

The PALAEMON Academy utilizes these approaches in its attempt to create a comprehensive training concept involving different learning methods to cater to the needs of a variety of trainees as learning styles differ from person to person. The chosen approach to present learning content via the Learning Management System (LMS) Moodle, paired with the PALAEMON VR Academy component, attempt to create a learning experience that is diverse and engaging for trainees. While the LMS learning component has a more theoretical connotation, it does provide opportunities to create a more engaging and fun learning environment by use of video content, quizzes and game-like features. Content provided via LMS is tailored to the PALAEMON objectives as well as tackling identified further needs in crew training not yet covered in the standard trainings currently offered. Content is focused on Evacuation procedures, sensitization on dealing with people with a disability, first aid for passengers, an optional module on the PALAEMON ecosystem for briefing of staff and the VR module in preparation of the VR training component which will put the learning into practice. The PALAEMON Academy is supported by the scenario database which contains a variety of possible VR trainings scenarios and can be adapted and extended as needed by the trainees.

1 Introduction

1.1 Objectives and aims

In order to render evacuation procedures more efficient and improve overall safety on board of a cruise ship, adequate training of staff (and where applicable of passengers) is crucial. It is important to create awareness, develop necessary skills and run through key steps in order to internalize important processes during an evacuation, which represents a very stressful situation that requires structured action and execution of tasks.

The deliverable at hand reflects an important output of T9.5 “PALAEMON Specialized Curriculum Development Training Activities” as it specifies on the different training components (tying together different elements of the project) and the overall training concept for ship crew members, generally and under specific consideration of the PALAEMON ecosystem.

The project task foresees an explanation of the training system and PALAEMON Academy features, including the gaming application. Furthermore, at a later stage the testing of the system in at least one predefined scenario and the collection of feedback from trainees on the PALAEMON system is intended to be collected. In its piloting phase trainees should also have the opportunity to build their own scenarios, which in turn will help to expand the scenario database.

As the first version of the report on training activities, this deliverable details the learning and training concept within PALAEMON and lays out in detail how the different PALAEMON components make up the Academy and are being tied together in a cohesive training concept.

The revised second version of this deliverable (D9.12) will capture insights of the piloting of the PALAEMON Academy and individual training components, capturing lessons learnt and revisions of the overall training concept.

The main aim of this deliverable is to create a complementary learning and training concept for cruise ship crews, focusing on the thematic areas of PALAEMON as well as apparent current gaps in training. Hence, the focus lies on evacuation procedures, also integrating training aspects for the PALAEMON ecosystem, as well as awareness raising for the handling of people with disabilities on board to enhance the safety of all passengers.

In order to set-up such targeted training, two main components – namely eLearning via a Learning Management System (LMS), as well as Virtual Reality (VR) training, have been identified as suitable training components and are detailed in this deliverable.

The document at hand is structured as follows: the first section explains basic concepts regarding didactical training approaches, with particular reference to eLearning, Moodle[1] as a prominent Learning Management System, blended learning and extended reality (virtual, augmented and mixed reality) approaches. The subsequent section presents the approaches applied within PALAEMON and the PALAEMON Academy. Chapter 4 introduces the Scenario Database for the VR Training. The document closes with final observations summarized in a conclusion. The Annexes provide further information on Moodle plugins available for the realization of training, as well as sample scenarios and screenshots from the scenario database.

1.2 Relation to other WPs

T9.5 on “Specialized Curriculum Development Training Activities” clearly connects with a number of other PALAEMON project components as it processes a training concept related to components developed as part of the PALAEMON project. D9.11 does draw on findings reported in WP2 (PALAEMON Architecture), WP3 (Smart Safety System, PALAEMON Academy) and WP4 (MEV).

Of particular relevance are e.g. findings on evacuation procedures, methodology and respective strategies (WP2 and 3) which serve as a basis for eLearning content with the respective thematic focus and subsequent training of evacuation procedures via VR and Mixed Reality.

Findings within D2.4 (PALAEMON Consortium, 2020a) on use case definition and operational requirements with specifics on ship evacuation management (concepts and trends) as well as a first scenario description further informs the formulation of learning content for one of the eLearning modules as well as the scenario database.

D2.6 (PALAEMON Consortium, 2020) details the PALAEMON Architecture – describing the PALAEMON system and individual components which should be trained and tested. The eLearning component foresees providing a first briefing of crew members on the PALAEMON technologies as well as a possibility of testing within the VR environment. The training concept will make specific referencing to the training of and with the PALAEMON system. Similarly, information received through WP4 on the Mass Evacuation Vessel contributes to the conceptualization of a training element in which handling and operation of the MEV can be included in the training.

Lastly, with the VR environment forming an important key element in the training curriculum, T3.6 PALAEMON Academy represents an important related task, providing the basis for the VR training component as described in this training concept.

2 Didactical training approaches

In the following chapter the basic concepts of eLearning and its different distinctions are being presented. This provides a foundation for further elaborations on the PALAEMON specific training approach. The main focus of the training approaches lies on eLearning as well as Blended Learning and Virtual and Augmented Reality approaches in particular.

2.1 eLearning

The term eLearning has a long tradition in the field of teaching and learning. Since the 1960s eLearning has started to become an ever-growing element of educational interventions in several fields like higher education institutions or industrial businesses (Kidd, 2010). eLearning is known under many synonyms, depending on the relevant target groups it is directed towards. In general, the term encompasses all training and teaching elements that are directly or indirectly connected with either a technological device (e.g. tablets) and/or software like a Learning Management System (LMS), e.g., Moodle (Moodle, n.d.). In other words, eLearning can be understood as either a didactical (design-) approach or a technical realisation of a learning environment.

As with every didactical approach, there are certain variables that can hinder or foster the success of an effective eLearning-experience for the respective learner. Criteria for the effectiveness of eLearning scenarios are the successful fulfilment of the learning objectives, an easy access to the installed “eElement”, delivering consistent and accurate messages to the learners, the ease of use of the installed “eElement”, the entertainment-factor (e.g. gamification elements like “badges”), the memorability of the learning-experience, the relevance of the learning-experience and reduced training costs (in comparison to regular face-to-face training sessions) (Steen, 2008). In their article ‘Elements of Effective eLearning Design’, Brown and Voltz (2005) propose the training content, as well as activities regarding experience and feedback as the main three components of effective eLearning. Before planning and implementing these, it is necessary to choose a fitting tool and technology. Due to the large number of eLearning tools on the market, it is recommended to focus on the needs and constrains of the learners, as they are the main users of eLearning (Steen, 2008). When it comes to the design process of a specific course, knowledge in education, multimedia content and electronic technologies is required and should be combined with a skilful use of learning and training theories.

As with other educational design, there is no one-size-fits-all approach, because each course is unique, but it is important to view the eLearning system as a two-way street, allowing ongoing communication between designers and learners (Brown & Voltz, 2005).

When looking at the specific topic of seafaring in eLearning, a Google keyword search with the terms “*seafaring online courses*” achieved approximately 4,470,000 results and therefore shows the popularity of this topic. Big online course providers are for example the Maritime Training Academy and the Maritime Institute of Technology and Graduate Studies. One course example therefore is the Maritime Training Academy’s “Maritime Fire Prevention, Fire Fighting and Fire Safety Diploma”, which consists of 10 modules over a period of at least 12 months. All students are required to successfully complete and pass the module assignments. Diploma students will also be required to sit and pass a final examination. The Syllabus includes topics

such as “Introduction to Maritime Firefighting”, “Chemistry of Combustion” and “Fire Risk Assessment”.

Turning away from potential risks and drawing attention to real world catastrophes, SARS-CoV-2, commonly known as COVID-19, affected people worldwide. Even though the outbreak of COVID-19 and the following global lockdown have caused major interruptions and disruptions in the fields of learning and education, they have also paved opportunities for the growth of the eLearning segment. Especially eLearning platforms, such as Moodle, experienced a massive spike in the number of users. The global eLearning industry is projected to surpass $243 billion by 2022 with Augmented and Virtual Reality technologies being the biggest innovators (NCES, 2019). Forecasts on the corporate eLearning market look similar. It is growing and will be worth $50 billion by 2026. With an annual growth rate of 15% from 2020 to 2026, the corporate market will be one of the biggest drivers of the eLearning industry (Research and Markets, 2019).

2.2 Moodle as example of LMS

Learning management systems (LMS), also known as CMS (Course Management System) or VLE (Virtual Learning Environment) are getting increasingly common, especially since the COVID-19 pandemic made it necessary to reduce or cancel face-to-face classes. The primary learning management system or computer assisted instruction system was called PLATO (Programmed Logic for Automated Teaching Operation) and was developed by the University of Illinois in 1960 (Stapić et al., 2008). It included key features of LMS, such as online forums, message boards, online testing, email, chat rooms, picture languages, instant messaging, remote screen sharing and multiplayer online games (Kumar et al., 2011). Later on, in 1997 two other LMS were introduced, namely WebCT 1.0 and Blackboard. Since then, many other systems have been released, leading to more than 150 different available systems providing eLearning services (Kumar et al., 2011).

Moodle (Modular Object-Oriented Dynamic Learning Environment), as one of the world’s most popular and most used LMS was developed by Martin Dougiamas in the late 1970s. Dougiamas was educated via the School of the Air— correspondence schools in the remote areas of Australia whose curriculum was largely delivered by radio, indoctrinating him in distance learning at an early age (Lambda Solutions, 2019a). Officially released in 2002, Moodle soon became one of the most common learning management systems. It is now used by more than 100 million users and has over 100.000 deployed Moodle sites worldwide in more than 225 countries (Lambda Solutions, 2019a). Moodle web page provides developer information, roadmap, coding guide and Concurrent Versioning System (CVS) guide to access its source code and it has a long list of developers (Kumar et al., 2011). Moodle provides educators with the technology to provide online learning in personalized environments that foster interaction, inquiry and collaboration (Lambda Solutions, 2019a). In private Moodle sites, educators, trainers and employers can create and deliver online courses to help their audiences achieve their learning goals (Lambda Solutions, 2019a).

Advantages and Disadvantages of Moodle

Moodle has several advantages as well as disadvantages that have to be taken into account when deciding for or against its use. One of the main advantages is that it is free to download

and distributed under the GNU General Public License[2]. Its code is open source, which allows everyone to review, change and redistribute it. Another advantage is its customization option by using independent modules (i.e., plugins) that allows its users to have exactly the functionality and features they want. The hosting of the platform can be done by the user or it can be outsourced to a Moodle hosting service provider. As Moodle has a strong global community, developers from around the world continually enhance the software and provide additional functions and plugins. There are already over a thousand of such plugins available for Moodle. A list of suitable plugins for the purpose of the PALAEMON LMS are listed in Annex I - Moodle Plugins and Gamification.

Gamification is a new approach that has been established in education to promote learners performance and motivation (Hasan et al., 2019; Langendahl et al., 2016; Šćepanović et al., 2015). It is one way to make learners more engaged with their learning material, which aims to increase the effectiveness of their training. Gamification stimulates two basic psychological human needs, the need for competence (a desire to seek out control or to feel mastery over a situation) and autonomy (the desire to feel independent or have a certain level of control over our actions) (Lambda Solutions, 2019c). A game-like functionality of the Moodle courses can increases the learner's participation by incorporating elements of video-gaming such as badges, points, levels and leader boards (Barata et al., 2013; Sailer et al., 2017; Wolf et al., 2018). Such elements as well as completion restrictions on activities are critical components (Berkling & Thomas, 2013; Costa & Aparicio, 2018; Hamari et al., 2014). It is also shown, that gamification has a significant influence on learner's engagement (Barata et al., 2013; Vanduhe et al., 2018), motivation (Šćepanović et al., 2015) and learning outcomes (Leong & Luo, 2011).

An important aspect of consideration when working with such online platforms are aspects of privacy and data protection. In 2018 the European Union enforced the General Data Protection Regulation (GDPR) that should protect user's personal data. Moodle is also supporting GDPR with Moodle 3.5 by covering the on boarding of new users, including age and location, checking to identify minors, versioning of privacy policies and tracing of user consents as well as handling of subject access requests, erasure requests and maintaining a data registry (Lambda Solutions, 2019b). Apart from this, Moodle can also be used as a mobile version which makes it a lot easier to be accessed by other technologies like tablets or smartphones.

Moodle has an ability of tracking the learner's progress, which can be monitored by both teachers and learners which implicitly includes both security and privacy threats and makes Moodle a vulnerable system (F. Muhsen et al., 2013; Kumar et al., 2011). It also has limitations due to the fact that is has no Shareable Content Object Reference Model (SCORM)[3] (ADL Initiative, n.d.) support and also the roles and permission system is limited (F. Muhsen et al., 2013; Kumar et al., 2011). Another disadvantage is that Moodle offers only limited support for personalization, although it is possible to create new themes and to use different plugins for personalization (Limongelli et al., 2011). Moodle 3.5 helps to be GDPR compliant, but it does not solve the issue by just upgrading to the latest version. Administrators still have to install additional plugins and check their site for GDPR compliance using some guidelines from Moodle.

[2] GNU General Public License home page - https://www.gnu.org/licenses/gpl-3.0.html
[3] A set of technical standards for eLearning products

2.3 Blended Learning

There is a huge variety of eLearning types. One of them is Blended Learning (BL) (Dziuban et al., 2018). Just as the name implies, it is a blend of different forms of learning, more precisely the merging of physical and digital learning spaces and experiences. Hereby each part (e.g. the digital and the face-to-face) is equally important and they ideally complement each other, compensating for particular weaknesses. The wide variety of methods in BL provides a customisation to different types of learners. Just as any other learning style, it offers many potential advantages and disadvantages that largely depend on design and execution quality. Benefits for learners include independent work opportunities and individual learning pace, while still having personal attention and assistance of in-person teachers. Benefits for organisations are e.g., a reduction in face-to-face training costs such as travel and accommodation (Boelens et al., 2017).

The modality of BL is not new. It can be tracked back to medieval times when printed material provided the first asynchronous learning opportunities. A lot has changed since then. Through today's highly digitalized learning environments, concrete (physical) teaching and learning places have lost the importance they once had when learners were reliant on face-to-face teaching scenarios. Simultaneously there has been a distinct shift to time being the primary organizational construct of any educational and technology supported environment (Norberg, 2017).

Research has shown many positive results of BL such as improvement in student success and satisfaction, as well as an improvement in their sense of community. In order to achieve this, institutional support for course (re-)design and planning is a key factor for successful blended learning initiatives (Dziuban et al., 2018).

2.4 Virtual and Augmented Reality (VR/AR) – A Mixed Reality Approach

Virtual Reality (VR) pursues the goal of developing computer systems that transport users into an apparent world in which they feel present and are able to interact in realistic and multisensory ways. Technologies are used to facilitate immersion in this virtual world by generating artificial stimuli for visual and auditory perception. Special VR goggles, but also VR headsets which make use of smartphones, play images of a virtual 3D world to the users. In addition, multiple sensors determine the current head position and direction of gaze, so that one can move around in the virtual world by simply turning the head, just as one would in reality. Sometimes also other senses such as the haptic sense or the sense of balance are included. In the extreme case of perfect VR, it would no longer be possible to distinguish virtual world and reality (De Paolis & Bourdot, 2018).

In addition to usual eLearning environments, VR generates a far more immersive experience of the specific learning content and opens up new learning environments. This can be extremely helpful when creating courses which explore dangerous or high-risk situations with potential hazards that could impact employee safety. Exposures to e.g. dangerous substances are more common than most people realize and VR allows to learn (from mistakes) in a fun and engaging way. Through low risk-high reward situations, it gives learners hands-on experience without possible safety and health concerns.

VR offers the exploration of new and unchartered locations that may be difficult to enter physically. Adding game-based elements can help improve motivation and learning. Here comes gamification

into play, which is defined as the transfer of game-typical elements and processes into non-game contexts (see also Annex I - Moodle Plugins and Gamification). In recent years it has gained huge popularity. Prominent examples are websites, apps, or various offline areas with reward systems, progress bars, or other feedback elements that can be easily introduced and provide user actions and motivation. Their common goal is to keep users in a state of flow in which they are so involved in an activity that nothing else seems to matter (Stelian et al., 2017).

What takes users literally to a whole other level of involvement is Augmented Reality (AR). Virtual Reality and AR could be described as the two sides of the same coin, as both systems use similar sensors and math. But while VR creates an entirely artificial environment, AR overlays new information in the form of 3D graphics on top of a real-life situation by using sensors and algorithms that determine camera settings and directions. In short, AR is the integration of digital information into real life environments. Computer-generated content is tied to specific locations and/ or activities and allows a fusion of Virtual Reality with the real world. The opportunity of gaining further information or knowledge about the real world that may not directly be accessible or help with the execution of specific tasks are only a few of many benefits of AR. Through experiential learning and practice opportunities, AR can increase engagement and interactivity of users. Areas of implementation are diverse and range from medicine up to marketing (De Paolis & Bourdot, 2018). Mixed reality unites these two extended reality training elements in a quite new training approach, submerging elements from the virtual as well as real world. While AR works with virtual layers onto the real-life environment, enhancing reality with digital objects or information, MR fosters a combination of the two that enables interaction with both environments (Kaplan et al., 2021).

3 PALAEMON Academy and training components

The PALAEMON Academy is a specialized training program, which was created to introduce trainers and trainees to ship evacuation operations led by smart technology devices. The Academy consists of two main parts, namely VR-elements (PALAEMON Evacuation System Simulator – PESS) and the eLearning platform Moodle, featuring content about evacuation with a special focus on vulnerable target groups on board. Given the popularity and accessibility of Moodle, it serves as suitable option for hosting the PALAEMON eLearning training content.

3.1 eLearning

3.1.1 Learning Framework

Briefly put, learning frameworks are models that support instructors in making informed decisions about learning goals and according learning activities as well as the integration of assessments into the learning environment. Frameworks offer conceptual maps to create courses, making it easy for the instructor to mix and match them as needed (Yale University, 2021b). In order to pick a suitable framework and develop the syllabus and course design along its lines, it is necessary to be aware of the learners' skills as well as the learning progress they are supposed to attain due to the course. Thus Benjamin Bloom developed a taxonomy tackling this specific topic, to help instructors develop effective learning outcomes (Yale University, 2021a). The taxonomy in its original form is comprised of six categories: knowledge, comprehension, application, analysis, synthesis and evaluation (Armstrong, 2010).

Khan (2014) adapted Bloom's Taxonomy and embedded it into an eLearning framework (see Figure 1). The taxonomy is very useful in the case of the PALAEMON Academy to explain the different approaches (LMS-platform and VR-training) used within the academy.

The LMS Moodle is an asynchronous learning tool, which is positioned on the lower end of the scale in terms of interactivity for the learners. This being a conscious decision to bypass any dependencies on e-tutors or additional personnel - besides the course provider - to administrate the course. In case of the VR-training-element the complexity, in terms of the taxonomy, is being raised. This type of learning setting can also be described as synchronous learning where the learner receives direct feedback to his/her actions in the VR environment. There is a high level of interactivity, because the learner has to engage in complex situations which demand a high level of certain soft skills (e.g. cooperation in a team) as well as a high level of cognitive skills (e.g. problem solving).

The combination of the rather static learning environment on Moodle with the very immersive and engaging one in the VR feature enables the learner to attain knowledge at his/her own pace as well as giving them the opportunity to engage with each other in scenarios that demand actions according to the theoretical input they have garnered on Moodle.

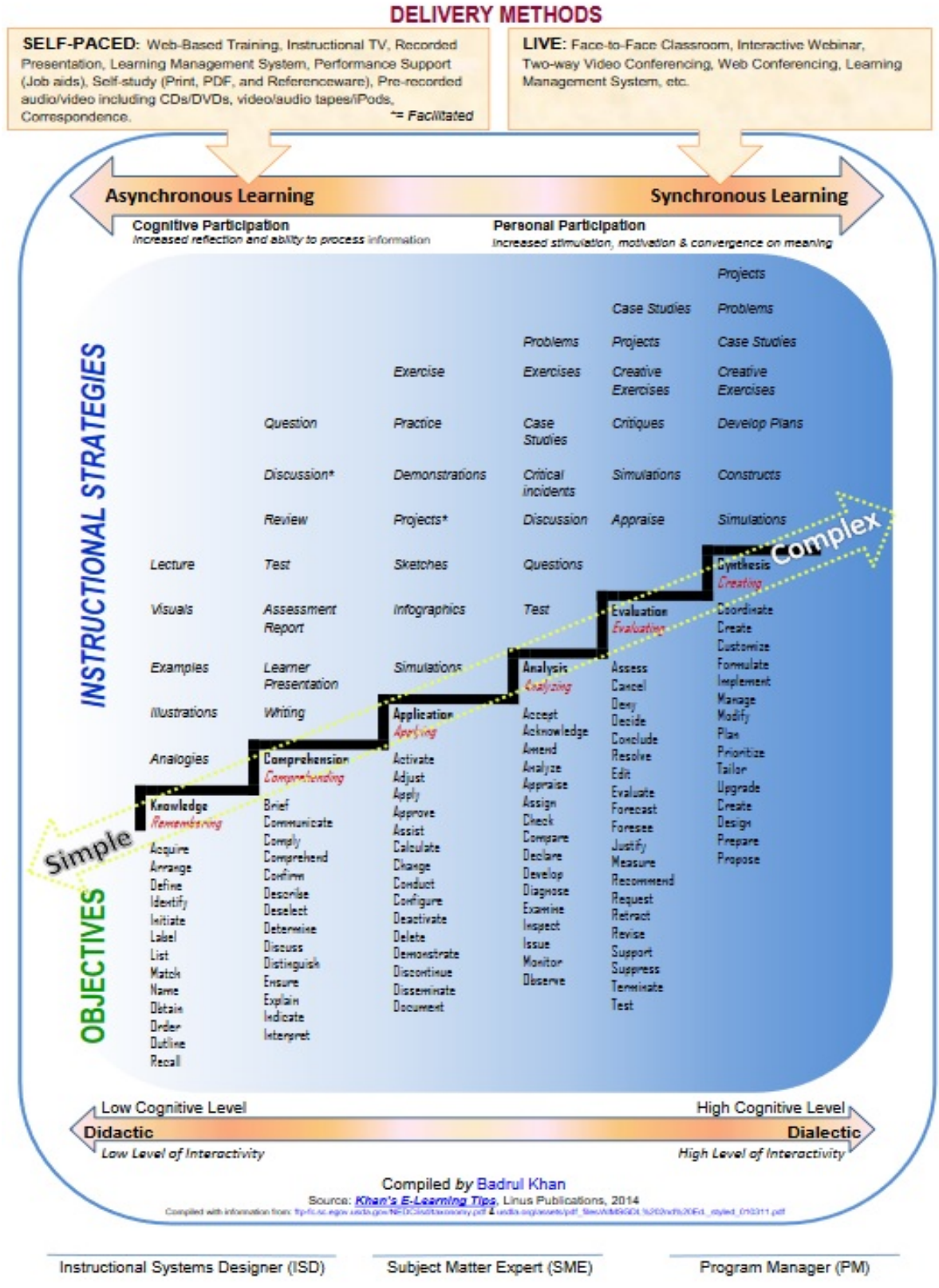


Figure 1: eLearning Framework by Khan (Khan, 2014)

Additionally, in the case of the PALAEMON Academy, it will be of special importance to consider a universal design for the course. This means, when designing the course, a diverse

range of learners (in terms of e.g. different learning styles) has to be kept in mind in order to let the learners benefit the most (Burgstahler, 2021).

3.1.2 Course Design

The course is divided into several sections, each of them with a different thematic focus. As will be addressed throughout Chapter 3, different formats on how the content of the course is delivered, will be used. This is to ensure that the needs of most learners are being met, according to their diverse learning styles. A detailed description on the content-outline of the modules will be given in Chapter 3.1.3.

An introduction to the course will be provided for the participants, with the intention of giving them an overview of the course-content. Links within the text will guide the learner directly to the described modules on the platform. In general, each of the main modules will contain information in text format.

Especially the modules on “Evacuation” and “Awareness for People with Disabilities” will contain instructional videos. These videos will be kept rather short (one to two minutes) and will focus on content that is very practical in nature as well as exemplary situations in accordance to the learning material provided. There will also be a module on “First Aid” for passengers featuring content in the form of text and depictions (brief “how-to guides”).

Attention will be put on the way in which information is presented in the course, additionally to the text format. If text is being used it will be accompanied by explanatory graphs and depictions - as much as possible - to illustrate important chunks of information. In addition, Presentation slides in the file-format PDF will be provided. Additional literature for optional reading will also be provided for the learners. To include those learners who prefer to learn in an auditive mode, the presentation slides will be accompanied with information delivered by a recorded talk (online-lecture).

To ensure that the learning goals have been met by the learners, the modules with the main course-content (“Evacuation” & “Awareness for People with Disabilities”) will contain quizzes to test the attained knowledge of the learners. These quizzes will be provided in different modes. Some will feature single- and multiple-choice questions after a learning unit, others will feature videos including questions at the end. Each module will include one or more different quizzes.

The module “PALAEMON VR Training Registration for Scenarios” will provide a link to an external platform where learners can register for the VR-Training session on site or in their respective learning centres. Furthermore, an announcement-forum will be installed. This is an easy means for the instructor to inform the learners about interesting additional material or to remind them to partake in the quizzes on the platform.

The course is accessible through the following link:

www.juh.at/palaemon

3.1.3 eLearning Modules

The content of the eLearning-course as part of the PALAEMON Academy is centred on the following core modules (see Table 1):

Table 1: Course content for the relevant target groups

Target Group	
Crew/Staff	**Passengers**
Introduction	Introduction
Evacuation: Roles, Activities, Actions and Security Measures	
Awareness for People with a Disability	Awareness for People with a Disability
PALAEMON VR Training Registration for Scenarios	
Information on the PALAEMON System	
	First Aid

The course is comprised of content specifically for crew members/staff and passengers. Three of the above listed modules are heavily content-based, one module aims to enable the learners to register for the on-site VR-training option. An additional module named “Introduction” serves as an information-board for the learners on all things administrative in regard to the course (objectives, aims, grading, etc.). In addition, centred on the PALAEMON project, a module to brief crewmembers on the functionality on the PALAEMON ecosystems and its main features will be set-up (see Table 1).

The whole course, including both its elements (i.e. Moodle and the VR Training), will be led by a trainer. For the Moodle-platform the trainers’ responsibilities are focused on administrative duties (e.g. enrolment in the course, update of learning material), whereas for the VR Training the trainer takes over the briefing as well as the debriefing of the trainees (e.g. analysis of scenarios).

Module “Evacuation: Roles, Activities, Actions and Security Measures”

According to IMO (2000, p.10). The contents of this module are broken down into four main clusters

1. Introduction to Standards of Training, Certification and Watchkeeping for Seafarers Convention (STCW 95) (International Maritime Organization, 2001)
2. Crowd Management Training
3. Familiarization Training
4. Safety Training for Personnel Providing Direct Service to Passengers in Passenger Spaces

The respective clusters are mandatory for particular personnel on the ship (see Table 2).

Table 2: Course outline for controlling passengers in emergency situations (IMO, 2000)

Course content	Mandatory for personnel with the following particular duties and responsibilities
Introduction to STCW 95	All
Crowd Management Training ***Life-saving appliances and control plans, assist passengers en route to assembly and embarkation stations, mustering procedures***	Required for masters, officers, ratings or any other personnel who are designated on muster lists to assist passengers in emergency situations. (Reg. V/3 pa.4, Section A-V/3 pa.1 of the STCW Code.)
Familiarization Training ***Design and operational limitations, procedures for opening, closing and securing hull openings, legislation, codes and agreements affecting ro-ro passenger ships, stability and stress requirements and limitations, procedures for the maintenance of special equipment on ro-ro passenger ships, loading and cargo securing manuals and calculators, dangerous cargo areas, emergency procedures***	Required for masters, officers and other personnel on board passenger vessels who shall at least ensure attainment of the abilities that are appropriate to the capacity to be filled and the duties and responsibilities to be taken up. (Reg. V/3 pa.5, Section A-V/3 pa.2 of the STCW Code.)
Safety training for personnel providing direct service to passengers in passenger spaces ***Communication, life-saving-appliances***	Required for all personnel on board passenger vessels who provide a direct service to passengers in passenger spaces on board, ego bar, restaurant, catering department, and shop staff. (Reg. V/3 pa.6, Section A-V/3 pa.3 of the STCW Code.)

As depicted in

Table *2* the module will be comprised on detailed information about the four clusters of the course content.

The module and its content is focused on crew members' perspective. Due to the differences depending on the vessel and shipping company an evacuation module for passengers is not included within this course. Passengers have to take part in a safety drill aboard the ship within 24h of the cast off of the ship.

Module "Awareness for People with a Disability"

This module is intended for all people (i.e. personnel and passengers) on board a cruise ship. The aim is to raise awareness for people with mobility impairments, respective needs as well as means to deal with passengers with disabilities when evacuation plans have to be

executed. There will also be a specific section for passengers where they can learn how to contribute in situations of an evacuation when dealing with a co-passenger that requires assistance.

Thus, the following content will be provided (adapted for the staff and passenger edition of the module):

- Who are people with a disability or impairment?
  (with a focus on the elderly, people with a disability, intoxicated people)
- What is a disability? Also tackling the thin line between visible and invisible disabilities (Disabilities come in many shapes and forms like hearing impairments and or missing limbs)
- Four scenarios with different subgroups of people with a disability (as mentioned above) and how to deal with them

Module “PALAEMON VR Training Registration for Scenarios”

This module is intended for the crew-members who attend the course. It serves as a briefing and registration-module for the onsite PALAEMON VR-training. Here the attendants can pick the roles they want to enact during the VR-training (e.g. captain, officer, crew-personnel) and the scenario they want to take part in (e.g. fire under deck/fire on deck, sinking ship, ship run on ground).

Module “Information on the PALAEMON ecosystem”

Aligned with the PALAEMON project objectives an additional optional eLearning module will be provided, presenting relevant components of the PALAEMON ecosystem, relevant to crew members. The module represents a possibility to provide an initial briefing on the PALAEMON system before gaining first hands experience, handling and working with the PALAEMON safety system. In that way the individual components can be easily explained, and the module serves as repository for trainees in case they would like to come back to individual components that may e.g. be especially relevant to their role on the ship.

Module “First Aid”

As first aid content is well covered in other trainings for ship personnel this module is more targeted towards passengers. The module on first aid is designed for passengers who are interested in gaining knowledge on first aid, especially for emergency-situations on-board and how to assist their fellow co-passengers, when in need. The content will be focused on basic-knowledge on first aid and is intended more as a refresher on first aid.

3.1.4 Didactics table

The following tables (Table 3 - Table 8) provide an overview of the content of the PALAEMON modules, specifically focusing on the learning objectives, tasks, content format as well as the assessment tools used on the platform per each module.

Table 3: Didactics table module 1

Module 1: **Introduction**			
Overall Learning Objective for the Module	**Duration**	**Type of learning activity**	**Format**
Introduction to the course, including the syllabus, overview of the modules for crew and passengers, assessment methods	1h	• Reading • Introductory Video	• Text • Links to modules • Video

Table 4: Didactics table module 2

Module 2: **Evacuation**				
Overall Learning Objective for the Module	**Duration**	**Type of learning activity**	**Format**	**Assessment**
Crew members should have an overview and a deeper understanding on the following topics: • Introduction to STCW 95 • Crowd Management Training • Familiarization Training • Communication, life-saving-appliances	5h	• Reading (incl. additional literature provided in PDF-format) • Videos on evacuation procedures	• Text • PDFs • PowerPoint slides with Audio • Videos	• One quiz per topic (multiple choice)

Table 5: Didactics table module 3

Module 3: **Awareness for People with a Disability**				
Overall Learning Objective for the Module	**Duration**	**Type of learning activity**	**Format**	**Assessment**
Crew members as well as passengers should have an overview and a deeper understanding on the following topics: • Who are people with a disability? • What is a disability? • How to assist people with a disability in case of an emergency?	3h	• Reading (incl. additional literature provided in PDF-format) • Videos on scenarios with vulnerable people on evacuation procedures to highlight possible difficulties	• Text • PDFs • Videos	• Video segments with a quiz in between the different segments (single choice)

Table 6: Didactics table module 4

Module 4: **PALAEMON VR Training Registration for Scenarios**				
Overall Learning Objective for the Module	**Duration**	**Type of learning activity**	**Format**	**Assessment**
Crew members are able to register for an onsite PALAEMON VR-training session, choosing the roles and scenarios most suitable for their job-profile.	1h	• Reading • Video-Tutorials	• Text • Link to the VR-registration • Videos	None

Familiarization with the VR-training component.				

Table 7: Didactics table module 5

Module 5: **Information on the PALAEMON ecosystem**				
Overall Learning Objective for the Module	**Duration**	**Type of learning activity**	**Format**	**Assessment**
Crew members are familiar with the PALAEMON ecosystem available on board.	1h	• Reading • PowerPoint	• Text • PowerPoint with Audio	None

Table 8: Didactics table module 6

Module 6: **First Aid**				
Overall Learning Objective for the Module	**Duration**	**Type of learning activity**	**Format**	**Assessment**
Passengers gather first aid knowledge and understand how they can help other co-passengers in need during an emergency. They are able to provide appropriate first aid treatment (meant as a refresher-course).	2h	• Reading • PowerPoint • Video-tutorials	• Text • PowerPoint with Audio • Video-Tutorials	Quiz (single choice)

3.2 VR & AR as Mixed Reality approach in PALAEMON

The development and adaptation of VR technologies paired with an AR system as a mixed reality approach within the PALAEMON project has the aim to enhance awareness as well as staff training of ship crew members. Furthermore, it should serve to facilitate knowledge transfers and standardization of best practices. Crucial purpose of these training tools is a safe training of passenger safety and evacuation related scenarios and drills. The VR technology should enable a full immersion of the trainee into the scenario and training situation (PALAEMON Consortium, 2021).

The VR technology, together with the AR devices, holds a crucial role in the PALAEMON training concept, next to its use in terms of remote monitoring. The use of VR technology for training purposes holds the benefit to be able to do 'on site' training such as evacuation drills in a virtual environment, with the ability of full movement of trainees (PALAEMON Consortium, 2021). This characteristic is especially relevant in terms of having increased flexibility and independence on training locations, e.g. allowing training even in times of the current COVID-19 pandemic as face to face interaction and group sizes can be reduced to a minimum number of participants that can engage via the virtual environment. As such the VR tools can also be used in a collaborative manner, also allowing for training of teamwork and procedures.

The VR component of the PALAEMON Academy builds on the learning content provided through Moodle, with the intended purpose to put prior learnings 'into practice'. For the purpose of this project the VR technology is conceptualised to be used *"to train the handling of people with special needs in crisis situation, transport handling of special gear, general evacuation, civil crowd control, use of VR training systems, AR training onsite and first aid for special situations and triage on rescue elements*" (PALAEMON Consortium, 2021, p. 8).

In PALAEMON, an AR component for the full system was envisaged to visualize situational information and passenger locations for the crew. The main device should have been the MS HoloLens (Microsoft, n.d.-b) at the planning phase. With an integrator, it is possible to visualize the AR component fully in the VR interface. By this, it is possible to train how to work with AR in VR. The integrator is pushing the PALAEMON System information to the AR Layer in the Heads-Up Display (HUD) of the participant in the VR environment.

Figure 2: Microsoft HoloLens 2 (Microsoft, n.d.-a)

By this kind of integration in VR, it is possible to train the usage and the handling of the AR component of PALAEMON already before the roll out. The data will follow a scripted database

output for one scenario at the beginning, as real ship data would probably show nothing spectacular during a training session.

At the time of writing this deliverable, the integrator was demonstrated by SIMAVI (see Fig. 3) already.

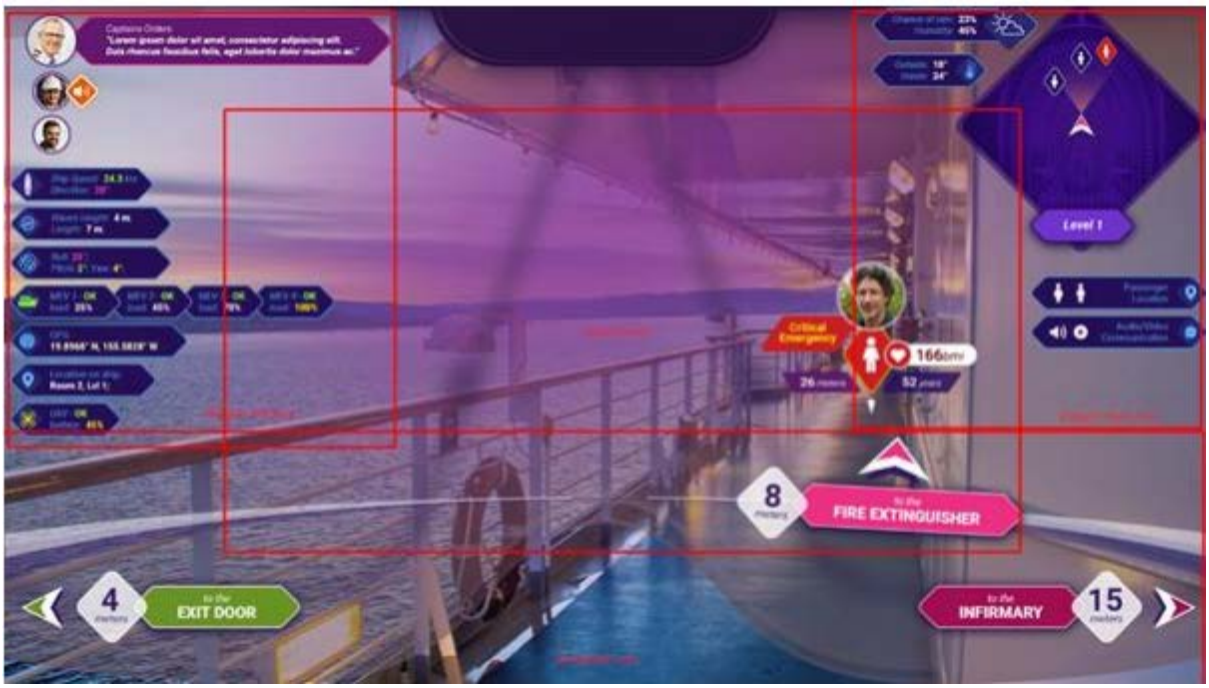


Figure 3: AR Overlay in VR by SIMAVI

The eLearning platform will provide a basis for the subsequent VR training component as it will (1) familiarize trainees with the VR component and training possibilities and (2) provide a platform for the registration for VR training (logistics arrangements) as the necessary equipment for the VR training needs to be provided to trainees (albeit the training itself being location independent).

Under specific tasks to be executed in the PALAEMON Academy are:

- Training of staff
- Assessment of staff
- Drill scenarios development
- Continuous improvement of safety procedures (PALAEMON Consortium, 2021, p. 8)

The VR training will be supported by the VR headset Oculus Quest (see Figure 4). This has the advantage of presenting an egocentric representation of a simulated virtual environment, meaning that the technology is allowing increased immersion into the virtual environment. The Oculus Quest headset allows an audio-visual experience for the user that is able to move freely within the 3D simulation, use their hands via headset controls and a possibility to engage with objects and virtual characters (PALAEMON Consortium, 2021).

Figure 4: Demo Video captures on the VR environment and basic navigation (JOAFG)

The VR training will allow the use of different role profiles (differing management levels) and will be able to draw on the specific scenario database that is being developed in the course of the project. This database should be seen as a growing repository. As the VR Training will be tested and continuously used, more scenarios are planned to be generated and fed back into the database.

An authoring tool allows for customization of existing scenarios and creation of new set-ups. The virtual world comprises of various room types, corridors, tight spaces, stores, service areas, staircases, decks among others, to provide ample opportunities to design a scenario. In addition, editors can place different types of objects, zone markers, or add hazards of varying intensity in the virtual space (PALAEMON Consortium, 2021). This will be further detailed in Chapter 4.

In order for trainees to familiarize themselves with the technology, prior to exercising any of the scenarios, tutorials are being provided to approach the use of VR in the context of PALAEMON and 'on board' training in a step-by-step process (PALAEMON Consortium, 2021). It is crucial that trainees feel comfortable and confident in using the VR technology in order to properly reap the training benefits in the scenarios and to conduct potential assessments of personnel.

The VR training can be used for standard mass evacuation training but can also be paired with the specific PALAEMON system functionalities which will be detailed in the following subsection.

3.3 PALAEMON System Training

Within the PALAEMON project innovative solutions to support the overall evacuation process of large cruise ship vessels are being developed. A variety of different sensors and smart technologies will form a complex and comprehensive ecosystem of information, providing real time information on the current ship status. This is being complemented by an innovative approach to the design of massive evacuation vessels (MEV) to ease the evacuation process, as described in D2.6 – PALAEMON Architecture v1 (PALAEMON Consortium, 2020).

This maritime evacuation ecosystem is intended to provide smart situation-awareness and guidance to passengers and crew members through continuous monitoring and control through the support of the following main components: Mass Evacuation Vehicle, Smart

Bracelets, AR Glasses, Smart Cameras, Unmanned Aerial Vehicle (UAV), PALAEMON Dashboard, Passenger Mustering and Evacuation Automation System (PaMEAS) (PALAEMON Consortium, 2020a; PALAEMON Consortium, 2020).

D2.6 contains a detailed description of the PALAEMON Architecture with its system components that are going to be used as data sources. In addition to the above mentioned PALAEMON system, it also draws on the Shipboard legacy systems, the Ship Stability Toolkit (SST), Structural Health Monitoring (SHM), VHF Data Exchange System (VDES) as well as the PALAEMON Academy-VR and together with all these components forms a full-fledged smart, digital ecosystem (PALAEMON Consortium, 2020).

Following, the incorporation of the PALAEMON system in the training concept are being presented and will be further detailed in the second version of this deliverable.

3.3.1 General Training components

The LMS learning component is intended to familiarize trainees with the PALAEMON system and its individual components through a specific Moodle module. Main purpose for learners is to gather a basic understanding of the components and functionalities. Using the general VR training environment based on the context of a cruise ship the PALAEMON Academy is also intended to provide opportunities to train with the PALAEMON system and draw on information provided through different PALAEMON system components. The VR system is planned to incorporate optional features of the PALAEMON system in order for crew members to draw on PALAEMON system features and its functionality. This can be done independently from the actual implementation status of technologies and could help refine specific features and generate further user requirements that may be identified through virtual testing.

Information incoming through the smart PALAEMON environment (smart bracelets, etc.) will be incorporated through a smart management layer, which is being developed to combine information gathered through the PALAEMON system. This information can be fed into the Master/Bridge and act as decision support (PALAEMON Consortium, 2020). This feature can quite easily be realized in VR, providing PALAEMON system information in the virtual training environment to be accessed by the crew e.g. via a monitor on the virtual bridge or control room. The Smart Evacuation Management (SEM) System can then be included in the training of crew members in order to improve the response to emergency situations on board.

3.3.2 MEV Training component

A Massive Evacuation Vessel (MEV) is envisioned to carry a large number of persons in case of an emergency evacuation. Its design should also facilitate boarding for persons with disabilities or mobility impairments. MEVs will be connected to the PALAEMON system via additional sensors in order to transit its operational condition during an emergency, e.g. doing a head count or navigating the UAVs (PALAEMON Consortium, 2020).

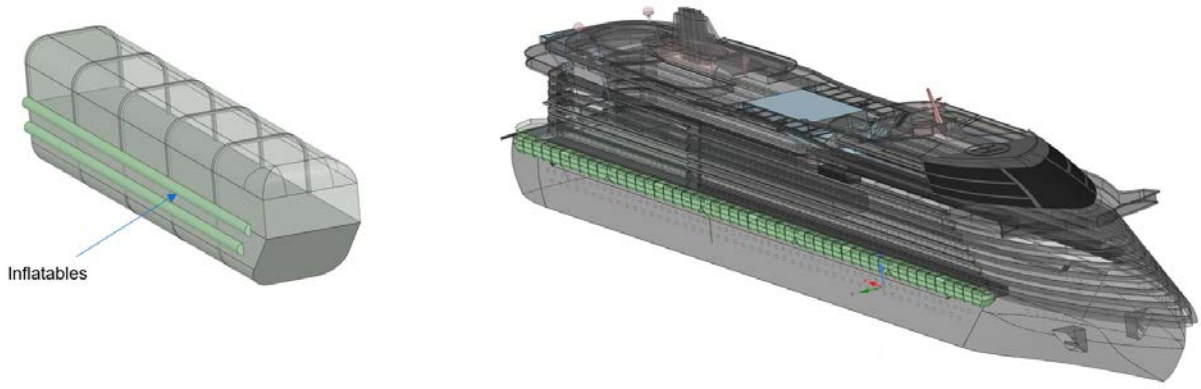


Figure 5: MEV II prototype design. 605 passenger capacity (10 MEVs each side) and Cruise ship with 6000 passenger capacity as presented by Astander in the Review Meeting 26th January 2021.

In WP4 and as detailed in the related working document specifications on the MEV are defined. It is designed to accommodate large numbers of passengers and intended to be studied in terms of stability, seakeeping and structural response in adverse weather or other incidents compromising the structural integrity of the MEV. The MEV is conceptualized to offer maximum utilization of space during regular operation of the ship. Furthermore, it is planned to be stored in a way that allows ease of launching as well as additional deck room to use in day to day activities on board. The MEV should withstand rough weather when stored as well as when brought to sea (PALAEMON Consortium, 2020b; PALAEMON Consortium, 2020). Two type of concepts are being explored. MEV Type I is designed as a composite floating structure, whereas a second solution, MEV Type II represents the MEV as part of the ship superstructure, as shown in Figure 5.

For the purpose of the PALAEMON project the MEV will be realised as a small-scale model to be able to test various capabilities. Since real-life simulations are out of scope for the project, training of mass evacuation procedures with the MEV is best realised through the use of VR, creating a specific scenario and VR environment incorporating the MEV component. This serves to be a cost-efficient and flexible solution. The realisation will be depending on the creation of the appropriate VR environment.

3.4 Outlook

The modular set up of the PALAEMON training curriculum allows for a flexible use and easy adjustments regarding the training content. While it is targeted at cruise ship crew members it does allow for individual training or learning components to be made accessible also to other target groups. eLearning content targeted at raising awareness concerning people with disabilities in evacuation scenarios, is intended to address e.g. crew members as well as passengers alike. In addition, the modular system allows general training for crew as well as targeted training on the PALAEMON ecosystem.

The envisioned AR component allows to visualize information for the crew and to train with this additional information. As this is a new approach, it is considered as experimental – also from the learning perspective. During the final 12 months of the PALAEMON project, crucial developments and improvements of all PALAEMON elements will be done. With the AR integrator, it is possible to run a testing of all components for usability, acceptability and feasibility of integration in the Standard Operating Procedures. This is taking the training

approaches beyond the current state of art and allows the training and testing of things, that otherwise would take much more money for a demonstrator in real life size. Another example for this chance through AR and VR is the testing of the MEV 1 and MEV 2. JOAFG is rebuilding the MEV 1 and MEV 2 in size 1:1 in VR to see, how passengers can move and can be seated. This should allow developers to have a better perspective on what they are designing in terms of practicability.

Once the training content is developed, a training of trainer (ToT) handbook will be finalized. The ToT handbook will function as a guide on how trainers can best utilize the different training methods and will detail how the different components are linked and complement each other. Focus will lie on how to set up a comprehensive training and making use of the PALAEMON Academy. The ToT will be hosted on Moodle, similar to other training content, to include a space for exchange between trainers and the possibility to collect lessons learnt and draw on trainers' experience. For this feature, however, responsibilities to manage the interactive space have to be defined.

4 Scenario database

The scenario database was developed as relational database to document all relevant components in a structured and transparent way to describe and define several scenarios (Meckel et al., n.d.). With the database it is possible to define all parameters and describe, document and share scenarios in an easy and structured way. The following sections detail the setup of the scenario database and explains the main identified components necessary to generate varied scenarios within the PALAEMON Academy. In Annex III - Screenshots of Database forms and reports (excluding the final scenario description) are visualized with screenshots. Sample Scenarios can be found in Annex IV – Sample Scenarios.

4.1 Components and database model

The requirements were defined during an internal workshop and via analysis of D2.2 PALAEMON Requirement Capture Framework and D2.4 PALAEMON Use Cases Definition and Operational Requirements. The database was developed with Access 2016 and is available from the PALAEMON partner JOAFG. The structure of the components is visualized in Figure 6.

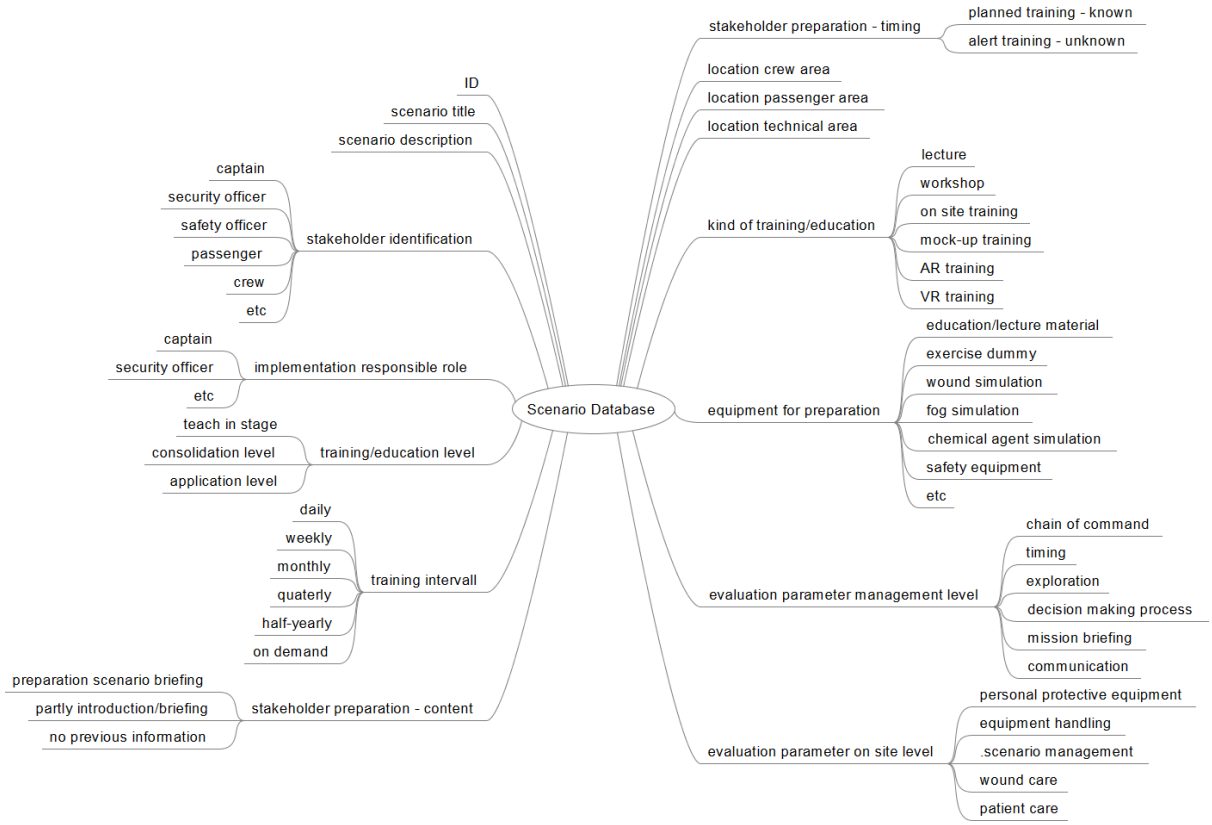


Figure 6: Scenario database components

The following datatypes which are available in Access 2016 are used to specify the components:

- **long text:** This datatype allows the input up to 64.000 characters.
- **short text:** This datatype allows the input of 255 characters.

The database model is visualized in the following Figure 7. The components are described in chapter 4.2.

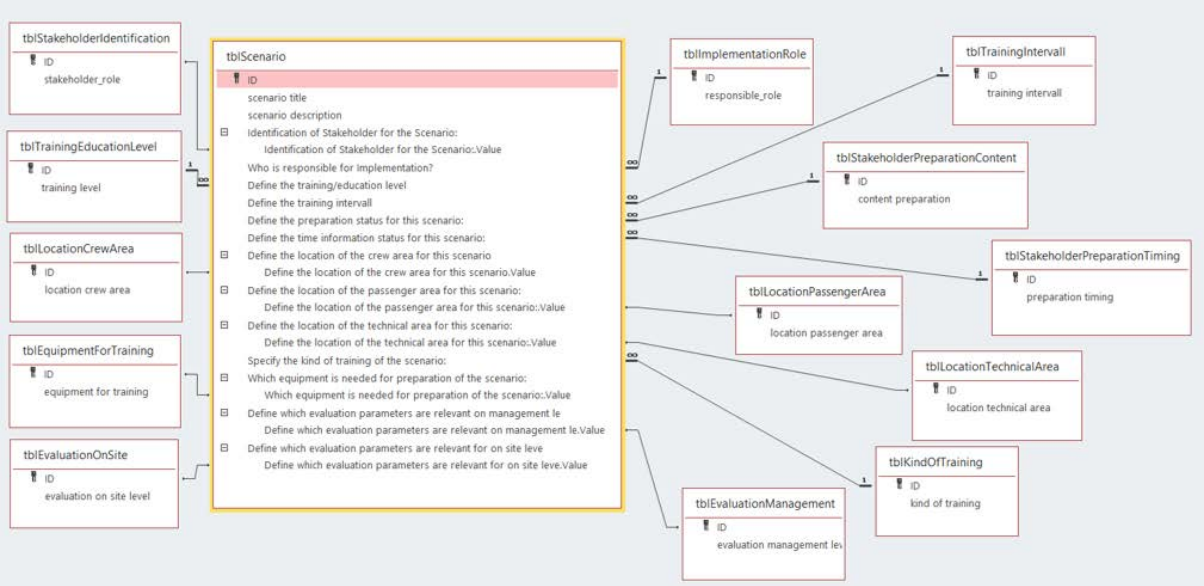


Figure 7: Database model

The database tool Access 2016 allows to update the model if necessary. In case there are additional components identified which are relevant for scenario description, these elements can be integrated into the model.

4.2 Database

A dashboard allows the navigation through the database in an intuitive way. The dashboard is visualized in the following Figure 8.

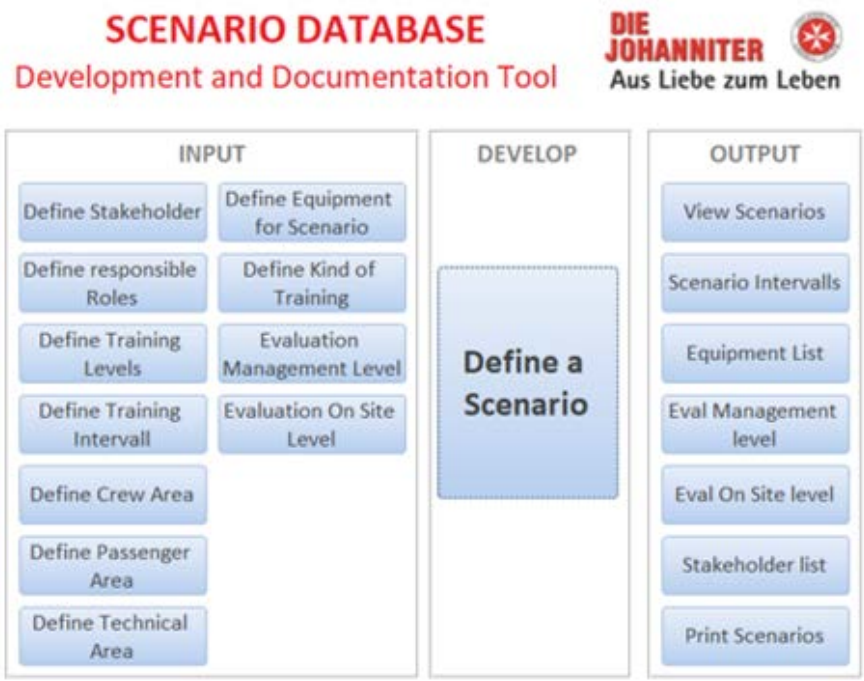


Figure 8: Dashboard Scenario Database

The dashboard consists of the three main sections:

- **INPUT:** In this section 11 specific forms allow to define parameters or specify components which are relevant for the scenarios.
- **DEVELOP:** With this form the scenarios can be described.
- **OUTPUT:** Features the possibility to display 6 specific reports and to print the developed scenarios as a whole.

4.2.1 Input section

Each form of the INPUT section has the same structure as visualized in the following Figure 9 and Figure 10.

The value in the ID field is automatically generated. In the second text field the specific content can be filled in text format with maximal 255 characters.

Figure 9: Form to document identified stakeholder

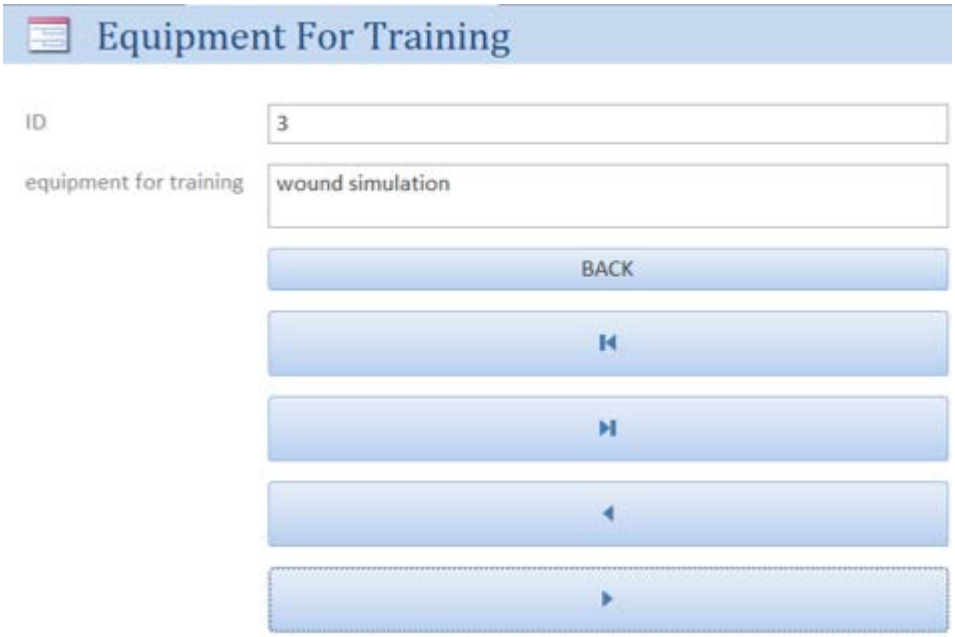


Figure 10: Form to define equipment for scenario

The 11 input buttons are linked to specific forms. These are in detail:

- **Define Stakeholder:** In this form all relevant stakeholders can be defined like captain, security officer, passenger, etc. which are part of a scenario.
- **Define responsible roles:** In this form the role that is responsible for the implementation of the scenario training can be defined.
- **Define Training levels:** Following the training methodology the three levels teach-in stage, consolidation level and application level are prepared so far (Ausbildung (J7), 2005).
- **Define Training Interval:** In this form the relevant intervals can be defined in text.
- **Define Crew Area:** All relevant locations which are assigned to the crew area can be specified here.
- **Define Passenger Area:** The relevant locations which are assigned to the passenger area can be specified here.
- **Define Technical Area:** In this form the relevant locations which are assigned to the technical area can be specified here.
- **Define Equipment for Scenario:** In this form the equipment which must be available for the scenario can be gathered.
- **Define Kind of Training:** In this form the identified kind of trainings can be listed e.g. lecture, workshop, on-site training, etc.
- **Evaluation Management Level:** In this form several evaluation elements for the level of decision making can be gathered like chain of command, exploration, etc.
- **Evaluation On Site Level:** Especially the evaluation elements which may be relevant for the handling on site can be gathered here.

4.2.2 Develop section

To develop a scenario a specific form is available. The title as well as the description can be filled textual. All other content can be added to the scenario as single as well as multiple choice due to the content of the input forms via drop down functions. The form to develop a scenario is visualized in the following Figure 11.

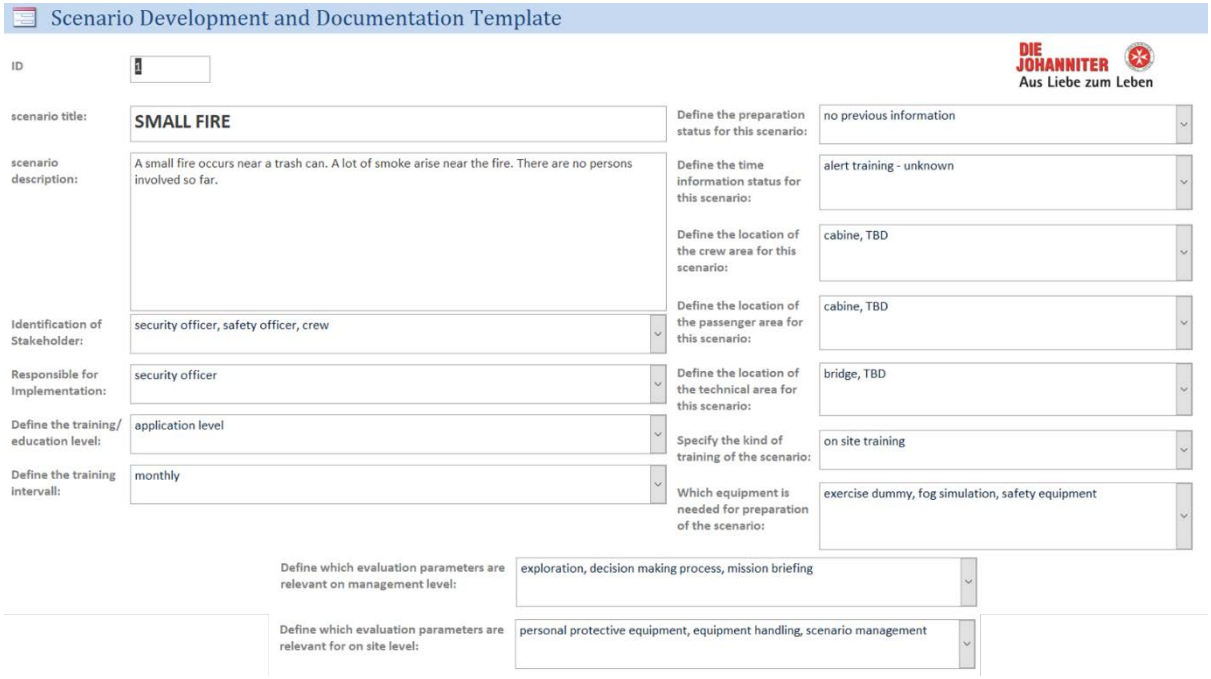


Figure 11: Form to define and describe scenario

4.2.3 Output section

In this section, at the moment, 6 different reports can be monitored. In addition, a catalogue with all defined scenarios can be printed. The reports are available to identify which elements are already available in the database and which are maybe missing.

In the following Figure 12 the report of the identified equipment, which is necessary for the scenarios, is visualized.

Number	Equipment
1	education/lecture material
2	exercise dummy
3	wound simulation
4	fog simulation
5	chemical agent simulation
6	safety equipment

Figure 12: Report of identified equipment

Finally, the scenarios are prepared in printed form including all connected components. Each scenario is available on a separate page.

In the following Figure 13 the scenario is visualized.

Scenario Definition Sheet

Tuesday, June 8, 2021
5:39:40 PM

number	1
scenario title	SMALL FIRE
scenario description	A small fire occurs near a trash can. A lot of smoke arise near the fire. There are no persons involved so far.
stakeholder for the Scenario:	security officer, safety officer, crew
responsible for Implementation:	security officer
Training/education level:	application level
Training intervall:	monthly
Preparation status:	no previous information
Information status:	alert training - unknown
Location of crew area	cabine, TBD
Loc of passenger are	cabine, TBD
Loc of technical area:	bridge, TBD
Kind of training:	on site training
Equipment for preparation:	exercise dummy, fog simulation, safety equipment
Evaluation parameters on management level:	exploration, decision making process, mission briefing

Figure 13: Final scenario – small fire

Of course, the update of a scenario is possible with the database in an easy way following the rules of Access 2016. Also, the necessary content can be updated via the input forms.

5 Testing of PALAEMON Academy

The PALAEMON Academy was tested together with Jade University and OELS at the premises of Johanniter in Vienna, Austria, at the 21st November 2022. Next to the eLearning review, the MEV visualization and bridge integration of PaMEAS. Therefore, the PALAEMON Dashboard was visualized on the bridge wall to allow an interaction with the prototype from command position at the bridge. The MEV visualization was tested for manoeuvrability within the small space of a MEV and to get an impression for the crew. This test was run at the premises of JOAFG in Vienna with support of JOAFG's Emergency Medical Technicians. Results are presented in D4.8 and D4.9.

6 Midterm Conclusions

The PALAEMON training concept presents the conceptual plan for the design and setup of PALAEMON training activities. This first version of the training report sets the direction and detailed plan of activities. The training concept highlights training content relevant to staff aboard a cruise ship, namely evacuation procedures as well as specialized content focused on passengers with varying needs during an evacuation process (tackling needs of vulnerable groups). Furthermore, the LMS (i.e. Moodle platform) also provides specific content relevant to the PALAEMON system, providing one module to brief crew members specifically on the PALAEMON ecosystem and individual components relevant for different staff. This way crew members can familiarize themselves with relevant PALAEMON system features before operating the system. As a last module of the LMS training component trainees will get briefed on the VR component and will have the opportunity to register for the VR follow up training, which will provide a more practical component.

However, training content is not solely tailored towards crew members' needs, but also pays attention to address passengers through content specifically tailored to their needs. Sensitization on needs of vulnerable groups is e.g. deemed valuable for crew and travellers alike. As the success of an evacuation procedure is dependent on a variety of factors and participation and performance of crew and passengers is equally important, training content addresses both equally. Learning material for passengers is further complemented by an optional first aid refresher training so that passengers can actively support others in need, potentially taking off pressure of crew members, already under high levels of stress.

D9.11, as first version of the PALAEMON training report, is providing a detailed plan on the PALAEMON Academy and training activities. As a next step, training content will be generated and results from a first pilot will be detailed in the second version of this deliverable. The second training report will be able to draw on lessons learnt from the first trials of the learning and training features of the PALAEMON project.

7 Implementation of didactical training approaches

Several adjustments had to be made in the development process. Initially it was planned to use a variety of different types of materials to keep the learners engaged and make the learning content approachable and transfer content in a fun and creative way. However, chances for creating short clips and videos to illustrate the content was limited due to limitations in the availability of demo ships for new content creation.

To mitigate this situation, the focus on VR training was put into the focus and a detailed didactical concept for further training, also beyond the nautical aspects, was developed.

The LMS and the training concept for VR by JOAFG, Andreas Peer (VR Train the trainer concept) constitute the backbone of the PALAEMON Academy. As exploitation, this VR Train the trainer concept is a sole IP by JOAFG and the VROnSite developer company M2D, which was an external, non-linked partner.

The implementation of this didactical concept is done by a cooperation between JOAFG and M2D for the training of ship crews in the next years.

7.1 Blended Learning Implementation

The blended learning method was used to train the operators as follows:

A course over three weeks, with a total of 15 hours scheduled. Each week had a different emphasis and was scheduled for approximately 5 hours. More details can be found in the rough concept.

Rough concept	
TOPIC:	Train the Trainer for VROnSite simulator
TITLE:	**Train the Trainer**
AIM of eLearning Course: (Hauptziel)	Future operators should achieve the ability to - Create scenarios, - conduct training with up to two trainees - to conduct debriefings - perform care and maintenance of the hardware • - Install new software updates to the HMD's and laptop.
LANGUAGE:	German and English
TARGET GROUP:	First Responder Trainer Business Partner
PREVIOUS KNOWLEDGE?:	Start assessment NOT mandatory with LMS required. Future operators MUST have experience in the field of leadership or training and real procedures.
TYPE OF E-LEARNINGS:	Blendend eLearning
ASYNCHRONOUS ELEMENTS:	Asynchronous, self-paced learning
SYNCHRONOUS ELEMENTS:	Yes (Not part of the eLearning Course)
START/ DURATION/ REPETITIONS	Variable start / 3 weeks at all - 5 hours per week / for several content provided

ACCREDITATION/ MOTIVATION:	Certificate „Train the Trainer“ VROnSite simulator, valid till end of project PALAEMON
CONTENT of course	01 Objectives and Presentation VROnSite Management Simulator 02 Components of the VROnSite Management Simulator 03 Commissioning and decommissioning 04 Care & Maintenance 05 Scenario, create, adapt, share 06 Creating a scenario concept 07 Operator behavior 08 Start, conduct and finish training 09 Conduct debriefing
LERNING TIME/Module:	01: 30 min 02: 60 min 03: 60 min 04: 60 min 05: 240 min 06: 60 min 07: 30 min 08: 240 min 09: 60 min Total learning time requirement: 840 min - 14 hours
TEACHING AND LEARNING OBJECTIVES:	Learners will... 1. can reproduce the objectives of the VROnSite Leadership Simulator software. 2. can reproduce the components of the hardware of the VROnsite leadership simulator 3. will be able to operate the VROnSite leadership simulator software in conjunction with the Oculus Quest accessories and VR goggles. 4. will be able to perform standardized actions for the care and maintenance of the VROnsite leadership simulator system. 5. can create a scenario for multi-user operation (2 trainees) with the VROnSite leadership simulator software. 6. are able to create a training concept for the execution of a scenario in the VROnSite leadership simulator 7. know measures to influence the trainee adequately to the situation. 8. are able to carry out an operational scenario with the help of the operator tool of the VROnsite leadership simulator software. 1. 9. can reflect on a mission scenario using the debriefing tool of the VROnsite Leadership Simulator software.
KNOWLEDGE CHECKS	• Small knowledge checks directly in the WBTs • At the End the trainees receive the certificates • Final exam F2F (not part of the online part) – including final “Train the Trainer” certificate
Infrastructure (learners' framework, software, hardware, internet...)	Computer, Internet, Tool (Software), Swivel Chair, Access to LMS.
Rough Course Structure:	Landing Page - Tile structure for the modules - forum

	- Up-load / download function for documents (template exercise planning) - Additional knowledge testing tools (quiz, cloze, etc.)

The fine concept was designed to be extremely user-friendly. In principle, only learning videos were created for the various contents and the knowledge within the videos was checked via HP5 content with learning objective checks. This had the advantage that the participants had immediate feedback available and thus the learning success was increased.

Concept E-Learning-Course

Title: Train the Trainer

GENERAL PART

Course info

Section heading	Objective and presentation VROnSite leadership simulator
Text	Welcome to the Train the Trainer e-learning course. In this course you will learn: - get to know the components of the VROnSite leadership simulator, - create scenarios, - conduct trainings with up to two trainees - to conduct the debriefing after a training session, - to carry out the care and maintenance of the hardware as well as - install any software updates. Basically, everything you need to be able to use the VROnSite management simulator as an operator for training up to two trainees. In total the course lasts 15 hours
responsible:	Andreas Peer

Activity: Course Café

Activity:	*Forum*
Title:	Course café
Text:	The course café is the meeting point in this online seminar. online seminar. You can use this forum to: - ask questions - answer questions from others - share your previous experiences with us In addition, the course administration will regularly provide information here for everyone. To start a topic, click on "add new topic" in the top right corner of the forum. on "add new topic".
Details for this activity:	The Forum activity has many uses, such as e.g. - A social space for participants to get to know each other - For course announcements - For discussing course content or reading materials - For continuing a discussion started in a face-to-face session - For instructor-only discussions (via a hidden forum) - A help center where tutors and participants can give advice - As an area for 1:1 support between participant and trainer (via a forum with separate groups and with 1 participant per group) • - For extension activities, e.g. "brain teasers" that participants can think about and suggest solutions to

Activity: Round of introductions

Activity:	*Forum*
Title:	Round of introduction
Picture:	Not relevant

Text:	In order for us to better exchange ideas and benefit from each other in this collaborative online seminar, in this activity we ask you to briefly introduce yourself to the seminar group. Task: Create a forum post. Briefly introduce yourself and your motivation for participating in the course. In doing so, address the following questions: - Do you already have experience with virtual reality? - In which function (executive) do you work in your organization? - In which function (training) do you work in your organization? - What are your motives for participating in the course (i.e. WHY are you participating)?
Details for this activity:	The Forum activity has many uses, such as e.g. - A social space for participants to get to know each other - For course announcements - For discussing course content or reading materials - For continuing a discussion started in a face-to-face session - For instructor-only discussions (via a hidden forum) - A help center where tutors and participants can give advice - As an area for 1:1 support between participant and trainer (via a forum with separate groups and with 1 participant per group) - For extension activities, e.g. "brain teasers" that participants can think about and suggest solutions to

Activity: Explainer Video

Activity:	*Video*
Title:	How to Moodle
Text:	In this video you will get an overview of the Moodle learning platform and how to use it. Watch the video and learn how to use the learning platform.

The video includes:

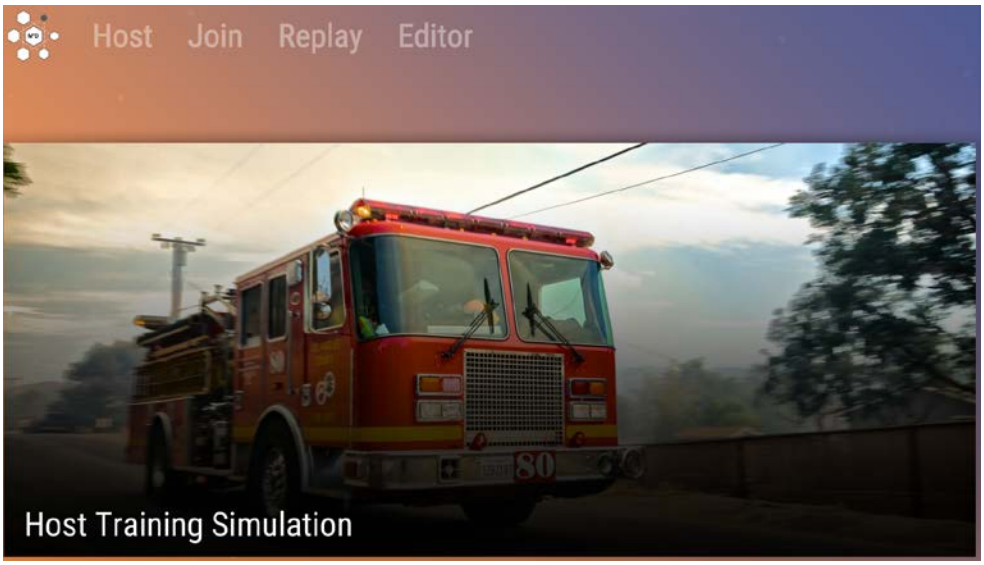
- the introduction to the learning platform,
- the forum and how to use it
- the flow of a learning video with the learning content.

The video lasts a total of 4 minutes and has no interactive content.

VIDEO: moodle.mp4

Details for this activity:	Multiple playback possible; pause, forward and rewind possible

Activity: Explainer Video

Activity:	*Video*
Title:	Explainer video VROnSite leadership simulator
Picture:	 Source: Andreas Peer
Text:	In this video you will get an overview of the functionalities of the VROnSite command simulator, the components as well as the available modules. In addition, you will learn that the operation is not rocket science, but rather that it provides you as an operator with a tool with which you can quickly and easily conduct desired training with up to two people. There is no interactive content in this video. The video with lasts about 5 minutes.

	VIDEO: VROnSite.mp4
Details for this activity:	Multiple playback possible; pause, forward and rewind possible

The eLearning Course was developed and pretested at the JOAFG station with the own personal as well as with other first responder elements of the Johanniter organization in Austria.

The interactive knowledge check for the various videos was performed using Single- or Multiple Choice. An example (excerpt) is visualized in the following Figure 14:

Learning video	**04_ Care and maintenance**
date	**October 2022**
contributer	**Andreas Peer**
time	**1:10**
number:	**1**
question:	**How should the laptop be cleaned?**
Right	**It is enough to wipe the screen with a soft cloth or eyeglass cleaning cloth.**
False	**During use, apply a special cleaning foam for the keyboard.**
Feedback	
R	Absolutely right. Go on!
F	That was not right now. It is enough to wipe the screen with a soft cloth or eyeglass cleaning cloth.
time	**1:10**
number:	**2**
question:	**What do you use to clean the virtual reality glasses?**
Right	**Optimal for cleaning are conventional eyeglass cleaning cloths!**
False	**The HMDs do not require special cleaning.**
Feedback	
Right	Absolutely right. Go on!

False	That was not correct. Conventional eyeglass cleaning cloths are basically sufficient for cleaning HMDs.

Figure 14: Interactive Knowledge Check

8 PALAEMON Academy and training components integration

8.1 VR & AR as Mixed Reality approach in PALAEMON

For the PALAEMON training JOAFG arranged to implement a 3D ship model into the VROnSite leadership simulator. SIMAVI contributed the 3D model and the business partner M2D Mastermind Development GmbH (M2D) implemented the model in the VR platform. The VR system was originally developed for leadership training for First Responder Elements.

The defined simulation and training topics were defined in several workshops as follows:

- Evacuation training for crew members at
  - Open deck level
  - Cabin deck level
- Evacuation training on ship bridge
  - Including PALAEMON system
- Movement with the existing setup using a swivel chair
- Movement like “walk freely”
- Implementation of automatically transport system to switch between decks

The requirements for the implementation are as follows:

- Single- and multi-user training
- Screen usage for bridge personal
- Communication training
- Decision making scenario training

During the implementation and testing phase JOAFG identified, based on their expertise, some additional requirements which are relevant for evacuation and crisis management activities on cruise ship vessels. Some of this expertise was also implemented in the VR training system. In the following chapter, the VR training is described with these additional requirements.

In Figure 15-Figure 18, some impressions were visualized from the VR training system.

Figure 15: To accommodate trainees to their first VR experience, they were set on a 360° turning chair to reduce the chance for motion sickness and prevent accidents.

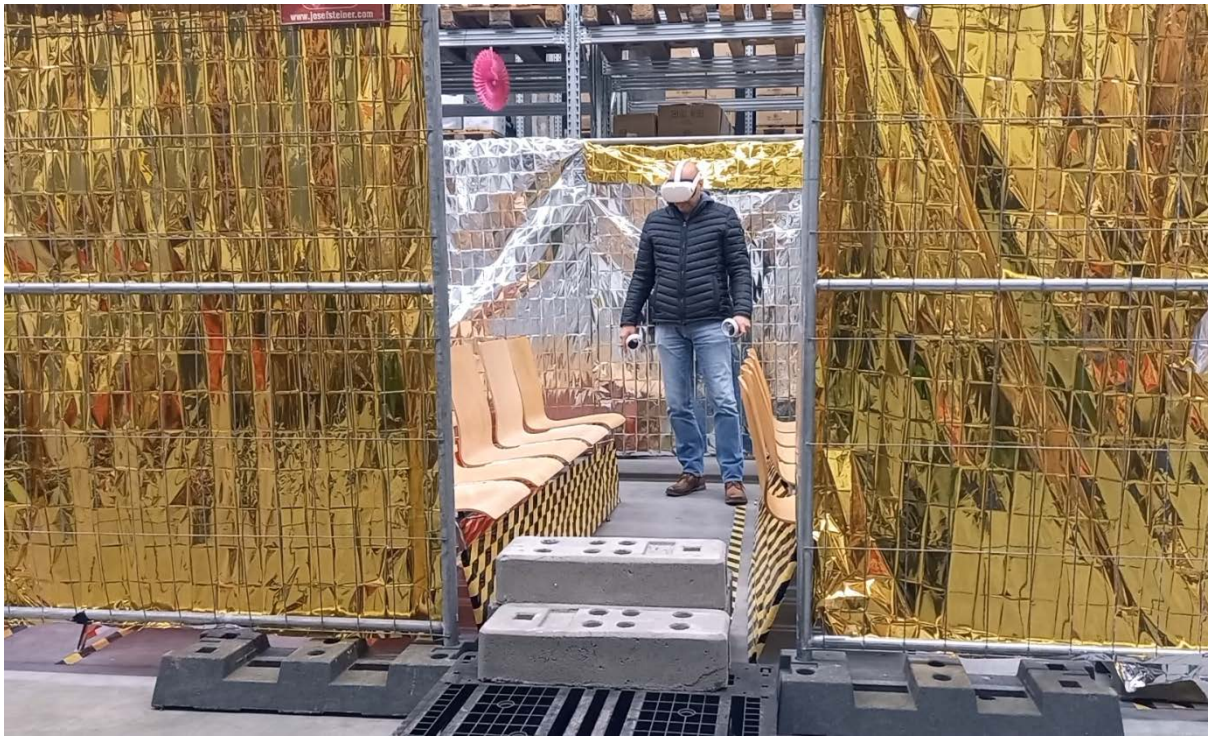


Figure 16: For the MEV testing and training, a mock-up was set up with room scale. This allowed a free movement and to experience the narrowness of the MEV concept.

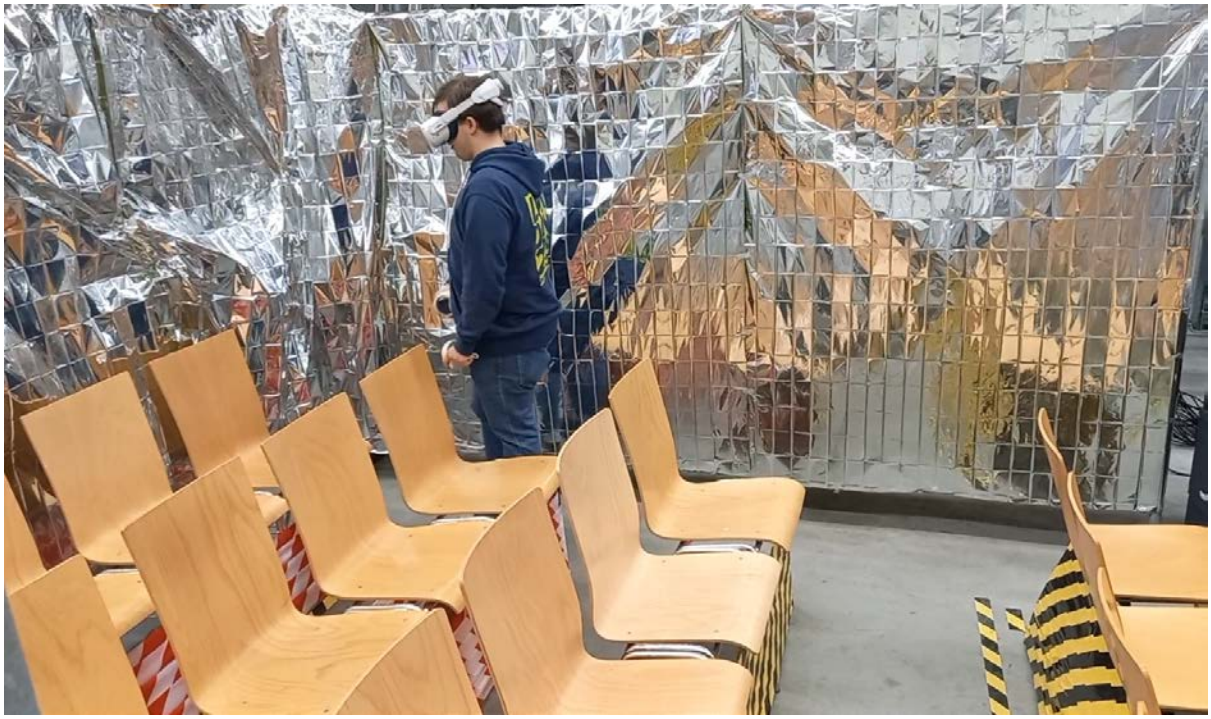


Figure 17: The MEV Mock-up was adjusted several times to allow the highest level of immersion. Seats were positioned according to the VR representation. This was a Mixed Reality Approach and allowed a real physical experience of the MEV interior.

Figure 18: Together with OELS and JU partners, JOAFG tested on JOAFGs premises (Vienna, AT) the VR models and the PALAEMON system on the bridge of the VR ship.

8.2 Content of PALAEMON System Training

8.2.1 General Training components

The VROnSite training system consists of:

- Laptop
- Microphone
- Two head mounted displays (Meta Quest II)
- Software “VROnSite”

- Router (for stand-alone training)

The 3D ship model follows the design of SIMAVI. This cruise ship was optimized from JOAFG and M2D especially for game engine Unity 3D. In Figure 19-Figure 23, some screenshots of the cruise vessel are available.

Figure 19: Perspective image of VR vessel

Figure 20: VR Bridge

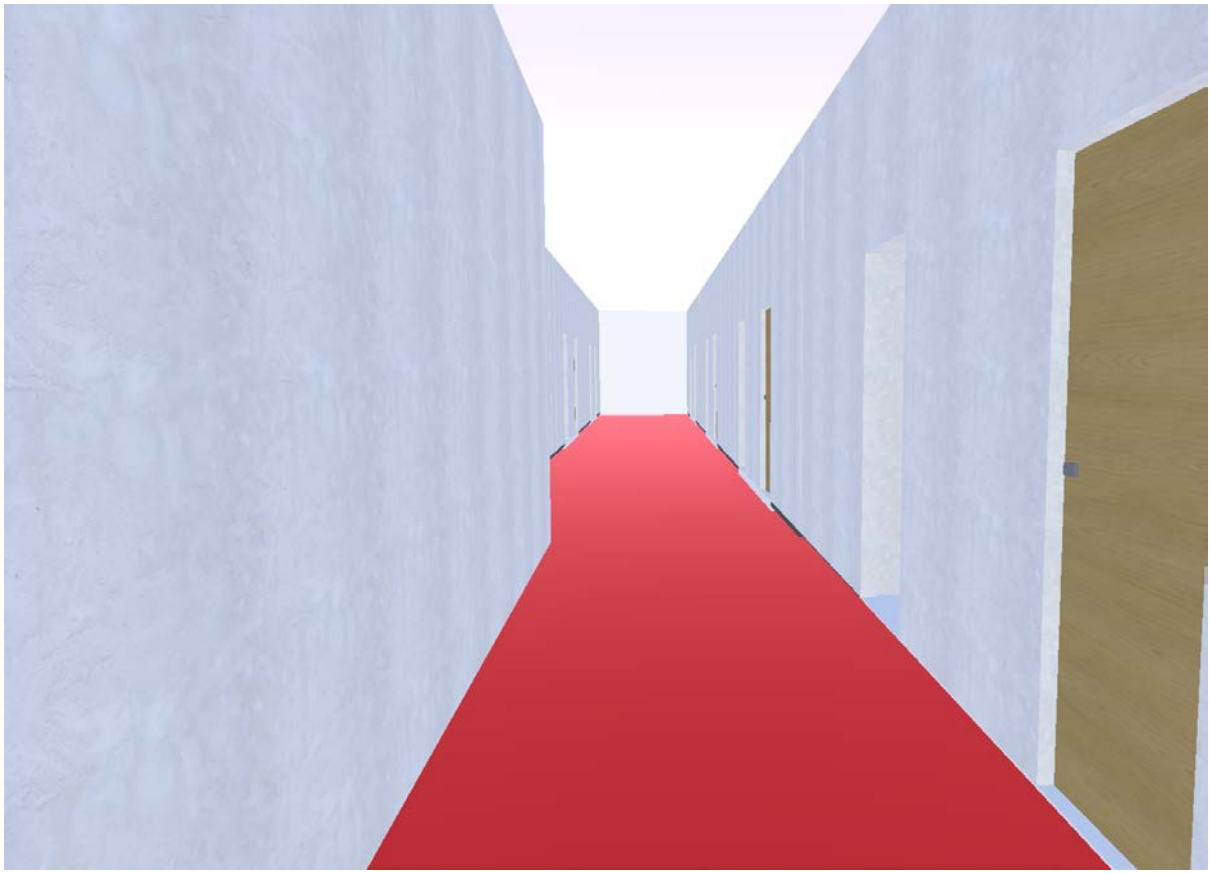


Figure 21: Screenshot cruise vessel (cabin deck)

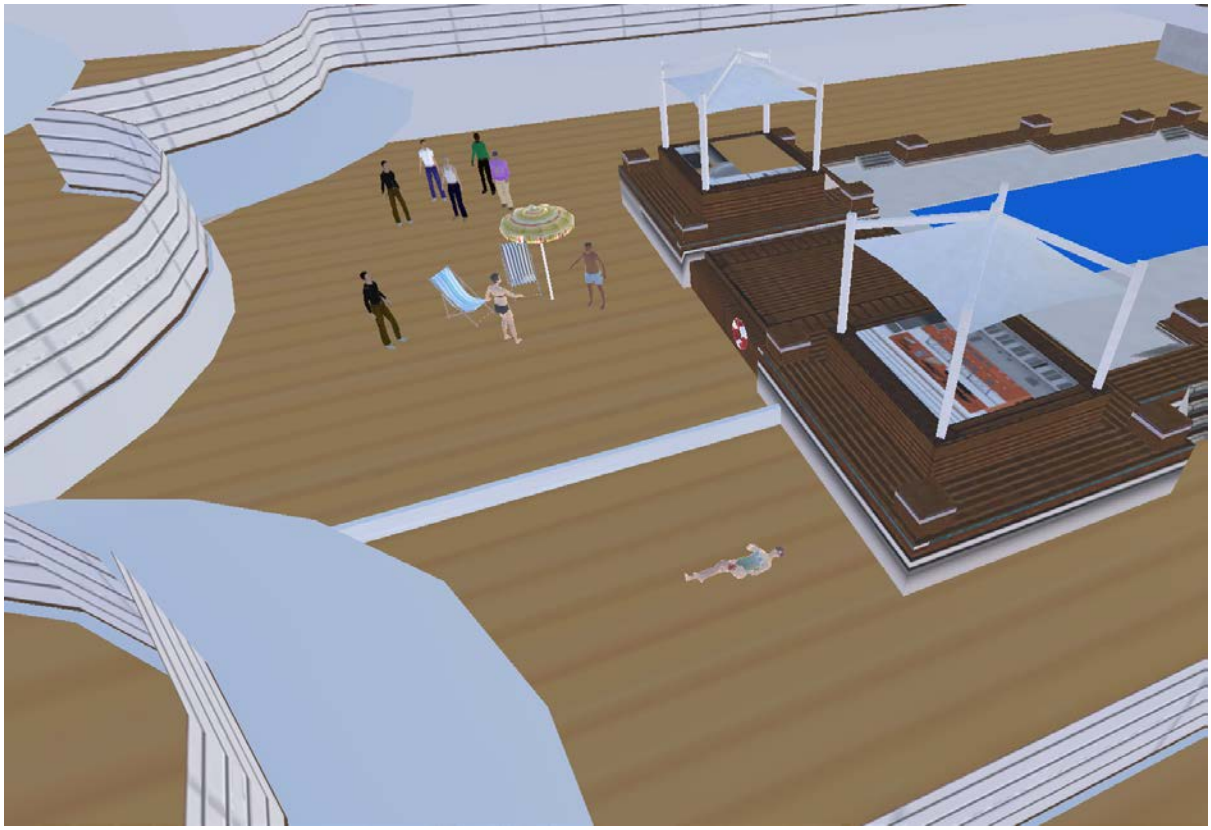


Figure 22: Screenshot cruise vessel (swimming pool deck)

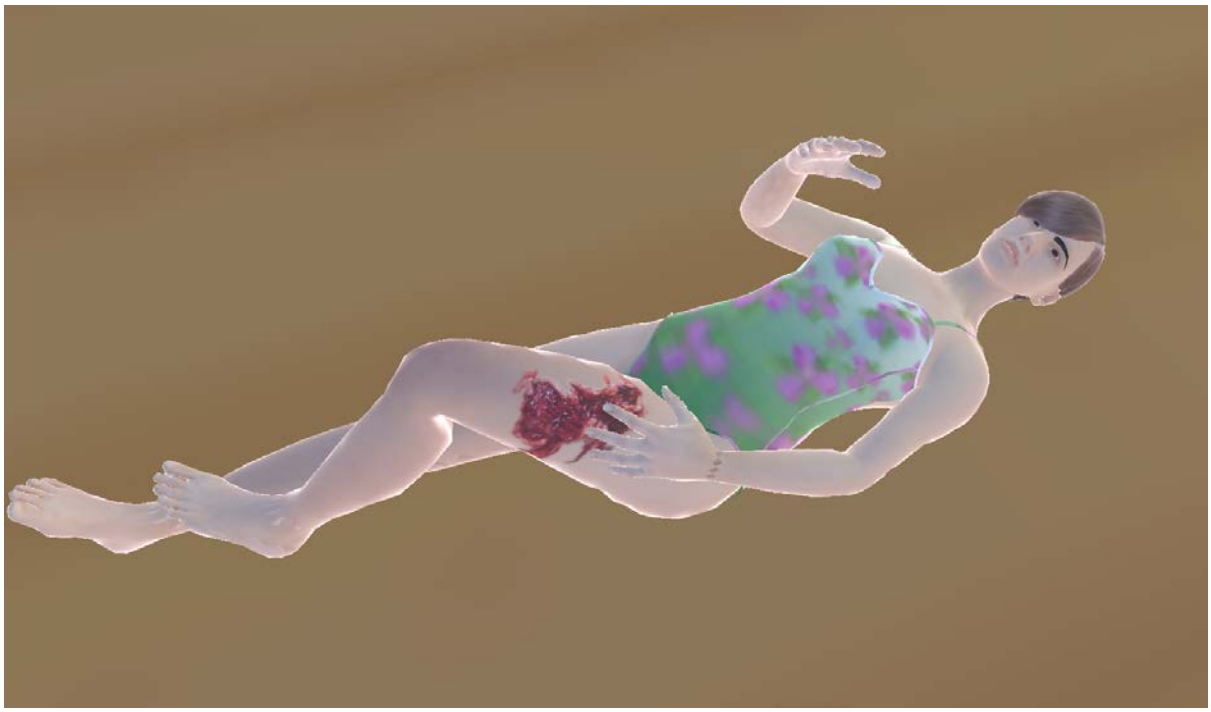


Figure 23: Screenshot injured person on swimming pool deck

8.2.2 MEV Training component

Especially for the MEV training two 3D models of MEVs were implemented into the VROnSite training system.

The model of the MEV 1 is visualized in VR as a raw model (see Figure 24). This model was just implemented but not used within the training courses, as a real model is available in Astander warft.

This 3D model was developed from M2D according to the construction plan from partner Astander and EFB. For better visualization the model was updated with small textures.

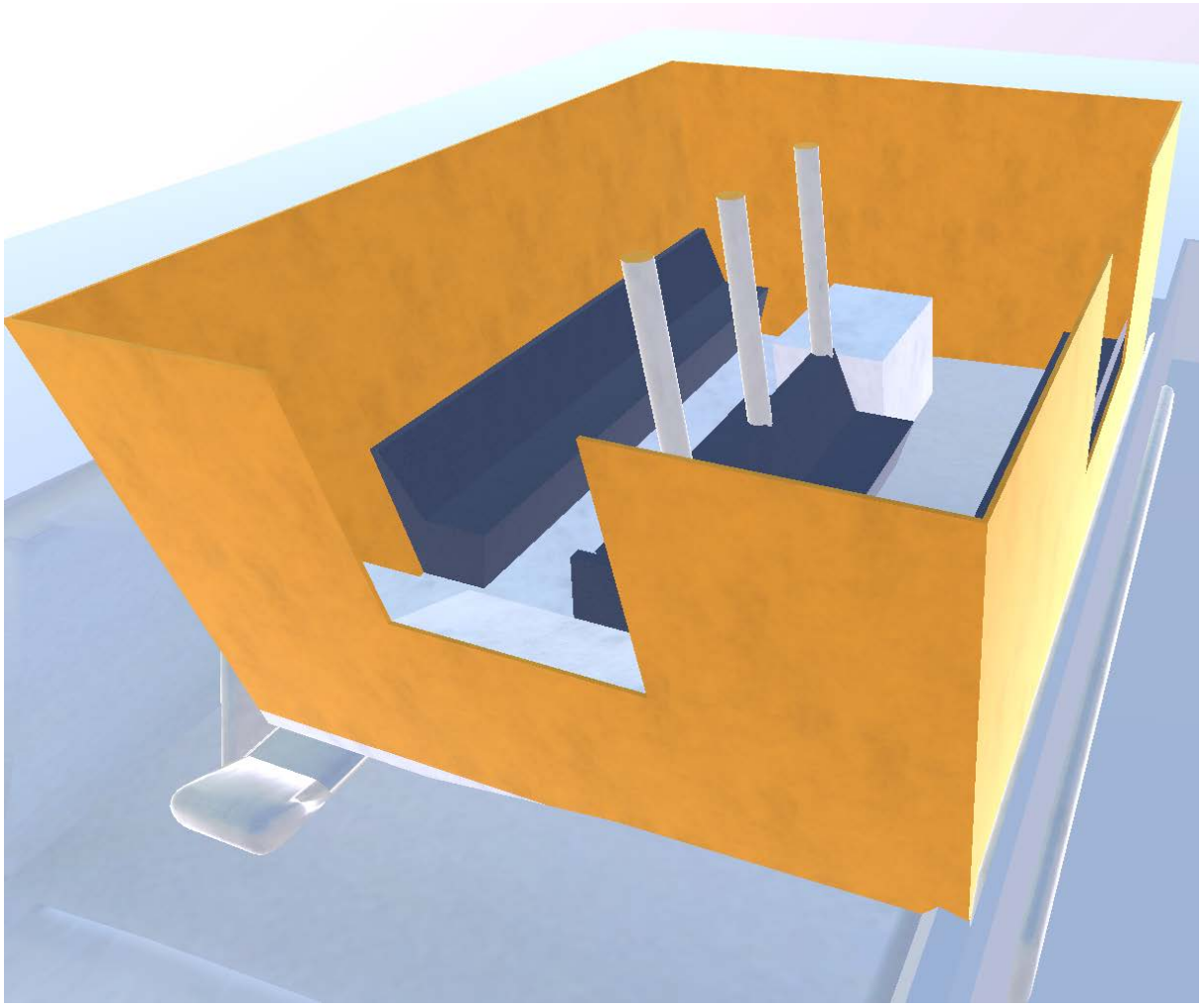


Figure 24: Screenshot of MEV 1

For the training as well as room scale testing of for the MEV 2 this model was also included into the VROnSite training system. In Figure 25 and Figure 26 the MEV 2 is visualized.

The 3D model was implemented without textures, to check the usability and maneuverability inside of crew and passengers. The model was provided from partner EFB and optimized for Unity 3D and the VROnSite training system form JOAFG and M2D.

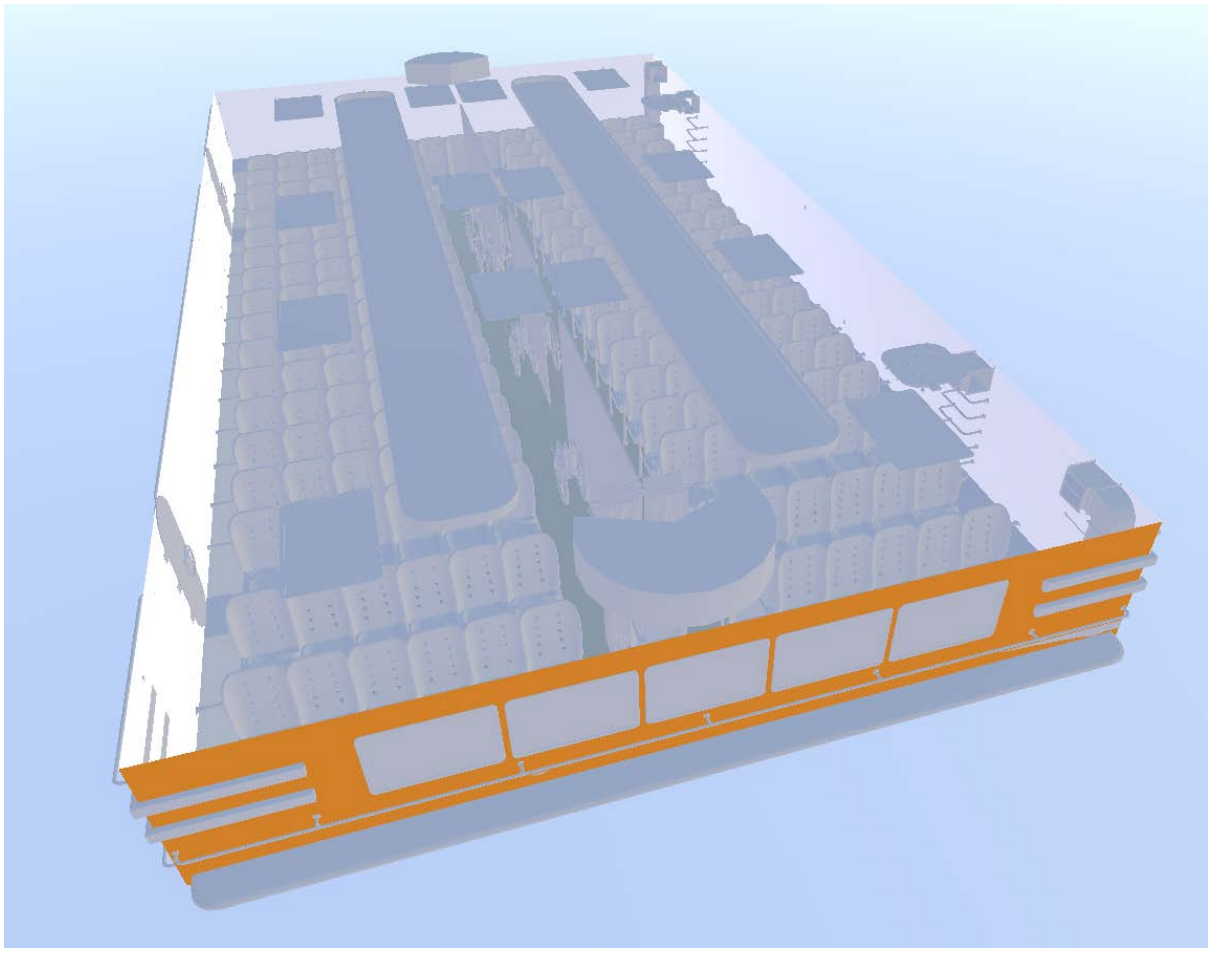


Figure 25: MEV 2 (bird view)

Figure 26: Screenshot – MEV 2 (inside)

Some interieur specifications were identified from JOAFG for better usage, especially for persons with limited mobility or injured persons.

These considerations are:

- Remove wheelchairs to allow more space into the MEV 2.
- Implementation of a rotating table to treat injured persons directly at the MEV (Advanced Life Support)
- Implementation of beds which are intended for lying injured persons

All new interiors are implemented in the middle section of the MEV. The trainee, also the person who is in the MEV can activate or deactivate these features in fact of decision-making process.

These updates are implemented from JOAFG and M2D and visualized in Figure 27.

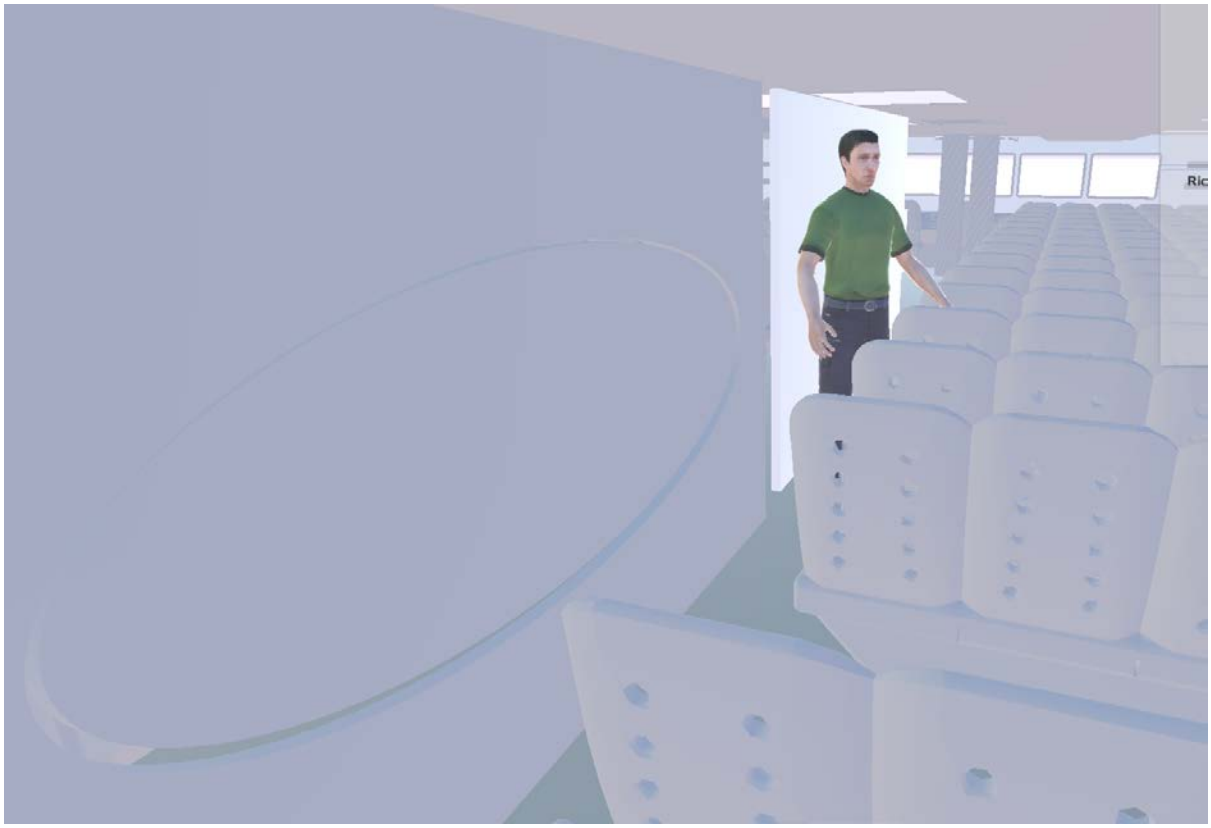


Figure 27: Screenshot of updated interior for MEV

8.3 Outlook

For further developments, there needs to be an update on the details and textures of the VR model. Also, the SOPs for the testing of new features and elements will be implemented after the project.

It is also envisaged to have Non Personal Characters (NPCs) that respond to commands of the trainees to simulate interaction with passengers.

This should allow a better evacuation training.

The VR Training curriculum will be further developed to customize the VR experience to the needs of the final contractors.

The VR system itself and with the further developments during the PALAEMON project by JOAFG will be implemented in JOAFGs training concepts for First Responders in special locations.

9 Scenario database update

The scenario database was developed as relational database to document all relevant components in a structured and transparent way to describe and define several scenarios.[4] With the database it is possible to define all parameters and describe, document and share scenarios in an easy and structured way.

The database allows the development of standardized as well as specialized scenarios as preparation for VR/MR/AR- as well as paperwork or field (real) training.

For the MEV training, located at JOAFG station, this database was also used for developing the relevant content for the trainees.

The database was finally developed to allow a standardized training and provide show cases for VR training as well as real life trainings. For a double use between the VR section planning and regular exercises of first responders, the database follows the logic of general exercise planning and role concepts of standardized operations from first responders. For taking up the results and a sustainable usage, this allows to use the database for future pilot developments and trainings of crew, first responders, and leadership training.

An overview of the database scenarios is in Annex IV – Sample Scenarios.

[4] https://wirtschaftslexikon.gabler.de/definition/datenbank-30025 (07.06.2021)

10 Conclusions

The PALAEMON training concept presents the conceptual plan for the design and setup of PALAEMON training activities. This first version of the training report sets the direction and detailed plan of activities. The training concept highlights training content relevant to staff aboard a cruise ship, namely evacuation procedures as well as specialized content focused on passengers with varying needs during an evacuation process (tackling needs of vulnerable groups). Furthermore, the LMS (i.e. Moodle platform) also provides specific content relevant to the PALAEMON system, providing one module to brief crew members specifically on the PALAEMON ecosystem and individual components relevant for different staff. This way crew members can familiarize themselves with relevant PALAEMON system features before operating the system. As a last module of the LMS training component trainees will get briefed on the VR component and will have the opportunity to register for the VR follow up training, which will provide a more practical component.

However, training content is not solely tailored towards crew members' needs, but also pays attention to address passengers through content specifically tailored to their needs. Sensitization on needs of vulnerable groups is e.g. deemed valuable for crew and travellers alike. As the success of an evacuation procedure is dependent on a variety of factors and participation and performance of crew and passengers is equally important, training content addresses both equally. Learning material for passengers is further complemented by an optional first aid refresher training so that passengers can actively support others in need, potentially taking off pressure of crew members, already under high levels of stress.

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Annex I - Moodle Plugins and Gamification

Moodle plugins relevant for PALAEMON Academy

In the LMS Moodle the core functionalities already allow the user to set up an eLearning program. Nevertheless, Moodle mainly draws its full potential from more than 1.000 plugins. The increasing Moodle community is continually adding functionalities to the core system by developing more and more of such additionally modules. In this chapter some of the most interesting plugins for the PALAEMON Academy should be presented. This is meant as a list of optional features for the PALAEMON Academy. The exact setup and use of plugins will be defined at a later stage and detailed in the 2nd version of this report.

Completion Progress

This plugin enables learners and instructors to see advancement in activities and learning resources within a course which helps in organization and as a time management tool (Lambda Solutions, 2020). The platform shows a bar with sections for each part of the course that has to be completed and colours indicate whether or not they are already done. The instructor has the possibility to see the progress of all learners subscribed to the course.

Attendance

With the Attendance plugin the instructors are able to keep track of the participation of the learners within a course (Lambda Solutions, 2020). This is a kind of basic function normally applied for self-learning courses and can be used to make sure that learners are subscribed to the relevant modules and attend the courses.

Custom Certificate

The custom certificate can be used to award a PDF certificate/ diploma to the learners depending on specific criteria that need to be set beforehand (Lambda Solutions, 2020). This can be a certificate for the completion of a course or a combination of several sub-courses.

Email-Based Self-Registration with Admin Confirmation

This plugin can be used to allow users the automatic creation of their accounts including the confirmation of the account by the site administrator (Lambda Solutions, 2020). When the administrator confirms the account, a customized Welcome-message can be set to the user, where, for example, relevant information about how to start with the course can be offered.

SAML2 Single Sign-On (SSO)

If the Moodle LMS should be integrated into an already existing site or portal of an organization, this plugin can be used to make the log-in simpler. It is a popular and commonly used data language for exchanging authentication and authorization information between applications (Lambda Solutions, 2020). The users can log in to the organization site or portal and can be then redirected to the Moodle site, without an additional log-in, as the credentials are exchanged between them.

Collapsed Topic or OneTopic Format

These two plugins can be used to change how the different section within the Moodle course are displayed and how they function (Lambda Solutions, 2020). A course can be divided into sub-sections for a better organization of the content and to provide a better overview of the content for the learners.

Interactive Content – H5P

The H5P is a very powerful module for Moodle. It allows the instructors to create interactive content for their learners, which can be interactive videos, presentations, games, quizzes and so on (Lambda Solutions, 2020). The Plugin is based on JavaScript and is easy to use, as it is not necessary to use a text-editor, by creating, sharing and reusing interactive HTML5 responsive design content (Lambda Solutions, 2020). In such a way, the user experience can be increased, and learners can better engage with the learning content.

Moove Theme

This Plugin is one of many that allows the instructors to better modify the Moodle theme of their courses. It transforms it to a more user-friendly, modern and simplified theme and makes it easier to edit it.

Onetopic Format

This is also a Plugin for the change of the look and feel of the Moodle site. With this module, the instructor can create different tabs and thus show the content not only on one site, but organize it into different tabs that can be labelled as liked.

Badges

A very good and simple plugin for motivating learners is the use of badges. They do not have a financial value but are still able to motivate learners to acquire them. A digital Moodle badge is a nice way to recognize achievements or competencies by setting up criteria for reaching them. There are two different kinds of badges, the site badges can be used to reward the completion of a set of courses at the site, the course badges can be rewarded after the completion of a set of activities within a specific course. It is also possible to view the achieved badges from other learners and see what badges are available to be achieved (Lambda Solutions, 2019c).

Points

This is a very easy feature that allows to award points to the learner for different activities within a course. This can motivate him/her to do the course activities and with this Plugin it is also possible to enable a stepwise unlocking of new stages with additional training material or awards.

Leaderboards

The Plugin Ranking Block allows to implement assessing points to completed activities and displays it in a scoreboard block. This feature engages learners to compete with others and thus increase their engagement with the learning material.

Levels

To organize the points given for different activities it is also possible to use Plugins for awarding the learners with levels. For the completion of the relevant activities the learners can collect points and depending on the settings, the reaching of a number of points leads to a level-up. A ranking list of the learners with the highest level can also be displayed. This can

be used to show them if they have reached a milestone or provide feedback on their learning process.

Time-based activities

For activities within a lecture the instructor can also add an artificial time pressure by adding countdowns or timed-quizzes to motivate them to work faster and to work better under pressure (Lambda Solutions, 2019c).

Stories and characters

Also, without using a separate plugin it is possible to increase the game-feeling for the learner by creating stories and characters around the learning challenges. This brings the learning material alive and memorable and provides an engagement boost (Lambda Solutions, 2019c).

Freedom to Fail

Like stories and characters, the freedom to fail is a way of developing the course that keeps the learners motivated. This can be done by giving the learner multiple lives, second chances or alternative methods to succeed during a challenge. It is also important to give feedback when they lose to show them the direction of improvement and keep them motivated to try it again (Lambda Solutions, 2019c).

Annex III Introduction to STCW Convention and Code - STCW requirements for personnel working on passenger ships

The International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW), 1978, as amended, and associated Code, was adopted by the IMO International Conference on Training and Certification of Seafarers on 7 July 1978 and entered into force in 1984. Since then, it has been amended numerous times (in 1991, 1994, 1995, 1997, 1998, 2004, 2006, 2010, 2014, 2015, 2016 and 2018). To promote the safety of life and property at sea and the protection of the marine environment, the STCW Convention establishes basic requirements on training, certification and watchkeeping for seafarers on an international level, which the contracting States (Parties) are obliged to meet or exceed.

The STCW Code supports the legal framework of the Convention by introducing specific technical standards to be met. The Code comprises two parts. Part A contains mandatory provisions which describe the minimum standards required to be maintained by Parties to give full and complete effect to the provisions of the STCW Convention. Part B provides non-compulsory measures/guidance to assist Parties to the STCW Convention and those involved in implementing, applying or enforcing its provisions.

IMO regulations included in the STCW Convention and Code require seafarers and other personnel working on passenger ships engaged on international voyages to have specific safety and emergency training. These special provisions were initially introduced with the 1997 amendments to the Convention and part A of the Code by the resolutions MSC.66(68) and MSC.67(68) respectively and entered into force in 2003. New relevant amendments were adopted in 2016 as per resolutions MSC.416(97) and MSC.417(97) and entered into force in 2018. These mandatory special training requirements for personnel of passenger ships are summarized in Table 1.

Table 9: Special training requirements for personnel of passenger ships as per STCW Convention and Code

Title	STCW Regulation	Crew required to be trained
Passenger ship emergency familiarization	V/2.5, A-V/2.1	Personnel serving on board passenger ships (the familiarization needs to be appropriate to their capacity, duties and responsibilities)
Safety training	V/2.6, V/2, A-V/2.2	Personnel providing direct service to passengers in passenger spaces on board passenger ships
Passenger ship crowd management training	V/2.7, A-V/2.3	Masters, officers, ratings in accordance with chapters II, III and VII and other personnel designated on the muster list to assist passengers in emergency situations on board passenger ships
Crisis management and human behaviour training	V/2.8, A-V/2.4	Masters, chief engineer officers, chief mates, second engineer officers and any person designated on the muster list having responsibility for the safety of passengers in emergency situations on board passenger ships
Passenger safety, cargo safety and hull integrity training	V/2.9, A-V/2.5	Masters, chief engineer officers, chief mates, second engineer officers and every person assigned immediate responsibility for embarking and disembarking passengers, for loading, discharging or securing cargo, or for closing hull openings on board ro-ro passenger ships

Crowd management training

Introduction

In passenger and cruise ships the safety of passengers is a top priority. The study of relevant ship accidents revealed that one of the main contributing factors to the scale of human losses and injuries was that the Masters and the crew members were unable to effectively evacuate the ships or their passengers. In this regard, the need to have the understanding and the ability to handle passengers not as individuals, but as a group (crowd), was evident.

Recognizing the importance of effective crowd control onboard ships, IMO has introduced into the STCW Convention relevant crew training requirements (regulation V/2, paragraph 7, and paragraph 3 of section A-V/2, and table A-V/2-1 of the STCW Code). Specifically, Masters, officers, ratings, and personnel designated on the muster list must have successfully completed crowd management training before being assigned to shipboard duties. The training must ensure that the personnel involved will be competent to contribute to the implementation of the shipboard emergency plans and procedures to muster and evacuate passengers.

This section provides an overview of the training subjects and guidance notes included in the IMO Model Course 1.41 “Passenger ship crowd management training”.

Contributing to the implementation of shipboard emergency plans and procedures to muster and evacuate passengers

Shipboard emergency plans, instructions and procedures related to the management and evacuation of passengers

Emergencies on board should be dealt with as soon as possible, before they are out of control, and effectively mitigate the potential losses and damages. To achieve this objective, and at the same time comply with the relevant mandatory IMO requirements on emergency preparedness, shipping companies develop and introduce shipboard emergency/contingency plans into their safety or integrated management systems. These plans must be applied by the Master and the crew in case of an emergency, such as the evacuation of passengers.

In general, the shipboard emergency plans include the following:

- Muster lists and emergency instructions; these plans comprise clear instructions for the ship’s crew regarding the tasks and actions they have to carry out in an emergency.
- Fire control plan; it shows the locations, types and technical arrangements of the various firefighting equipment available onboard.
- Damage control plan; this plan contains the following information:
    - Locations, categories and control stations of various watertight doors;
    - Boundaries and openings of watertight compartments; and
    - Arrangements for the correction of any list due to flooding.
- Lifesaving appliances and escape route/evacuation plan; the plan includes the following:
    - Locations and types of various life-saving appliances onboard; and
    - Recommended escape routes and emergency exits.

Muster lists and emergency instructions

The muster lists contain clear instructions detailing the actions to be performed by each crew members on board in the event of an emergency. Copies should be posted in conspicuous locations that can easily be seen and be accessible by the crew, such as the bridge, the engine control room, accommodation passageways, etc.

Crowd management techniques and relevant equipment used to assist passengers in an emergency

Crowd management is the intelligent and disciplined application of practical skills to control and direct a crowd, both passengers and crew, in an emergency. The objective is to optimize the chances of survival for every person on board. Effective crowd management depends on the following elements:

- Leadership skills;
- Familiarity with the ship's layout and escape routes;
- Familiarity with the essential safety and emergency equipment on board, including personal life-saving appliances;
- Knowledge and implementation of the emergency and safety procedures;
- Communication skills; and
- Understanding the behaviour of passengers and crew members in emergencies.

Assisting Passengers en route to muster and embarkation stations

Giving clear and reassuring orders

During an emergency, providing passengers with accurate information and reassurance is vital. The extent to which people respond to a warning message is influenced by many factors, including individual characteristics and perceptions, whether the message comes from a credible source, how the message is delivered, and the message itself. Crew members assigned to guide the passengers should be able to give clear and reassuring orders to them. In this regard, they should:

- Ensure that everyone can hear;
- Present the information in the correct sequence and word it precisely;
- Use common terminology and avoid jargon, abbreviations, acronyms, etc.;
- Choose their words carefully. Avoid using words such as emergency, crisis, disaster, etc. Try other words instead, such as incident, situation, minor technical problems, etc.;
- Use positive language and commands;
- Speak with confidence and authority;
- Be assertive, so that the passengers have confidence in them;
- Speak slowly and concisely, omitting unnecessary details;
- Bear in mind that passengers will always request more information;
- Only tell the passengers what they know and don't rely on guesses; and
- Listen carefully to public address announcements and pass on information that the passengers may not have heard or understood. Repeat the command as appropriate.

Managing passengers in corridors, staircases and passageways

An emergency may require the full or partial evacuation of the ship. In such an event, it must be ensured that all passengers, including those with reduced mobility, can evacuate to an appropriate place of safety. Leading the passengers in corridors, staircases and passageways is a challenging task, especially if they are in a state of panic. Thus, the crew members need

to be trained accordingly. To control effectively the passengers in corridors, staircases and passageways, the designated crew members must:

- Follow the procedures described in the relevant emergency plan;
- Identify any hazards associated with obstructions along the escape routes;
- Give clear and calm directions on the route to be followed;
- Reply to simple questions asked by the passengers. However, they should also say that additional information will be given at the assembly station. This should ensure that there are no delays;
- Close any doors that may allow passengers to deviate from the prescribed route;
- Be aware of the emergency lighting that is installed;
- If family groups become separated, keep them calm and get information on the location of the other members. Reassure them that every effort is being made to reunite the group; and
- Where applicable, adhere to the procedures for personnel having direct control of children's activities.

Regarding the use of elevators, the following dangers and restrictions need to be considered:

- A power failure may cause entrapment of people;
- Smoke may travel rapidly up elevator shafts;
- The elevator may be requested for a deck that is dangerous because of smoke or fire. On the contrary, crew members acting as stairway guides will direct passengers to the assembly stations by a safe route;
- Elevators may become overloaded (caused by the rush to escape); and
- Too many people attempting to enter the elevator may result in closing doors malfunction, leading to further distress.

Maintaining escape routes clear of obstructions

It is critical to keep escape routes clear of any obstruction. During an emergency, the passengers will seek escape routes. The presence of any obstruction can delay their exit and cause entrapment, injury or loss of life. Crew members can be hampered in carrying out their duties. For example, obstructions can cause delays in rescuing passengers. They can also be a potential fire risk. Since it is not possible to foresee an emergency, all escape routes should be kept clear at all times. Therefore, the crew members should always ensure that cleaning trolleys, temporary maintenance equipment e.g. ladders, and any other obstructions are not blocking entrances, exits and accesses.

Methods available for evacuation of persons with disability and persons needing special assistance

Depending on the type of disability of the person and the given situation, there are several methods applicable for the evacuation of persons with disabilities and persons needing assistance. Factors such as the ship list and motion, crowd density and psychological factors also have an impact on their evacuation. The following should be considered:

- Some people with mobility difficulties who are usually able to move independently under normal conditions may not be able to do so safely during the evacuation, where a large number of other passengers are rushing to reach their muster stations;
- Persons requiring assistance include drunk, injured, anxious/nervous and very noisy individuals;

- Since lifts are not used in an evacuation situation, alternative ways may be required to move wheelchair users and people with mobility impairment in staircases;
- Crew members need to keep in mind that every person has different abilities and needs, so they should demonstrate flexibility in their approach;
- Persons with disabilities and people needing special assistance require care and their evacuation is a labour intensive task. Thus, the ship's emergency plan should include certain crew members assigned to assist these people.

Methods available for evacuation for disabled persons and persons needing special assistance are the following:

- Upon hearing the Emergency Signal, the dedicated crew members should immediately muster at their designated assembly station (e.g. reception lobby) for check off by their team leader (e.g. evacuation control team leader). Then, they should proceed to assist disabled persons and persons needing special assistance to reach their assigned muster or embarkation stations as necessary;
- The crew members need to ensure that the passengers' lifejackets are worn properly;
- Crew work parties could assist disabled persons using lightweight evacuation chairs if available;
- To effectively locate the passengers requiring assistance, appropriate cabin lists could be available;
- The ship's Public Address System and VHF communications can be utilized to advise crew members where assistance is required;
- Personnel should be assigned to look after the disabled persons and persons needing special assistance when they reach their muster/embarkation stations. They should try to keep them as calm as possible. Suitable passengers may be of help;
- The designated crew members should report to their leader and call for extra assistance if required. They should know beforehand where to get assistance from (e.g. the evacuation control team leader or the muster station leader).

Methods of searching for passengers in accommodation and public spaces

The crew needs to search the accommodation areas and public spaces for passengers who might be left behind during evacuation, to ensure that all passengers are accounted for. Thus, a number of crew members are assigned, as per the ship's muster list, with the task of searching specific areas/spaces of the ship. The searching must be thorough, methodical, systematic, and based on a specific plan/pattern. Its results should be recorded. The objective of the process should be to perform the searching activities timely, cover all areas of interest and prevent a space from being searched twice or omitted. The success of the searching depends on the thorough planning of the relevant activities, the proper preparation/training of the responsible crew members and the effective implementation of the relevant procedures by them.

For the proper searching of the cabins and corridors, the responsible crew members should apply the following:

- Wake the passengers and inform them of the emergency;
- Check the cabin thoroughly, including the toilet, wardrobes and underneath the beds;
- Advice the passengers to dress warmly;
- Ensure that the passengers will put on their lifejackets;
- Direct the passengers calmly to the nearest stairway leading to their muster stations;
- Assist the passengers to pass through the fire doors (in case they have been released);
- Collect all remaining lifejackets and pass them to the muster stations;
- Report to the section/zone leader or muster control if they need assistance;

- Check that all cabins in their section have been evacuated and mark each cabin door accordingly (with inspection tags, stickers, labels, towels, etc.);
- Search and evacuate all spaces, rooms and offices within their section;
- Report to the section/zone leader or muster control when their section is completely evacuated;
- Remain at their station and wait for further orders; and
- Keep all doors tightly closed.

To evacuate public rooms, the crew members responsible should:

- Guide passengers and personnel to the nearest exit and direct them to their muster stations;
- If the fire doors have been released, assist the passengers and personnel in passing through.
- Check all spaces within the room;
- Report to the section/zone leader or muster control when the room is completely evacuated or if they need assistance;
- Remain at their station and wait for further orders; and
- Keep all doors tightly closed.

To evacuate open decks, the crew members responsible should:

- Direct all passengers via the stairways directly to their muster stations;
- Remove deck chairs, sun loungers, tables, etc. which may be a hindrance to evacuation;
- Report to the section/zone leader if they need assistance; and
- Remain at their station and wait for further orders.

Effective mustering procedures. The crew has to maintain control in muster/embarkation stations and ensure that the assembled passenger groups remain calm and well behaved. Greater control needs to be exercised should signs of panic initiation are detected.

To effectively address the assembled passengers, the following technics can be applied by the crew members:

- Be prominent, stand on a stage, table or chair;
- Wear highly visible clothing, jackets, caps; and
- Use a microphone or loud hailer, if available.

For reducing and avoiding panic, the following approach should be applied by the crew:

- They should inform the first arrivals that patience is needed until everyone has arrived;
- They should keep passengers towards the centre or extremities so that entry points do not become blocked;
- They should be confident; then others will have confidence in them;
- The display of leadership is essential. In its absence, rumors will spread and stronger-willed but ill-informed passengers may attempt to influence events;
- They should not leave their position.
- They can detail the muster personnel or selected passengers to assist in supportive roles;
- They should be aware that separated family groups will need information on missing members;
- They should look for changes in behaviour and ensure that the passengers remain calm; and
- They should never be aggressive.

The crew members should use, where appropriate, passenger lists for evacuation counts:

- The required numbers should be counted for each lifeboat/raft;
- Passengers should be directed to the embarkation stations in single file;
- The number of passengers evacuated should be passed to the bridge;
- Passengers may not have been allocated to specific assembly stations on certain ships. However, a thorough accommodation search should ensure that all passengers are accounted for.

When passengers have reached their muster stations, the muster area crew should ensure that the passengers are suitably clothed and have been donned their lifejackets correctly. The following should be considered:

- Prior instructions on the public address system should be given to the passengers instructing them to proceed to the assembly stations wearing extra clothing;
- Precise instructions and visible demonstration of donning lifejackets should be provided to the passengers in the muster stations;
- Extra lifejackets and blankets should be available at the assembly stations.

The following activities should be performed by the crew in the passenger muster stations:

- Assemble the passengers assigned to the muster station in groups according to their lifeboat allocations;
- Check off passengers by cabin numbers;
- Check that lifejackets are properly worn and secured;
- The muster station leader should report to the evacuation control team leader when the mustering is completed;
- Keep passengers at the muster stations and wait for further orders;
- On receiving embarkation orders, the boat group leaders should lead the boat groups to their embarkation station;
- Follow the designated routes as instructed by the evacuation control team leader;
- Give assistance to those who need it;
- Keep family groups together;
- Assist in the proper embarkation of passengers into the assigned survival craft; and
- Do not overload the survival craft (the persons embarked should not exceed the stated capacity).

The following are examples of giving information to passengers in the muster stations.

Example No. 1:
Ladies and gentlemen and children, may I have your attention, please.
This is Muster Station "A". I am (state your name and position) and I am your Muster Station Leader.
As of this moment, we have a minor technical incident and our Captain on the Bridge is in full control. Updates regarding the situation will be broadcasted from the Bridge over the public address system very shortly.
In the meantime, please all be seated and remain calm. I assure you all will be back to normal in a few moments' time.

Example No. 2:
Ladies and gentlemen and children, may I have your attention, please.
As of this moment, our control parties are dealing with the incident.
For those passengers whose friends or relatives or family members are not in the muster stations yet, we assure you that crew members are checking all areas on the ship and we are bound to find them.
Please remain in the muster station and be calm.

Example No. 3:
Ladies and gentlemen, as of this moment our control parties are still dealing with the incident. You are very safe here and there is no cause for alarm.
The Captain on the Bridge is in full control of the situation. I assure you that everything will be back to normal in a few moments' time.
There are no passengers in the lifeboats. It is just a precautionary safety measure to prepare the lifeboats.

Example No. 4:
Ladies and gentlemen and children, may I have your attention, please.
We will now do a roll call for us to determine who is inside our assembly station.
When I call out your cabin number please acknowledge your presence by answering loud and clear with the "number" of occupants in the cabin.
1201 - Mr. Dick 1204 - Ms. Jill
1202 - Mr. Harry 1205 - Mr. Potter
1203 - Mrs. Jane 1206 - Mrs. Doubtfire

Example No. 5:
Ladies and gentlemen and children, may I have your attention, please.
We will now do a roll call for us to determine who is outside our muster station.

Example No. 6:
Ladies and gentlemen, please listen up as I will call your name and cabin number.
Please say "here or present" as soon as you are called.
Ms. Moore of Cabin 601 Mr. Bighead of Cabin 604
Mr. Scooter of Cabin 602 Ms. Robinson of Cabin 605
Ms. Caroline of Cabin 603 Ms. Brown of Cabin 606

Disembarking passengers, with special attention to persons with disability and persons needing assistance

If the Master commands the evacuation of the passengers from the muster stations to the embarkation stations (next to the lifeboats and liferafts' area), the crew members in charge of the muster stations have to guide all assembled passengers to the embarkation stations in an organized and supervised manner. On their way to the embarkation stations, the passengers must be kept under control and directed accordingly. The following actions are applicable to the crew:

- On receiving the embarkation orders, boat/liferaft groups must be led to their embarkation stations by their group leaders;
- The family groups must be kept together; and
- For an efficient and controlled movement, the passengers may line up and form a "crocodile queue". They should hold with one hand the lifejacket in front of them, and never break the line formation as they move along;

The sequence of the evacuation actions is the following:

- The first boat group leader should lead at the head of the queue;
- Passengers in wheelchairs and/or stretchers should be positioned at the end of the queue;
- The designated evacuation roots should be used as per the evacuation control/bridge team instructions;

- Assistance should be offered to those in need;
- One muster station crew member should be positioned in the middle of the line, and one at the end;
- The muster station leader should leave last, once all passengers and crew members are cleared from the muster station;
- Trained personnel to be able to use basic phrases e.g. identify decks, directions to take or where further information can be obtained;
- Identify other passengers who can translate and pass on information;
- In certain circumstances public address announcements can be made to locate people with this expertise;
- Be visible, use arm signals to clearly direct the route to take;
- Understand all of the signs on board and bring passengers' attention to them as required;
- Torches are useful and will draw attention not only to you but also to the stowage of life-saving devices and evacuation routes.

Identifies the extent to which complete safety instructions have been provided to passengers in their native language or languages:

- Trading routes have changed, and some signs are not understood;
- Training booklets and emergency information are not in the appropriate language;
- Use of international symbols.

Recognizes the requirement for languages in which emergency announcements may be broadcast during an emergency or drill to convey critical guidance to passengers and to facilitate crew members in assisting passengers:

- Bi-lingual and perhaps multilingual announcements are essential;
- Companies must consider training extra personnel in languages required by the trading routes;
- Stress will be reduced if passengers can understand information passed or have their queries understood and reassuringly answered.

Safety training for personnel providing direct service to passengers in passenger spaces

Introduction

The study of maritime disasters involving passenger ships clearly suggests the need to have additional training for personnel providing direct service to passengers in passenger spaces, before being assigned to shipboard duties, as prescribed in STCW, regulation V/2, to ensure the safety of the passengers, when an emergency occurs.

This training must ensure the attainment of abilities such as:

- The ability to communicate with passengers during an emergency;
- The ability to demonstrate to passengers the use of personal life-saving appliances; and
- The ability to embark and disembark passengers, with special attention to disabled persons and persons needing assistance.

This section provides an overview of the training subjects and guidance notes included in the IMO Model Courses 1.44 “Safety Training for Personnel Providing Direct Service to Passengers in Passenger Spaces” and “1.29 Proficiency in Crisis Management and Human Behaviour including Passenger Safety, Cargo Safety and Hull Integrity Training”.

Communication with passengers during emergency

Establishing effective communication

The crew must have the ability to communicate effectively with all passengers during normal or emergency situations, regardless of the working language on board. Stress will be reduced if passengers can understand information passed or have their queries understood and reassuringly answered. Thus, identifying in advance the language or languages appropriate to the principal nationalities of the passengers on the particular route is very important. In this respect, the following measures can be applied:

- Ensure that bilingual or multilingual announcements are made over the public address system;
- Train crew members accordingly to be able to communicate in the appropriate languages;
- Identify crew members who can communicate in more than one language;
- During emergencies, place the personnel in strategic positions e.g. assembly areas, etc.; and
- Use appropriate pictorial or video information.

Complete safety instructions need to be provided to passengers in their native language(s) or a language understood by them. The following aspects should be taken into account:

- The training booklets and emergency information must be written in the appropriate language;
- If trading routes change, the relevant material must be updated (because e.g. some signs may not be understood by the passengers); and
- International symbols must be used.

Generally, the use of elementary English is effective in communicating basic instructions to the passengers. Thus, whether or not the passenger and crew member share a common language, the following actions should be considered:

- Train personnel to be able to use basic phrases in English e.g. identify decks, provide directions to take and reassuring information regarding the emergency or indicate where further information can be obtained;

- Identify passengers who can translate and pass on information. In certain circumstances, public address announcements can be made to locate people with this expertise.

If there are hearing-impaired or non-English speaking passengers in a group, alternative means of communication should be considered, such as:

- Assigning interpreters (crew, passengers);
- Using hand signals; and
- Pointing to posters, safety signs and symbols (including TV screens).

Additionally, the closed-loop information exchange protocol can be utilized to ensure the intended message is received and avoid misunderstandings. In closed-loop communication, when the sender gives a message, the receiver is expected to acknowledge the receipt of the transmitted information by repeating it back. If this is done correctly, i.e. the information repeated is the same as the original, the sender follows up and confirms the receipt of the message by using e.g. the word "yes" or something similar. If the feedback received is incorrect, the sender should say "no" or “negative” or a similar expression and repeat the correct message. If the sender receives "no” feedback, i.e. the receiver does not provide a reply, the sender must repeat the message until the receiver closes the loop (Figure 28).

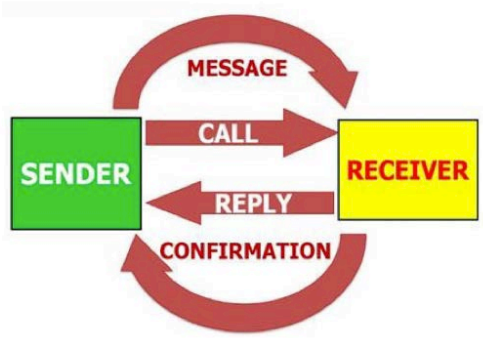

Figure 28: Closed-loop communication style ((IMO HTW 5/3/5/Add.1))

If oral communication is impractical during an emergency, communication with passengers can be established by some other means such as demonstration or hand signals or calling attention to the location of instructions, assembly stations, life-saving devices or evacuation routes. In such cases, the crew members should:

- Be visible and use arm signals to direct the route to take;
- Understand all of the signs on board and bring passengers' attention to them as required; and
- Use torches or batons to draw attention not only to them but also to the stowage areas of life-saving devices and evacuation routes.

IMO symbols for safety

As per IMO regulations and guidelines, signs, labels, posters, danger markings and pictograms are used on board ships to indicate safety equipment and display operating instructions or danger warnings. The use of symbols helps passengers to easily locate important facilities, such as assembly or muster stations, embarkation stations or emergency exits. IMO Resolution A.1116(30), adopted in 2017, specifies the safety signs and mandatory action signs for launching life-saving equipment to be followed (Figure 29).

Figure 29: Indicative IMO safety signs and symbols ((www.marine-sign.com))

Demonstration the use of personal life-saving appliances to passengers

The crew assigned to the safe evacuation of passengers must be able to demonstrate the correct donning of personal life-saving equipment. In their preparation, the crew members should take into account the following aspects:

- There are many types of individual life-saving appliances.
- Illustrated posters should be displayed at the assembly stations, with instructions for wearing individual life-saving appliances.
- The crew members must be familiar with the donning procedure. They must practice the procedure and demonstrate it in front of their colleagues.
- During real demonstrations professionalism and confidence must be displayed, using simple and clear instructions, accompanied by proper movement of the arms.
- Clear instructions generate fewer questions and eliminate passengers' confusion.

Onboard passenger ships, lifejackets may be stored in the following locations:

- Bridge;
- Engine control room;
- Crew cabins;
- Passenger cabins;
- In special lockers along evacuation routes;
- Passenger assembly/muster stations;
- Survival crafts embarkation stations;
- Inside the lifeboats; and
- Open decks.

Embarking and disembarking passengers, with special attention to persons needing assistance

Embarking passengers with special attention to disabled persons and persons needing assistance in accordance with prescribed procedures

All persons on board must be counted before departure. The names and gender of all persons on board, distinguishing between adults, children and infants, must be recorded for Search

and Rescue (SAR) purposes. All the above information must also be kept ashore and made readily available to SAR services when needed.

Moreover, SOLAS Chapter III, Regulation 19, requires the following:

- On a ship engaged on a voyage where passengers are scheduled to be on board for more than 24 hours, musters of newly embarked passengers should take place prior to or immediately upon departure. Passengers should be instructed in the use of the lifejackets and the action to take in an emergency.
- Whenever new passengers embark, a passenger safety briefing should be given immediately before departure, or immediately after departure. The briefing should include the instructions required by SOLAS Chapter III Regulations 8.2 and 8.4, and should be made by means of an announcement, in one or more languages likely to be understood by the passengers. The announcement should be made on the ship's public address system, or by other equivalent means likely to be heard at least by the passengers who have not yet heard it during the voyage. The briefing may be included in the muster required by the above paragraph. Information cards or posters or video programmes on ship's video displays may be used to supplement the briefing but may not be used to replace the announcement.

Access for persons needing special attention

Details of persons who have declared a need for special care or assistance in emergency situations must be recorded and communicated to the Master prior to departure. Special measures for persons needing special attention must also be implemented during embarkation and disembarkation.

In 1996 IMO adopted the circular MSC.1/Circ.735 "Recommendation on the design and operation of passenger ships to respond to elderly and disabled persons' needs", which provides guidance for the design and operation of passenger ships with respect to persons needing special attention.

A number of key considerations of the guidance are described below:

- The integration of persons with restricted mobility - including infirm, very young, elderly and disabled persons- with the other passengers should be given special consideration when designing a passenger ship and preparing contingency plans for such a ship.
- For the purpose of safety, new passenger ships should to the extent possible be designed in such a way that there is barrier-free passage for elderly and disabled persons in public spaces on board and in escape routes to muster stations.
- The ship should be constructed and equipped in such a way that wheelchair users and other disabled persons can embark and disembark easily and safely, either unassisted or by means of ramps, elevators or lifts. The maximum slope of ramps for wheelchairs should be 1:20. There should be at least one access to the ship which is suitable for disabled persons and wheelchair users. The access should be without stairs and steps and be marked with the international symbol for installations, etc., suitable for disabled persons. Directions to this access should be posted at the other accesses to the ship and other appropriate locations throughout the ship.
- For car ferries, cars with disabled drivers or passengers should be given a special marking at the gate ashore and be directed to a separate marshalling lane, before driving on board the ship. The gate attendant should have the means to communicate with the person in charge of the marshalling area and the personnel on board the ship. There should be no kerb (differences in levels) in the marshalling lanes which could prevent a disabled person from getting out of a waiting car. The ship's crew should

guide disabled passengers to a special parking space on board and give the necessary assistance, including taking any wheelchair out of the car. At the ship's destination, the crew should also assist.

- Special parking spaces from which a wheelchair user can exit from the car should be available on-board car ferries. The number of spaces may be variable as required. The parking spaces may also be used by disabled persons who are not wheelchair users. There should be a barrier-free passage for wheelchair users from the parking spaces to passenger facilities.
- At least one elevator should lead from the car deck to a deck with barrier-free access to public spaces, cabins and toilets.
- Door openings to public spaces should be wide enough for wheelchairs to pass unimpeded with a free opening of at least 80 cm.
- Stairways should be constructed to facilitate the climb for elderly and disabled persons. Stairways should not be steep and should be of a design with closed steps. Steps should give optimum safety concerning height, depth, colour, lighting and risk of slipping. Out of consideration for the elderly and persons with reduced vision, the front edge of each step should have a contrasting bright colour. Tactile warnings should be provided at the top and bottom of each flight of steps.
- For every 100 passengers the ship may carry, at least one place should be reserved for a wheelchair, so that the wheelchair user may travel sitting in the wheelchair together with other passengers.
- At least 4% of the ship's passenger seats should be suitable for disabled persons. The seats for elderly and disabled persons should be situated near evacuation routes and toilets.
- There should be sufficient space available in corridors for elderly and disabled persons to move about, especially on-board ships at sea for longer periods of time.
- On ships with cabins, a number of cabins suitable for wheelchair users should be available.
- Compatible with the size and use of the ship, a number of toilets suitable for wheelchair users should be available, if possible, on each passenger deck.
- In ships with cabins, elderly and disabled persons who may need assistance in an emergency should be assigned cabins situated in the proximity of the embarkation deck, so that they may be assisted to the survival craft quickly and easily. A list of cabins occupied by passengers who may need assistance from the crew should be available.
- The crew should be given training and be issued with clear instructions about the assistance needed by elderly and disabled persons in an emergency.
- Details of persons who are visually impaired and thus in need of special care or assistance in emergency situations should be recorded and communicated to the Master prior to departure; and
- Trained ship personnel are designated to assist the visually impaired passengers (Figure 30, Figure 31) during an emergency situation.

Figure 30: Signs for hearing impaired people (IMO HTW 5/3/6/Add.1)

Figure 31: Signs for visually impaired people (IMO HTW 5/3/6/Add.1)

Disembarkation procedures during an emergency at sea

Upon hearing the general emergency alarm signal, which consists of seven short blasts plus one long blast on the ship's whistle and/or alarm systems, the following actions shall be performed:

- Crew shall proceed to their designated emergency station and perform their assigned tasks and emergency duties.
- The passengers shall proceed to their designated assembly/muster station or lifeboat stations as directed.

Should it become necessary to evacuate the ship the following actions shall be taken:

- The passengers will be guided and assisted by designated ship personnel in an organized and safest way en route from the assembly stations to their assigned lifeboat stations.
- Crew shall proceed to their assigned survival crafts after all the passengers are cleared from the assembly stations.

During the evacuation, the principle of "from fastest to slowest" will be followed, in order to speed up the movement of people. It is also needed to avoid the possible blockage of evacuation routes that could hinder the fast movement of people in case of difficulty in moving the stretcher or wheelchairs along the route.

Should a decision be made by the Master to abandon ship, the following actions shall be taken:

- The designated survival craft crew shall supervise the orderly distribution, embarkation and allocation of seating arrangements of persons in the survival craft (Figure 32);
- Crew will embark on their assigned survival crafts giving priority to passengers first;
- The survival crafts will remain loaded at the embarkation deck until lowered to the water in the sequence ordered by the Command Team (Bridge);

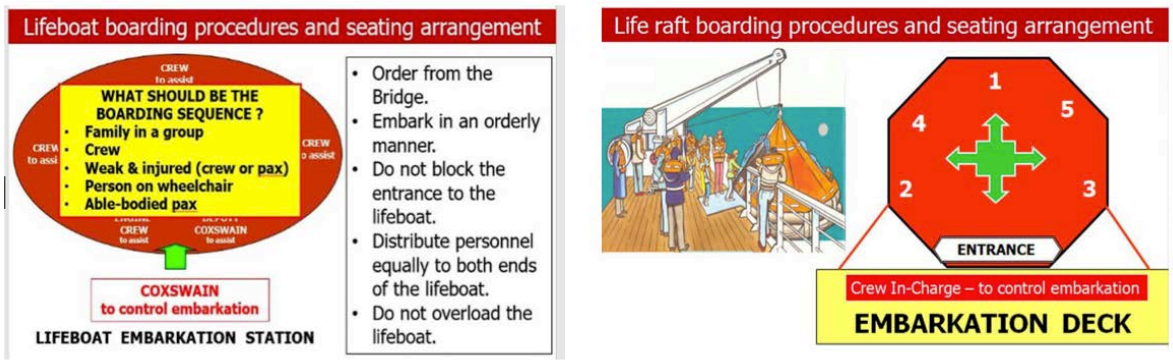

Figure 32: Life Raft Boarding Procedures and Seating Arrangement (IMO HTW 5/3/6/Add.1)

Exercises

Indicative exercises for the crew are the following:

Exercise No 1

Communication with passengers during an emergency:

1. Send the message with the use of two-way handheld radio.
2. Confirm the message was received and understood.
3. Acknowledge the message.

Exercise No 2

Demonstration of the use of personal life-saving appliances to passengers:

1. Announce the procedure of donning the lifejacket.
2. Demonstrate donning of lifejacket per announced procedure.

Exercise No 3

Demonstration in donning of lifejacket announcement to passengers:

Ladies and gentlemen and children, this is your Muster Station Leader. May I have your attention, please? We will now demonstrate how to put on the lifejacket properly. Please listen and watch carefully.

Lifejacket donning demonstration:

1. Undo the buckles. Separate the panels and put on your lifejacket like a normal jacket or waistcoat by putting your arms through the two side holes.
2. Ensure the front sides face outwards.
3. There are two sets of straps with buckles, the waist strap and the chest strap.
4. Secure the waist strap first by passing it around your back from left to right then clip the buckles at the front.
5. Then secure the chest strap by clipping the buckles at the front together.
6. It is important that the lifejacket is properly tightened by pulling the chest and waist straps towards the right. Any remaining straps should be tucked into the back of the lifejacket.
7. All straps and jacket must be firm and tight with minimal movement.
8. On every lifejacket, there is a whistle for attracting attention. There is also a light that will automatically illuminate when it comes in contact with water.
9. Retro-reflective tape has been attached to the lifejacket to aid rescuers in locating survivors in the water when dark. The crew will now go around to check that the lifejackets are donned correctly.

Passenger safety, cargo safety and hull integrity

Introduction

Masters, chief engineer officers, chief officers, second engineer officers and every person assigned immediate responsibility for embarking and disembarking passengers, loading, discharging or securing cargo, closing hull openings on board Ro-Ro passenger ships and managing these ships in critical situations which may lead to a loss of stability due to damages to ship's hull and cargo decks (such as flooding caused by ship's collision or grounding), need to have completed approved training in passenger safety, cargo safety and hull integrity as specified in the IMO STCW Code (section A-V/2, paragraph 5, taking into account the guidance in section B-V/2).
The relevant training should provide trainees with guidance and information to gain knowledge, understanding and proficiency on the following topics:

- Managing the loading and discharging cargo operations;
- Embarking and disembarking passengers, with special attention to disabled persons and persons needing assistance;
- Applying special safeguards, procedures and requirements regarding the carriage of dangerous goods on board ro-ro passenger ships;
- Applying provisions of the Code of Safe Practice for Cargo Stowage and Securing in securing cargoes;
- Using the stability and stress information properly and calculate stability, trim and stress information;
- Correctly operating the associated systems and applying properly the procedures established for the ship regarding the opening, closing and securing of bow, stern and side doors and ramps (Figure 33), and setting up and stowing retractable vehicle decks; and
- Monitoring Ro-Ro deck atmosphere.

This section provides an overview of the training subjects and guidance notes included in the IMO Model Course 1.29 "Proficiency in Crisis Management and Human Behaviour including Passenger Safety, Cargo Safety and Hull Integrity Training".

Loading and embarkation procedures

Design and operational limitation of Ro-Ro passenger ships

According to specific regulations, every ship shall be subdivided by bulkheads, which shall be watertight up to the so-called bulkhead deck, into watertight compartments. the maximum length of which shall be calculated according to the specific requirements given. Every other portion of the internal structure, which affects the efficiency of the subdivision of the ship, shall be watertight. The primary function of watertight bulkheads is to divide a ship into a number of watertight compartments. There is a different design for the ro-ro ships and passenger ships. The lack of transverse bulkheads on board ro-ro ships, due to operational requirements, means that a relatively minor incident such as a trailer toppling over as a result of a defective lashing - can rapidly escalate into something more serious.

The process of familiarization onboard is specific to each ship, includes all categories of personnel, and covers both the aspects related to the safety of life at sea and the specific task of each function on board the ship.
The ship's construction requirements determine the operational limits, as follows:

1. Operational limits on ship - international (longs) or domestic (shorts) voyages;

2. Limits given by the weights loaded (ship capacity) – the ship must not be overloaded;
3. Limits given by weather conditions and the state of the sea – Stockholm Agreement (IMO/MSC Circ.1891 and Directive 2003/25/EC on specific stability requirements for RO-RO passenger ships) is based on weather conditions and the state of the sea and also considers that water loaded on decks is an additional weight that will reduce the stability of the ship;
4. Stability in relation to the ship's construction:
    - High freeboard influences the metacentric height (GM) and the ship's center of gravity (KG);
    - Absence of transverse bulkheads - transverse subdivision provides structural strength and maintains the stability of the damaged ship;
    - High chances of flooding - danger of loss of ship tightness;
    - Damaged ship's stability (always with higher risk);
    - Severe roll motions- low center of gravity, short rolling period, cargo damaging/moving risk;
    - Doors for cargo (stern door or bow door) - (stern door is closer to the waterline, that's proper sealing door arrangement is required to prevent water entry; bow door have to encounter with waves, so it should be);
    - Cargo shifting due to rolling motion may cause instability of ship;
    - Location of life-saving appliances- (deck is higher, so the position of life-saving appliances should be convenient for escaping).

Loading, securing and discharging vehicles, rail cars and other cargo transport units, including related communications - procedures

The operation of ROPAX ships involves the embarkation/disembarkation of passengers, as well as the loading/unloading of vehicles, in a short time.

The general arrangements for loading vehicles, rail cars and other cargo transport units are the following:

- The guidance in the Code of Safe Practice for Cargo Stowage and Securing (CSS Code, as per IMO Resolution A.714(17)), should be followed. Additionally, the loading of vehicle decks is normally done horizontally.
- The transfer of vehicles, rail cars and other cargo transport units from shore to ship is achieved by the use of various cargo handling equipment such as ramps, linkspans, shell doors, cargo lifts, movable decks, etc.;
- Cargo (vehicles) are arranged according to a stowage plan and adequately secured/lashed and chocked according to the Cargo Securing Manual carried on board in accordance with IMO Resolution A.489(XII);
- Vehicles are generally loaded via a ramp, which may or may not be installed on the ship;
- Vehicles are stowed on different cargo decks such as lower hold, main vehicle deck, upper vehicle deck and at platform or mezzanine decks. The general principle of heavy cargo units loaded in the lower cargo decks will assist to maintain the stability of the ship; and
- The heeling pumps for port to starboard transfer, will have a high capacity to transfer ballast quickly transversely across the ship to compensate for the weight of vehicles, rail cars and other transport units being loaded; equally the ballast pumps for forward to aft and vice versa transfer of ballast, will have a high capacity to transfer ballast quickly longitudinally to compensate trim for the weight of the vehicles, rail cars and other transport units being loaded.

To carry out these operations safely, the correct application of the established procedures is required, including the following aspects:

- Cooperation with shore staff to ensure a continuous, controlled flow of loading/unloading;
- Knowledge of height restrictions, above and below the platforms;
- Assessment of the length of passenger cars and lorries, as well as oversized cargo;
- Awareness of the risks to which personnel on vehicle decks are exposed:
    - Physical risks (visible clothing, lighting, whistle, radiotelephone);
    - Atmospheric risks (atmosphere testing, ventilation).
- Drivers will be warned of the speed limit and alert in the event case of danger (overloaded tanks can cause fuel leaks);
- Following the loading plan to ensure that the ship is kept upright or if a list appears, the appropriate listing tanks shall be used;
- Special vehicles stowing – refrigerating, tank, livestock;
- Clearing the decks of mooring materials, chains or debris;
- Training of the personnel involved in the loading/unloading operations regarding the location of the escape routes and the application of the safety rules;
- The need to supervise drivers (communication with drivers may be hampered by fatigue, stress, lack of familiarity with the ship and specific operations on board);
- Use clear direction signs and use reflective sticks or arms.

Figure 33: RO-RO Stern and Bow ramp (www.macgregor.com)

Embarking/disembarking of passengers- procedures

The safe embarkation/disembarkation of passengers is ensured by applying the established procedures, while paying special attention to people with disabilities and those who need special attention. Moreover, the following aspects must be considered:

- Ensuring safe access on board through appropriate, properly located, secured, and permanently adjusted access route (need to take into account the tide, ships' traffic, variation of the draft during operation, etc.);
- Ensuring provision of adequate lighting, fitting safety net(s) and placing a lifebuoy (self-igniting light) with a floating line attached to the embarkation/disembarkation access point;
- The maximum angle of slope for an accommodation ladder must not exceed 55 degrees;
- The maximum angle of slope for a gangway must not exceed 30 degrees (Figure 35);
- The maximum slope of any wheelchair access ramp shall not exceed 1:20;
- Providing properly trained staff, as well as standardized instructions and information on assisting passengers needing assistance;

- Marking access points for persons needing assistance with the respective international symbols (these access routes must not include stairs/steps);
- For ROPAX ships, means of communication shall be provided between the personnel in the passenger grouping area on the quay, and the personnel supervising the embarkation/disembarkation on board the ship;
- Organizing the crew to guide passengers needing assistance - car owners to special parking spaces on the vehicle deck, as well as provide assistance (prior exercises are required to move wheelchairs in and out of vehicles);
- Ensuring the free passage for wheelchair users from the parking spaces to the elevator, or to the spaces intended for passengers;
- Displaying as clearly as possible, through enlarged posters, visual instructions, and safety information for the hearing impaired;
- Preceding the messages given through the public address system, in a distinctive tone, to attract the attention of the visually impaired;

Figure 34: Embarkation and Disembarkation of Persons Needing Assistance (IMO HTW 5/3/6/Add.1)

- Arranging special areas with facilities for interpretation, to assist people with impaired senses;
- Drawing up and forwarding to the Master, before the departure of the ship, the list of passengers who need assistance or special care (Figure 34) in emergencies;
- Counting the passengers before the departure of the ship and forwarding the list of persons embarked to the land authorities, in order to carry out efficient search and rescue operations in case of a shipwreck (name, sex, and nationality will be recorded for all persons on board, mentioning adult/child/newborn).

Figure 35: Gangway and ladder (www.aister.com)

According to SOLAS Convention, Chapter II-1, on completion of loading of the ship and prior to her departure, the Master shall determine the ship's trim and stability, and ascertain and

record that the ship complies with the stability criteria in relevant regulations. The determination of the ship's stability shall always be made by calculation. The Administration (Flag) may accept the use of an electronic loading and stability computer or equivalent means for this purpose. Both the passengers and the vehicles loaded on the ship are registered (as numbers, weight and location) and are the basis of the ship's stability calculation. Moreover, a flooding detection system for watertight spaces below the bulkhead deck shall be provided based on the IMO guidelines.

Lowering and hoisting ramps

Most of the ramps are lowered and hoisted using a hydraulic device. The instructions given in the Manufacturers' Manual for the operation, inspection, testing and maintenance of the ramps must always be followed. Position/Motion monitoring of the ramps is performed by sensors and cameras. The relevant information should be integrated into the Bridge information system to ensure that any malfunction/failure of a ramp during the operations or voyage is displayed on the Bridge to provide an alarm/warning. The SOLAS Convention stipulates that, where vehicle ramps are installed to give access to spaces below the bulkhead deck, their openings must be able to be closed weathertight to prevent ingress of water below, alarmed and indicated to the navigation bridge. Additionally, all ramps leading to spaces below the bulkhead deck must be closed before the ship leaves the berth on any voyage and remain closed until the ship is at its next berth.

Setting up and stowing retractable vehicle decks

The setting and operation of retractable vehicle decks should be part of the company's Safety Management System (SMS) to ensure that everybody can operate them if necessary. The SMS provides methods of risk identification and mitigation. When setting the retractable vehicle decks and using them, the ship command must consider that the GM (metacentric height - static stability indicator) of the retractable vehicle decks is different from the car decks. This must be taken into account when preparing the stability calculation for the intended voyage.

Carriage of dangerous goods

Spaces for dangerous goods

The ROPAX ships have restrictions on the quantity and type of dangerous goods transported. When loading these goods, the following precautions and restrictions shall be taken into account:

- Proper ventilation of the spaces intended for dangerous goods;
- Exclusion of the risk of ingress of any dangerous gases or liquids in the living spaces, or the car compartment;
- Proper segregation of different classes of dangerous goods;
- Preparation of appropriate emergency response equipment in case of accidents caused by dangerous goods;
- Provision of fire protection systems to protect the ship from the added fire hazards associated with the carriage of dangerous goods;
- Adequate separation of dangerous goods from ignition sources; and
- Provision of appropriate personnel protective equipment for the hazards associated with the carriage of dangerous goods.

Transport of dangerous goods

Although ROPAX vessels have restrictions on the quantity and type of dangerous goods that can be loaded on board, the operation of these ships must be performed by applying strictly the procedures designating the special measures imposed by the risks associated with these goods. The following aspects must be considered:

- Drawing up the plan for the loading and segregation of dangerous goods;
- Supervision of loading/unloading operations by the ship's crew following specific tasks;
- Conducting safety patrols during the voyage, for the early detection and reporting of any danger;
- Banning the access of passengers or unauthorized staff on loaded with dangerous goods decks (access may be allowed only with an authorized attendant); the warnings regarding ACCESS DENIED will be visibly displayed;
- Closing and ensuring the openings between the vehicle decks and the living spaces, in order to prevent the ingress of vapors or dangerous liquids;
- Prohibition of the stowing of flammable gases and liquids in closed RO-RO spaces, or in special category spaces, if they do not comply with the requirements of the SOLAS Convention;
- Mechanical ventilation of closed ro-ro spaces and special category spaces, where this is a transport requirement;
- Prohibition of the operation of mechanically operated refrigeration or heating units (containers, tanks etc.) during the voyage when they are stacked in enclosed RO-RO spaces or special category spaces;
- Prohibition of the operation of electrically operated refrigerating or heating units if they are stacked in closed RO-RO spaces or special category spaces, together with flammable liquids with a flashpoint below 23 degrees Celsius;
- Treatment of empty, residual load-bearing units as if they were loaded with previously transported goods;
- The stacking of the load units on board the ship according to the requirements of the IMDG Code;
- Stowing the marine pollutants under deck or in well-sheltered areas;
- Rejection on loading of any loading units that have damage or leakage.

Stowing and securing the cargo onboard ROPAX ships

Cargo Securing Manual

The proper stowage and securing of cargo are of paramount importance for the safety of life on board a ship, but also for the safety of the property and the ship herself. There are numerous cases of persons' injury or loss of life, and even ship casualties because of inadequate loading, stowage, securing and unloading of cargo. To enhance the safety at sea and reduce the hazards associated with the improper stowage and securing of cargoes, IMO has introduced relevant regulations and has issued several guidelines.

As prescribed by the IMO SOLAS Convention, cargo, cargo units and cargo transport units must be loaded, stowed and secured throughout the ship's voyage in accordance with a Cargo Securing Manual approved by the vessel's Flag State or a Recognised Organisation on behalf of the Flag State. This manual must be drawn up to a standard at least equivalent to relevant IMO guidelines (MSC.1/Circ.1353, Revised Guidelines on the preparation of the Cargo Securing Manual). Notably, Chapter VI, Regulation 5 of the SOLAS Convention, stipulates that on board ROPAX ships, the entire securing of the cargo (vehicles, load units, packaged units, etc.) must be finished before the ship leaves the loading berth.

According to MSC.1/Circ.1353 Guidelines, the following aspects of stowing and securing cargo should be observed:

- The relevant IMO guidance should not exclude the principles of good seamanship or replace experience in stowage and securing practice;
- The information and requirements of the Cargo Securing Manual should be consistent with the requirements of the vessel's trim and stability booklet, International Load Line Certificate (1966), the hull strength loading manual (if provided) and the requirements of the International Maritime Dangerous Goods (IMDG) Code (if applicable);

- The Cargo Securing Manual specifies arrangements and cargo securing devices provided on board for the correct application to and the securing of vehicles, cargo units and other entities. These arrangements and devices must be able to withstand the forces (transverse, longitudinal and vertical) which may arise during adverse weather and sea conditions to prevent cargo shifting;
- The securing of the cargo must be carried out properly and only appropriate securing points or fittings must be used;
- The cargo securing devices applied should be suitable and adapted to the quantity, type of packaging and physical properties of the cargo to be carried. Any new or alternative types of securing devices introduced should not have less strength than the devices being replaced, and the Cargo Securing Manual should be revised accordingly;
- A sufficient quantity of reserve cargo securing devices should be available on board; and
- The Cargo Securing Manual should provide, where applicable, information on the strength and instructions for the use and maintenance of each type of cargo securing device. The cargo securing devices should be kept in satisfactory condition. Any impaired items due to wear or damage should be replaced.

For safe transport the following actions are required:

- Implementing the securing manual;
- Ensuring the availability of adequate securing materials and equipment;
- Correct location and efficient marking of securing points; and
- Consulting the ship's documentation for the maximum permissible weight on the vehicle’s axles.

Code of safe practice for cargo stowage and securing

The majority of the cargo securing problems are attributed to the forces created by the longitudinal, vertical and predominantly transverse motions of the ship. To effectively deal with the hazards arising from these forces, special measures to ensure proper stowage and securing of cargoes, as well to reduce the amplitude and frequency of ship motions should be implemented. Recognizing the importance of the matter, IMO adopted in 1991 the Code of Safe Practice for Cargo Stowage and Securing (CSS Code) by Resolution A.714(17). Since then, the CSS Code has been amended several times (MSC/Circ.664; MSC/Circ.691; MSC/Circ.740; MSC/Circ.812; MSC/Circ.1026; MSC.1/Circ.1352; MSC.1/Circ.1352/Rev.1).

The CSS Code provides, inter alia:

- Recommendations on measures to be taken in bad weather;
- Recommendations on the measures to be taken once the cargo has been moved;
- The loading of the cargo must be done ensuring stability and structural resistance throughout the voyage;
- Vehicles and load units must be stowed on the longitudinal axis of the ship;
- The securing must be carried out in such a way that the forces are distributed as evenly as possible on each securing device;
- The transverse securing must not have an angle greater than 60 degrees to the deck of the ship;
- During loading, stowage and securing must be supervised by the ship's crew, and after departure, the securing shall be periodically inspected and adjusted as necessary.

Use of equipment and securing materials:

- The information from the Stowage and Securing Cargo Manual will be extracted and applied;
- The crew must know the type, number, location and safe working load- SWL, for all the securing devices;
- The securing connections will be applied at the marked points on the vehicle;

- For every securing point on the vehicle, the securing angle of connection with the deck will be 30-60 degrees;
- The ship must have adequate securing points, attached on deck and strong enough securing equipment for the respective navigation area;
- Special attention will be paid to non-standard load units, for which securing points may become inadequate.

Stability, trim and structural resistance of passenger ships (including ROPAX)

For a passenger ship and Ro-Ro passenger ship, the intact stability requirements will be specified in the stability booklet.

Passenger Ship Safety

MSC 99 adopted amendments relating to SOLAS Chapter II-1/1 and II-1/8-1 concerning computerized stability support in the event of flooding of existing passenger ships.

To provide operational support to the Master for safe return to port after a casualty, passenger ships should have:

- An onboard stability computer; or
- Shore-based support based on the guidelines developed by IMO.

Damage Control Drills

MSC 98 adopted amendments relating to SOLAS regulations III/1.4, III/30 and III/37 by introducing new regulation in Chapter II-1/19-1, which requires that:

- A damage control drill should take place at least every three months.
- At least one damage control drill each year should include activation of the shore-based support, if provided in compliance with regulation II-1/8-1.3, to conduct stability assessments for the simulated damage conditions.

Use of stability booklet for Ro-Ro passenger ships

Each ship should be provided with an approved stability booklet on board, which will enable a quick process to obtain accurate guidance for the stability of the ship under various service conditions. The approved stability booklet will guide the Master including specific stability information for Ro-Ro passenger ships such as the following;

- The GM value of the actual loading condition corrected by free surface moment should always be higher than the minimum allowable GM limit curve;
- When it is intended to introduce or discharge ballast water during the voyage the Master should check compliance with the allowable minimum GM curve before departure; and
- Compliance with intact stability and damage stability criteria has been investigated and calculations have been carried out for different draughts and trims, examples of which are provided in the approved stability booklet.

Stability and structural resistance

Special attention for a passenger ship (ROPAX) should be paid to stress limits for sensitive parts of the ship, such as watertight ramps or other watertight doors. In assessing the stability of the ship, the following aspects will be taken into account:

- Compliance with the intact/damage stability criteria;
- Establishing the correct procedures for securing the watertight ramps, before ship's departure;
- Watertight ramp closure reporting;
- Proper securing of vehicles;
- Studying the forecasted meteorological conditions;
- Consideration of the imposed restrictions (trim, speed, wind, wave, ice, etc.);
- Ensuring stability from departure to arrival at the next port, within the prescribed limits.

Stability and stress information, trim for different conditions of loading, using the stability calculators or computer programs

Proper stowing of vehicles on board and proper securing are intended to ensure the intact stability and structural strength of the ship throughout her voyage. In modern ships, stability and trim calculations, as well as structural strength calculations, are made using onboard computers through special programs adapted to each ship.
In case of a ship's accident, it is necessary to constantly update the information on the stability of the damaged ship, which can also be done with the help of software. A diagram of possible causes that could lead to ship damage and affect the ship's stability is presented below (Figure 36).

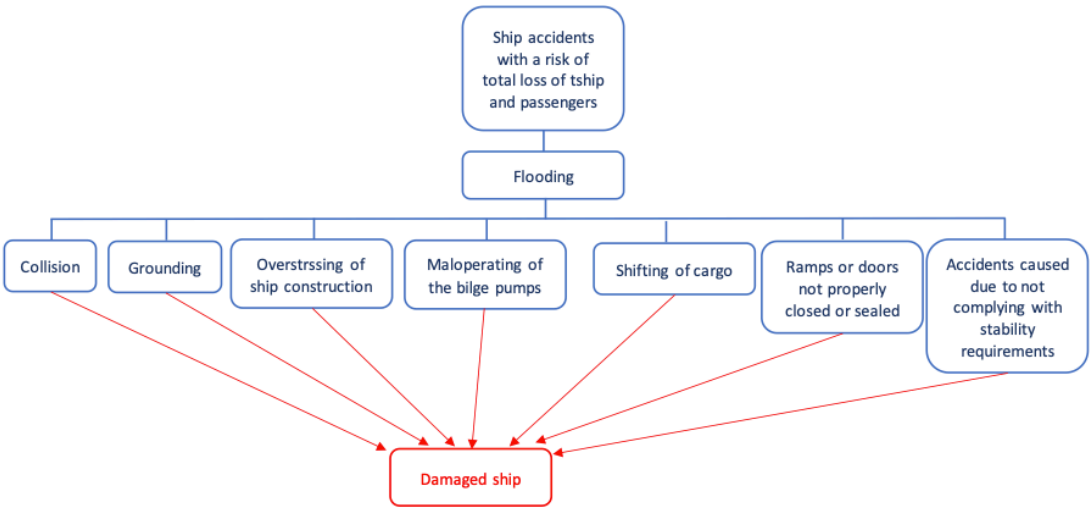

Figure 36: Damages causing loss of ship stability (Capt. Peter Grunau of UMTC)

All of the above ship damages will always lead to a loss of stability, and overstressing of the structural part which causes a reduction in stability as well. Therefore, the Master should be provided with proper information regarding:

- Draughts/displacement of the ship;
- Significant wave heights;
- Amount of accumulated seawater;
- Survivability of Ro-Ro passenger ships following collision damage, as determined by their damage stability standard;
- Floodable Length Curve Diagram;
- Stability cases for flooding condition;
- Permeability factors for each compartment and tank;

- Damage control plan and damage control book.

In general, the Master shall be supplied with the necessary data to maintain sufficient intact stability under service conditions to enable the ship to withstand critical damage. In case of a cross-flooding occurrence, the Master shall acknowledge the stability conditions used for the calculation of heel and the excessive heeling, because the ship might be in danger in a less favourable condition. This information is usually used by the ship's software (Onboard Stability Calculation Software) to assess the stability of the damaged ship.

Opening, closing and securing operations of doors and ramps

Operating and securing procedures for side openings and ramps

Ship watertightness is essential for the safety of the ship and people responsible for the operation and securing of the openings (doors, ramps) must be trained and certified, following the demonstration of competence, in the application of the appropriate procedures. Although the procedures are similar in many cases, differences are noticed in some types of ships that require specific training and certification .

The procedures for closing, opening and securing the openings (ramps, scuppers, watertight doors etc.) must include the following:

- All openings must be operated (open/closed/secured) by a competent, designated operator;
- Orders for the operation of doors and ramps must be clear and approved by the Master;
- Before the departure of the ship, the officer on duty shall report the closing and securing of the doors and ramps;
- Check that the OFF indicators of the doors and ramps work properly;
- Watch CCTV monitors for additional verification;
- Record in the logbook the time when all boarding openings and all ramps have been closed and secured; and
- All doors and ramps must remain closed and secured until the ship has berthed in the next port.
- The Master should ensure that an effective system of supervision and reporting of the closing and opening of the door is implemented.
- The Master should ensure, before the ship proceeds on any voyage that an entry in the logbook is made of the time of the last closing of the doors and the time of any opening and closing of particular doors.

Survey of proper sealing

Considering the survey of proper sealing:

- Indicators should be provided on the navigating bridge for all shell doors, loading doors and other closing appliances which, if left open or not properly secured could, in the opinion of the Board, lead to major flooding of a special category space or ro-ro space.
- The indicator system should be designed on the fail-safe principle and should show if the door is not fully closed or not secured.
- The power supply for the indicator system should be independent of the power supply for operating and securing the doors.
- Means should be arranged, such as television surveillance or a water leakage detection system, to indicate the navigating bridge of any leakage through bow doors, stern doors or any other cargo or vehicle loading doors that could lead to major flooding of special category spaces or enclosed ro-ro spaces.
- Special category spaces and enclosed ro-ro spaces should either be patrolled or monitored by effective means, such as television surveillance, so that movement of

vehicles in adverse weather and unauthorized access by passengers can be observed while the ship is underway.

- The condition of the sealing arrangements of doors and ramps can be checked by visual inspection of the condition of the rubber packing of the door or ramp and the round sealing bar or the steel edge of the door frame which contacts the rubber packing and provide a sealing when is closed. The rubber packing should be fully intact without damage and also the round sealing bar or steel edge of the door frame should be undamaged. The compression of the sealing arrangements can be checked either by chalk test or by water hose test.
- Tests of the functionality and satisfactory operation of the door's limit switch and corresponding light can be performed by two crew members, one operating the limit switch and the other crew member viewing and monitoring the panel light indicator, which is normally located on an indicator panel in the wheelhouse.

Procedures for the maintenance of the special equipment of ROPAX

The equipment of passenger ships must always be kept in good order and safety, by planned maintenance activities and by periodic inspections. The maintenance procedures for the equipment must include:

- Knowledge of the ship maintenance plan;
- Greasing of moving parts, hinges, butterflies, etc.;
- Correct positioning of safety bolts;
- Constant visual inspection, in particular of the gasket of the side openings;
- Clearing drains from possible obstacles;
- Inspection of hydraulic cylinders and flexible pipes.

Ro-Ro deck atmosphere

Atmosphere in ro-ro spaces

Exhaust gases from motor vehicles contain hazardous substances. Carbon monoxide (CO) from petrol engines, nitric oxide (NO) and nitrogen dioxide (NO_2) from diesel engines are the substances affecting crew and passengers.

Measures should be considered as follows:

- Reduction in exhaust gas emissions;
- Provision of an adequate ventilation system; and
- Prevention of exposure to the gases.

Ventilation of Ro-Ro spaces during loading and discharging of vehicles while on voyage and in emergencies

An operation manual should be supplied and include a plan of the ventilation system, showing fans, supply air and exhaust air openings and doors, ramps, hatches, etc. The location of the control panel for the ro-ro space ventilation system should also be marked.

Crew members who are assigned duties in the Ro-Ro spaces, should be familiar with and trained in the procedure for ventilation of Ro-Ro cargo decks during:

- Loading and discharging of vehicles;
- Voyage at sea;
- Emergencies; generally, when there is an emergency on the ro-ro cargo decks, such as a fire alarm, the ventilation will be automatically switched off while the emergency

is investigated. The master will then activate emergency procedures if it is a fire situation or authorize the ventilation to reactivate in the case of a non-fire situation.

Atmosphere control in vehicle compartments

During the loading of the vehicles on board a ROPAX ship, it is necessary to carry out an atmosphere control by using appropriate monitoring equipment, as follows:

- Whenever there is any doubt as to the freshness of the air on the vehicle decks, the atmosphere shall be tested;
- Where an atmosphere monitoring equipment is available, it shall be operated by a competent person;
- A constant oxygen concentration of 21% and a CO content below 50 ppm (parts per million) shall be ensured;
- If there is any indication of the presence of hydrocarbon vapors in the atmosphere, the loading / unloading operation shall be stopped immediately, until ventilation and testing of the atmosphere are completed.

Ventilation of ro-ro compartments

On board ROPAX, procedures shall be established for the ventilation of Ro-Ro compartments during loading/ unloading operations, voyages and emergencies. The following aspects will be considered:

- Instructing drivers to stop the engine of vehicles immediately after the end of the boarding maneuver, in order to avoid the accumulation of exhaust gases;
- The use, whenever possible, of the natural ventilation system (by opening watertight doors at the ends of the ship, docks, etc.);
- The mechanical ventilation system of these ships must provide at least 10 air changes per hour.

Training in crisis management and human behaviour

Introduction

Any crew member designated on the muster list as having responsibility for the safety of passengers in emergency situations must have successfully completed an approved crisis management and human behaviour training. The objective of the relevant training is to provide trainees with knowledge, understanding and proficiency on the following topics:

- Crisis management principles;
- Human aspects in crisis management;
- Contingency planning for shipboard emergencies; and
- Teamwork and stress under extreme conditions.

Definitions

Emergency – Emergency Intervention

An emergency is a situation or occurrence related to vessels or maritime services such as the following:

- An occurrence that happens suddenly and unexpectedly with the potential to pose a risk to human life, property or environment and that demands immediate attention and action.
- A situation outside normal operating parameters where corrective decisions are based on documented procedures.
- A situation that is time-critical and requires the urgent engagement of resources that may not be available immediately.

During an emergency, there is no or only a short preparation time available and a minimum period for clarification.

In an emergency response action (emergency intervention), all available resources and measures for assistance are combined, in order to avoid or minimize harm to people and environmental impact. Normally, the initial emergency response is completed within two hours – as soon as the situation is under control or the response actions can be resumed by regular rescue teams and there is no more risk to human life, the environment or property. In general, emergency intervention requires:

- Assessment of the situation;
- Leadership, communication and cooperation;
- Monitoring and applying best methods; and
- Evaluation and review.

Phases of emergency management

Emergency management is the function responsible for establishing the framework within which a shipping company strengthens the overall capacity and capability to efficiently cope with all types of emergencies and bring about an orderly transition from relief through recovery, and back to sustained development. The phases of the emergency management are (Figure 37):

- Mitigation; includes the identification of hazards in an effort to reduce or eliminate their impact on human life, environment or property;
- Preparedness; assists the company to take steps in order to be ready for a disaster and manage the impact;
- Response; refers to action taken for preventing ongoing negative effects; and
- Recovery; the objective of this phase is to restore services and return the company to a normal function.

Figure 37: The phases of the emergency management

Crisis – Crisis management

A crisis is an unpredictable and unstable condition that could involve unforeseeable consequences and requires urgent attention and action for protecting human life, property or the environment. It can be described as the combination of several emergencies, or a stage in a sequence of events at which the trend of all future events, especially for better or worse, is determined (a turning point). An emergency can usually be managed by replanned responses, while a crisis is dynamic and requires leadership and direction from the highest levels of an organisation. A crisis may trigger significant public interest and severe long-term negative effects, both financial and operational. It is perceived as a threat to important goals.

Crisis management is the implementation of strategies designed to assist an organization to identify and response effectively to a disruptive and significant negative event. Crisis management involves:

- Identifying a crisis (assessment of the situation);
- Planning a response to the crisis (contingency planning, emergency preparedness); and
- Confronting and resolving the crisis (emergency response).

A difference between emergency and crisis is that the former is commonly handled through replanned responses as opposed to crisis which requires monitoring and directions from the highest levels of an organisation.

Overall Concept of Crisis Management

A crisis management begins with the identification of risks followed by the development of contingency plans to eliminate hazards. Afterwards training and exercises are essential to prepare crew and to examine if the procedures followed are demanding review. As a result, crew will be well prepared and efficiently trained to manage the occurrence of an accident. In the end, an effective crisis management is necessary to establish a preparedness to manage the consequences.

Basic rules of Crisis Management

When a crisis management plan is being developed, the following elements should be included:

- Alerting people and provide information about the hazard;
- Identification of the problem/situation (initial response measures should be activated);

- Communication internally on board, ship-shore, shore-other parties involved;
- Delegation of tasks (crew should know what to do in a crisis);
- Cooperation with other parties involved and coordination of the different activities;
- Leadership (state the position of the crisis management manager/team); and
- Feedback for the achievement of objectives (review and update of the plan should be provided frequently).

Preparedness

The establishment of preparedness is stipulated as a requirement under mandatory international, regional and national rules and regulations (e.g. SOLAS, MARPOL, STCW, ISM Code, ISPS Code, EU Directives, Flag requirements, etc.). The applicable guidelines and standards recommended by IMO, Flags, classifications societies and maritime industry organizations should also be taken into account.

The development of response preparedness includes:

- Interfaces and interrelation with other parties/teams involved in response actions (ship-shore, ship-port, fire squad, police, medical services, authorities, salvor);
- Clarification of responsibilities and authorities;
- Communication channels; and
- Procedures (i.e. risk management, initial and subsequent response actions);

The planning process of preparedness should aim to the prevention of human injury or loss of life and the avoidance of damage to the environment, property and company.

Optimization of the use of resources

During an emergency, the following resources are required to be fully maintained and operational:

- Personnel resources (shore and ship staff);
- Crafts available for response actions (e.g. other vessels, tugs, helicopters);
- Equipment available on board (e.g. firefighting and life-saving appliances, equipment for combating oil pollution, medical kit);
- Equipment available on stand-by condition (e.g. pumps, spare parts);
- Infrastructure (e.g. communication, data network, transportation);

The possibility that resources availability may be limited in an emergency, should be taken into account. To optimize the use of personnel and equipment, it is needed to make full use of immediately available resources and, if necessary, to improvise.

Management of human recourses

An effective response to an emergency in accordance with an established emergency procedure requires the management of personnel/crew members and is based on the following elements:

- Education and training (realistic training and practical demonstration);
- Briefing and debriefing after a drill/exercise;
- Leadership skills and pre-knowledge of tasks; and
- Stress handling:
    - Self-management and control in extreme situations; and
    - Appropriate reactions under stress.

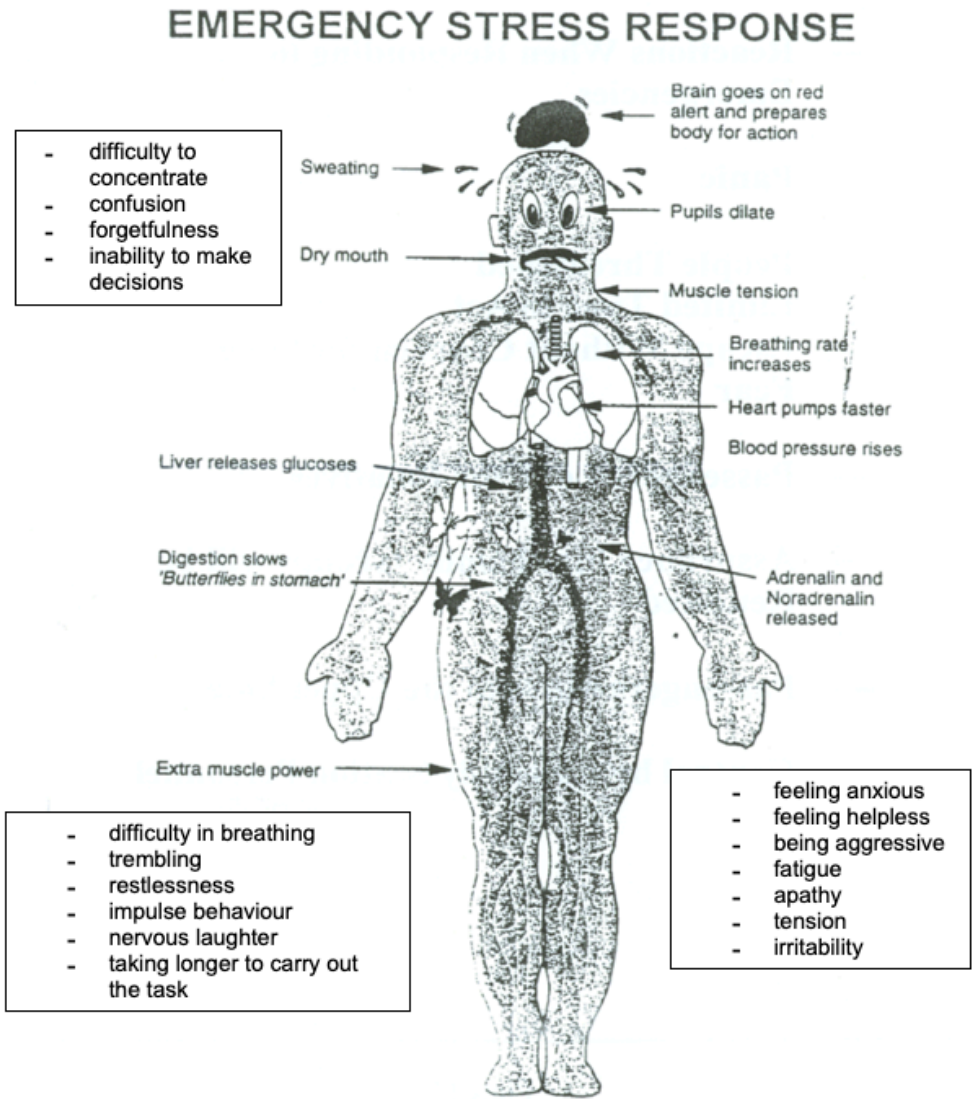

Figure 38: Signs/Symptoms of stress

Human aspects in crisis management–Four stages of behaviour

The human behaviour and responses to an emergency situation are unexpected and could make difficult the implementation of an emergency plan. The crew members should consider the following to maintain order and control of the passengers and other personnel (included in the ship's emergency teams):

- Be aware of the general reaction patterns of passengers and other personnel during an emergency;
- Be able to assess self and group behaviour in extreme situations;
- Identify the development of signs and symptoms of personal stress and other personnel (Figure 38);
- Understand that stress generated by an emergency situation affects human performance;
- Recognize that groups of persons (crew and passengers) behave differently in extreme situations (flight or fight reaction); and
- Implement measures to reduce fear (by e.g. establishing and maintaining effective communication and information exchange).

During a crisis, human behaviour can be distinguished into four stages as follows:

- **Phase one (proactive phase) – Warning** (Warnings allow those involved to take the necessary steps/Alerting those who may be threatened can still be difficult);
- **Phase two (active phase) – Impact** (Warning signs and alarms have been seen, heard and accepted and it is understood that the threat is real);
- **Phase three (reactive phase) – Evacuation** (Getting all persons to stop whatever they are doing and move); and
- **Phase four (post reactive phase)– Recoil** (A growing realization that a possible crisis situation has not materialized – the emergency is over/A crisis has occurred, but any further damage can be caused).

By taking into consideration the above four phases, behaviour management would be more effective and reduce the instances of behaviour that challenge the procedures followed during an emergency.

Intervention – The Five Rules of intervention in an emergency

Intervention refers to the actions taken to prevent or minimize the harm caused by an unforeseen occurrence. It aims at assisting individuals to build resilience in a crisis. The intervention method relies on the availability of contingency plans and the preparedness of crew and office staff. Additionally, the existence of predefined actions works as a mental thread that ensures the overview in dramatic and unexpected situations. Because each emergency situation is different, it should be mentioned that there is no fixed pattern F procedure. Nevertheless, as a guideline, a systematic approach has been proven, in order to preserve forces and structure the procedures.

The Five Rules of a crisis intervention strategy are:

- **Concentration on the here and now** and the next 24 hours have priority over the past and the future;
- **Immediate reduction of hazard** exposure is a high priority;
- **Prevention of additional damage** and a solution-oriented approach take priority over the identification of root causes;
- **Limiting the mental injury** as well as confirming the remaining strengths have priority over uncovering internal conflicts; and
- **Methodical** emergency response is to be preferred to the pure common-sense reaction.

Elements of Contingency Planning

A contingency plan is a course of action designed to help an organization respond effectively to a significant future event or situation that may or may not happen. With respect to continency planning, the IMO ISM Code stipulates the following requirements in its element 8 (emergency preparedness):

- The shipping company should identify potential emergency shipboard situations, and establish plans and procedures to respond to them (clause 8.1).
- The company should also establish programs for drills and exercises to prepare for emergency actions (clause 8.2).
- The safety management system (SMS) should provide for measures ensuring that the company's organization can respond at any time to hazards, accidents and emergency situations involving its ships (clause 8.3).

IMO SOLAS Convention also specifies requirements regarding emergency preparedness. Namely, the following regulations apply:

Chapter III, Regulation 29 – Decision support system for Masters of passenger ships

- On all passenger ships, a decision support system for emergency management shall be provided on the navigation bridge.
- The system shall, as a minimum, consist of a printed emergency plan. All foreseeable emergency situations shall be identified in the emergency plan, including fire, damage to the ship, pollution, unlawful acts threatening the safety of the ship and the security of its passengers and crew, personnel accidents, cargo-related accidents, and emergency assistance to other ships.
- The emergency plan or plans shall provide decision support to the Masters for handling any combination of emergency situations.
- The emergency plan or plans shall have a uniform structure and be easy to use. Where applicable, the actual loading condition as calculated for the passenger ship's voyage stability shall be used for damage control purposes.

In addition to the printed emergency plan, the Administration (Flag State) may also accept the use of a computer-based decision support system on the navigation bridge which provides all the information contained in the emergency plan or plans, procedures, checklists, etc., and is able to present a list of recommended actions to be carried out in foreseeable emergencies.

Chapter III, Regulation 20 - Operational readiness, maintenance and inspections

- Before the ship leaves port and at all times during the voyage, all life-saving appliances shall be in working or and ready for immediate use.
- Maintenance, testing and inspections of life-saving appliances shall be carried out based on the guidelines developed by the IMO and in a manner having due regard to ensuring reliability of such appliances.

Chapter II-2, Regulation 14 - Operational readiness and maintenance

- Firefighting systems and appliances shall be kept in good working order and readily available for immediate use. They shall also be properly tested and inspected.
- The fire protection systems mentioned above include:
    - structural fire protection including fire resisting divisions, and protection of openings and penetrations in these divisions;
    - fire detection and fire alarm systems; and
    - means of escape systems and appliances.

IMO has also issued several guidelines to support the development of an effective emergency preparedness and response onboard vessels and ashore, such as the following:

IMO Resolution A.1072(28) - Revised Guidelines for a structure of an integrated system of contingency planning for shipboard emergencies.

- During the preparation of response actions for the many possible emergencies on the basis of a case-by-case consideration, a great deal of unnecessary duplication will result. To avoid this, a two-tier framework may be applied.
- The concept underpinning the two-tiered system is the integration of multiple plans into a uniform and modular structured frame.
- Given the variety of emergencies that arise at sea, harmonised contingency plans are useful because they are more likely to be accepted by the ship's crew. More importantly, they are easier to use in the event of an actual emergency.
- The two tiers are:
    - **Initial actions** to be taken in the event of all emergencies, regardless of the nature and extent of the preceding incident.
    - **Subsequent responses**, which, in contrast, depend upon variables such as the ship type, the nature of the cargo being carried, and the category and magnitude of the emergency at hand. These require particular actions to be undertaken.

IMO MSC.1/Circ.1251 - Guidelines on the control of ships in an emergency
The purpose of these Guidelines is to provide Contracting Governments, shipmasters, companies, salvors and others engaged in a maritime emergency with a framework of authority within which they will be expected to operate.

The main goals of the guidelines are to:

- Identify the chain of command in an emergency; having a clear chain of command is essential for maximizing the efforts to save life and property and prevent pollution; and
- Clarify the issues related to the fair treatment of seafarers involved in an incident, bearing in mind possible criminal prosecutions at a later date.

The Elements of contingency planning are thoroughly presented in Table 10.

Table 10: The Elements of contingency planning are the following:

Identification of all foreseeable emergency situations and their combinations	Identify hazards and assess risks • Assess vessels operation and on board activities. • Gather information about accidents, incidents, near misses (internal and external). • List what can go wrong and the consequences. • Classify the risks (based on the likelihood of occurrence and the consequences). • List actions to reduce each risk to the “as low as reasonably practicable” (ALARP) level.
Identification of response actions	Define response procedures for the accident scenarios identified • Eliminate risk at source or establish measures to reduce risk. • Establish measures to protect life, the marine environment and property. • Establish measures to monitor compliance with planned arrangements. • Assess the effectiveness of emergency procedures in operation and establish additional procedures for emergency response if required.
Assignment of shipboard response squad and communication lines	Assign persons by rank or name participating in the shipboard emergency response and define communication lines • Assess arrangements in operation and modify set-up if required. • Involve ship's personnel in the assignment of emergency response participants and in any modifications of the set-up. • Ensure that roles and responsibilities are defined and understood. • Establish a list with ship internal and external communication lines. • Check availability of personal safety outfit, tools and equipment.
Identification of reporting lines for emergencies	Establish reporting procedures for emergency situations • Establish reporting requirements and contact lists (when to report, how to report, whom to contact, what to report). Ref. is made to the SOPEP reporting procedures (see Res.MEPC.54(32)) and "General principles for ship reporting systems and ship reporting requirements including guidelines for reporting incidents involving dangerous goods, harmful substances and/or marine pollutants" (see Res. A.648(16))
Identification of existing procedures, plans, checklists, etc. for integration into the Decision Support System (DSS)	Identify, modify and improve existing plans, procedures and checklists to fit into the system • Ensure that existing plans, procedures and checklists are updated. • Select those plans, procedures etc. to be integrated into the DSS. • Identify interface problem zones and eliminate overlapping, duplications, gaps. • Ensure continuity of responsibilities across interfaces. • Perform modifications as required.
Drafting of final plan(s) and interfaces of shore emergency	Establish printed emergency plan(s) for all identified emergency situations and their foreseeable combinations • Ensure that the seven main groups of emergencies and the foreseeable combinations of emergencies are included in the DSS (as required by SOLAS 74 Ch.III/29).

response plan(s) with the DSS	• Observe additional Flag state requirements, if any. • Design the DSS user-friendly and in a modular, uniform structure. • Include all information necessary to gain control in an emergency. • Ensure a realistic decision support to the Master in an emergency. • Consider interface with shore emergency response plan(s).
Training of emergency response participants	Evaluate education and training requirements for both shore and shipboard response participants and establish training programs, plans and procedures • Investigate existence and availability of training facilities. • Integrate DSS training, drills and exercises into existing safety training.
Development of procedures for the improvement of the DSS	Establish procedures for testing, monitoring and improving the DSS • Perform realistic exercises (ship, shore and ship-shore). • Record exercise results in a systematic manner and report to shore responsibilities for evaluations. • Review DSS and take corrective actions as required.

Shore-based Emergency Response Team

In general, the levels of response in an emergency are the following:

- Emergency control: Immediate shipboard response measures to get the situation under control;
- Emergency response: Shore-based operational and technical company support;
- Emergency management: Divisional or regional response to the impact of the emergency on the company, support at a higher level; and
- Crisis management: Headquarters' response to the impact of the emergency on the company as a whole (stock exchange notifications, strategic decisions)

According to the IMO ISM Code, the safety management system (SMS) of a shipping company should include measures to ensure that the company's organization can respond under any circumstances to hazards, accidents and emergencies onboard its ships.

To fulfil this requirement and to support actively its Masters and crews, a shipping company needs to establish a shore-based Emergency Response Team, which has to maintain the highest level of readiness and be able to respond effectively to any vessel's request of assistance. Moreover, the company needs to develop an Emergency Response Plan which comprises measures and corresponding procedures to be implemented by the Emergency Response Team during an actual emergency.

The shore-based team must provide shore-based support and guidance to the Master of the ship to assist him/her and not instruct him/her during emergencies. It must be emphasized that according to IMO resolutions and regulations, the Master of is not constrained by the shipowner, charterer or any other person, including the shore-based emergency response team, from taking a decision which, in his/her professional judgement, is necessary for the safety and security of life at sea and the protection of the marine environment. As per ISM Code, the shipping company must establish and provide in writing in its Safety Management System that the Master has the overriding authority and the responsibility to make decisions concerning safety, security and pollution prevention and to request the Company's assistance as may be necessary.

Today, thanks to the technological advances in communications, it is relatively easy for the Master and the Command Team of the vessel to notify the company in the event of an emergency and receive timely advice and guidance, as well as for the shore-based management to obtain detailed reporting on the vessel's conditions and actions. However, it must be ensured that the exchange of information and any communication protocol does not detract from decision-making and management on board, and that it does not become

counter-productive to emergency preparedness, professionalism, initiative or taking responsibility.

An example of contacts priority is displayed in Figure 39.

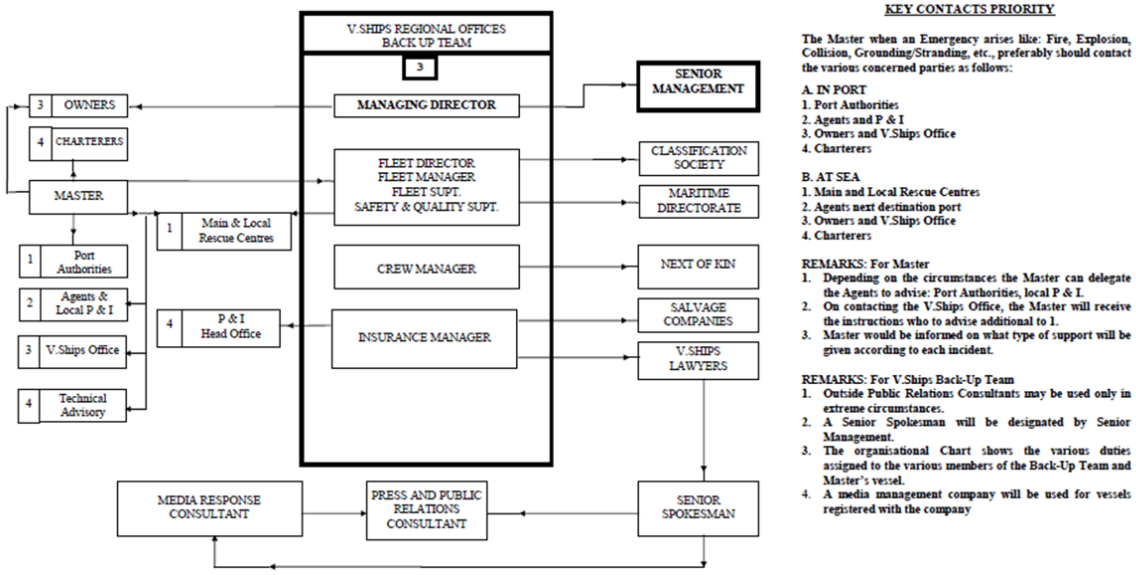

Figure 39: An example of contacts priority

Typical roles of the Emergency response team are the following:

- Emergency Coordinator: Coordinates all activities. Could be a senior manager or the Designated Person Ashore (DPA);
- Fleet, technical, marine and operational managers and superintendents- support the Master by providing advise on the actual incident;
- Logistics officer
- Coordinates the logistics activities;
- External communication officer- takes over communication with external authorities;
- Media Advisor- Co-ordinates response to the media;
- Crew manager/officer- takes care of all personnel matters;

Any additional office personnel possibly needed to support the team. Depending on the emergency and the management protocol of the company, the managing director/general manager could also be a member of the team, to e.g. contact the owner(s), coordinate communications with press and media, arrange for a crisis consultant, seek legal assistance, handles underwriters, etc.

A typical shore-based emergency response plan includes the following elements:

- Shipboard emergency procedures;
- Roles and responsibilities of the emergency response team members;
- Contact lists (telephone directories including out-of-hours numbers for organisations and persons);
- Internal and external communication protocols and procedures;
- Checklists;
- Ship details and plans, crew lists, sea charts; and
- Relevant forms for records and reports.

In most cases, the shipping companies provide emergency support to their vessels internally without the assistance of external service providers. Optionally, classification Societies and other entities may offer emergency response to the shipping companies, but there are variations in the level and scope of service provided.

It is worth noting that the Oil Companies International Marine Forum (OCIMF) has issued in 2013 “Guidelines on Capabilities of Emergency Response Services” to recommend a minimum scope of the emergency response services (ERS) provision, and to suggest minimum requirements of competency and capability of the ERS service providers.

Accoridng to these guidelines, the service agreement should include the following;

- Description of the ERS;
- Emergency contact details of the ERS;
- Expected standard response times of the ERS;
- Ship-specific Casualty Information Exchange sheets;
- Requirement to update records and vessel data at ERS;
- Requirement to provide the ERS with cargo loading status
- Drill scope and schedule requirements (One drill annually is recommended as a minimum)

Training, Drills and Exercises

Safety drills and exercises

In general, conducting safety drills and exercises is a method to improve the technical and non-technical skills (competence, confidence, cooperation, communication, teamwork, leadership, etc.) of the personnel involved. It also enables the review of the applicable documented procedures and the evaluation of the effectiveness and clarity of the emergency plans. Moreover, it provides an opportunity to test the relevant equipment. Their results should be evaluated and relevant records should be maintained.
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Requirements for Training, Drills and Exercises

SOLAS Convention specifies minimum requirements regarding training, drills and exercises. Namely, the following regulations apply.

SOLAS Chapter III/Regulation 19

- Drills
  - Fire;
  - Abandon ship;
  - Enclosed space entry and rescue;
  - Launching life boats and rescue boats.
- Training
  - Life-Saving Equipment (LSA);
  - Davit launched life rafts;
  - Deployment of Marine Evacuation System (MES);
  - Muster of passengers and safety briefing for new passengers;
  - Training of crew members with emergency duties.

SOLAS Chapter II-2/Regulation 15

- Drills
  - Fire (see III/19)
- Training
  - Familiarization with the arrangements of the ship as well as the location and operation of any firefighting systems and appliances they may need to use.

The performance of crew members assigned firefighting duties shall be periodically evaluated by conducting on board training and drills to identify areas in need of improvement, to ensure competency in fire-fighting skills is maintained, and to ensure the operational readiness of the firefighting organization.

SOLAS Chapter V/Regulation 26

- Steering gear testing and drills
  - Within 12 hours before departure, the ship's steering gear shall be checked and tested by the ship's crew;
  - Emergency steering drills shall take place at least once every three months in order to practice emergency steering procedures;
  - These drills shall include direct control within the steering gear compartment, the communications procedure with the navigation bridge and, where applicable the operation of alternative power supplies.

Security drills and exercises

For the effective implementation of the Ship Security Plan (SSP), the ISPS Code requires the following:

- Drills shall be carried out at appropriate intervals (A/13.4);
- The Company Security Officer (CSO) shall ensure the effective coordination and implementation of the SSP by participating in exercises at appropriate intervals (A/13.5).

According to the ISPS Code, the main objectives of security drills and exercises are to:

- Ensure that shipboard personnel are proficient in all assigned security duties at all security levels (B/13.5);
- Identify any security- related deficiencies which need to be addressed (B/13.5).

The minimum frequency recommended in Part B of the ISPS Code for security drills is (B/13.6):

- At least once every 3 months, and in addition;
- In cases where more than 25% of the ship’s crew have been changed within 1 week of the change, at any one time, with personnel that has not participated in any drill on that ship within the last 3 months.

Regarding exercises, the ISPS Code recommends the following (B/13.7):

- The security exercises should be conducted to test communications, co-ordination, resource availability, and response.
- The exercises may be:
  - Full scale or live;
  - Tabletop simulation or seminar; and
  - Combined with other exercises held such as search and rescue or emergency response exercises.
- They should be performed at least once each calendar year with no more than 18 months between the exercises.
- They may include the participation of CSOs, Port Facility Security Officers (PFSOs), relevant authorities, and Ship Security Officers (SSOs).

A frequent requirement of the Administrations (Flags) is that the exercise, as a minimum, must cover the company and one of the company’s ships.

Teamwork under Extreme Conditions

A team is a group of two or more individuals with specified roles, interacting adaptively, interdependently and dynamically toward a common and valued goal.

The key performance aspects that are essential to achieving team effectiveness, sometimes called the “Seven C’s” of teambuilding, are the following:

- **C**ommon goal (all team members need to put efforts in a similar direction focusing on a similar objective);
- **C**ommitment (it reflects the trust and responsibility among team members);
- **C**omplementary roles (all roles of team members are critical);
- **C**lear communication (an effective cooperation is also open and honest);
- **C**onstructive conflict (collaboration requires skills such as negotiation, problem-solving and emotional intelligence that enable the fulfilment of personal and team goals and strengthen the team);
- **C**ohesion (respect provides collaboration and coordination that result in better productivity and reduce errors); and
- **C**redible coaching (build a high-performance team by improving team members’ abilities and eliminating their weak areas).

The challenges of teamwork under extreme conditions can be identified through the questions:

- What is the difference between regular and extreme conditions?
- What happens when a leader’s authority is contested under extreme conditions?

An extreme environment could affect team performance in a decision-making task. There are tools that facilitate a leader in the decision-making process and allow him or her to gather all possible options, assess risks and determine the best course of action. FORDEC is a common model for decision-making in case of an emergency situation and stands for:

- **F** FACTS (determine the situation you are dealing with);
- **O** OPTIONS (consider any possible options to deal with the situation);
- **R** RISKS AND BENEFITS (for every option you need to evaluate the risks associated);
- **D** DECISION (after assessing possible outcomes and risks, make the decision);
- **E** EXECUTION (involves the essential tasks for fulfilling the outcome); and
- **C** CROSS-CHECK (after the execution process, verify the completion of the tasks assigned).

In order to evaluate the impact of the identified tasks, the Eisenhower Principal[5] could be a useful tool. The Eisenhower decision matrix is designed as an infographic (Figure 41) that will help to decide which tasks are the most urgent and important to take immediate action and complete them quickly. It starts by evaluating the tasks and determining their urgency and then the identification of importance follows up.

[5] https://study.com/academy/lesson/practical-application-eisenhower-decision-matrix-infographic.html

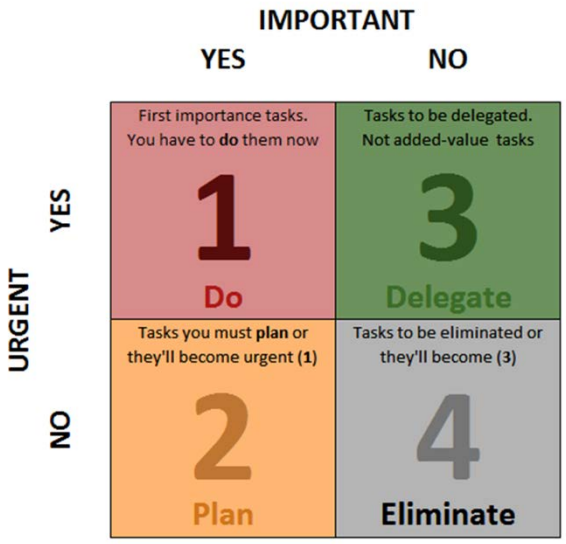


Figure 41: Eisenhower Decision Matrix

Onboard emergency preparedness, training and drills related to evacuation

Introduction

According to the IMO International Safety Management (ISM) Code, the shipping companies should identify potential emergency shipboard situations, such as fire, flooding, grounding, collision, ship evacuation, man overboard, etc. and establish procedures to respond to them. They should also establish programmes for drills and exercises to prepare for emergency actions.

IMO Resolution A.1072(28) (IMO, 2013) provides a guide to assist the companies in the preparation of an integrated system of contingency planning for these emergencies. The guidelines suggest the development and use of a module structure of an integrated system of shipboard emergency plans. Based on the IMO guidance, the integrated system may include the following modules:

Provisions

The primary objective of the shipboard emergency preparedness and response plan should be to develop and implement an efficient and effective system that will minimize the risks to human life, the marine environment and property, with a continuous effort towards improvement. In this respect, potential elements to be included in the module are the following:

- The coordination of safety procedures between the company and its ships is critical. Thus, the company's shore-based and shipboard contingency planning and response must be consistent and appropriately linked.
- It is important to describe how the emergency management system could be developed based on suggestions for improvement made by the individual company and shipboard personnel.
- It should be emphasized that safety involves "top-down" and "bottom-up" commitment to active development and application of safety procedures and practices by all persons, both ashore and afloat, including management.
- To effectively improve emergency preparedness and response actions onboard ships, emphasis should also be given to the need for free and open communication when evaluating emergency procedures, taking into consideration accidents and near misses when using this system. The module should provide information for the

implementation of an error reduction strategy with appropriate feedback and procedures for the modification of plans.

- The module should inform about the most important requirements with which the plans should at least comply. The following main elements should be addressed in the module:
    - Procedures to be followed when reporting an emergency;
    - Procedures for identifying, describing and responding to potential emergency shipboard situations; and
    - Programmes/activities for the maintenance of the system and associated plans.

Planning, preparedness and training

Any system of contingency planning for shipboard emergencies should provide for emergency training and education of shipboard personnel, to develop general awareness and understanding of actions to be taken in the event of an emergency. For the emergency preparedness system to be effective, all crew members must know in advance what their duties and responsibilities are and to whom they are to report under the plans.

The system of emergency training and education of shipboard personnel should include procedures, programmes or activities developed to:

- Familiarize shipboard personnel with the provisions of the system and plans.
- Provide training for shipboard personnel about the system and plans, especially for personnel transferred to new assignments.
- Schedule regular drills and exercises to prepare shipboard personnel to deal with potential shipboard emergencies.
- Coordinate the shipboard personnel and the shipping company's actions effectively and include and take note of the aid which could be provided by external emergency coordinating authorities.
- Prepare a workable feedback system. Feedback is essential for refining emergency response plans and emergency preparedness based on the lessons learned from previous exercises, accident investigations or real emergencies.

Response actions

Implementing an effective and reasonably safe course of action during an emergency onboard the ship requires careful consideration and prior planning. Thus, appropriate shipboard procedures should be developed to ensure the safety of personnel and property, stabilize conditions, and minimize losses and environmental damage when an incident occurs. Notably, IMO has developed relevant guidelines, which contain information to provide a starting point and assistance in the preparation of plans for individual ships.

The emergency plan incorporated in the shipping company’s management system comprises procedures that are different from those implemented for daily routine shipboard and shore operations. While normal operational procedures can be used to handle very difficult problems and manage/perform critical operations, an emergency can extend those involved beyond their normal capabilities and thus, special additional measures need to be developed and applied.

The company should identify possible emergencies where shipboard contingency planning would be required, taking into account the vessel’s type, relative operational requirements, equipment and trade. However, priority should always be given to actions that protect life, the marine environment and property, in that order. This means that "initial actions" which are common for all ships, regardless of their type and the cargoes carried, should be fully taken into account when developing "subsequent response" procedures.

Potential emergencies to be included in the plans comprise the following main groups: fire; damage to the ship; pollution; unlawful acts threatening the safety of the ship and the security of its passengers and crew; personnel accidents; cargo-related accidents; and provision of emergency assistance to other ships. These groups can be further subdivided to cover the majority of shipboard emergencies. The detailed response actions should be formulated to enable all the necessary steps to limit the consequence of the emergency and the escalation of damage following, for example, a collision or grounding.

The emergency plan held by the ship and shore should be identical and identify clearly whether each planned action needs to be undertaken by the shipboard personnel or shoreside personnel. Thereby, the possible confusion as to who is responsible for which action in an emergency would be reduced.

The shipboard and shoreside personnel should be familiar with and competent to apply the emergency procedures when needed. When developing the plan, the ease of reference should be considered to support the effective use of the plan. Allowance must be made for quick and easy access to essential information under stressful conditions.

The shoreside emergency response actions should include information relating to the individual ship and its cargo, and provide advice and data to assist the shipboard personnel. Examples of such information are listed below:

- Information on:
  - The number of persons aboard; and
  - The cargo carried (e.g. dangerous goods, etc.);
- Steps to initiate external response:
  - Search and rescue coordination;
  - Buoyancy, strength and stability calculations;
  - Engagement of salvors/rescue towage;
  - Lightering capacity; and
  - External clean-up resources;
- Ship drift characteristics; and
- General information:
  - Cooperation with national and port authorities; and
  - Public relations.

In brief, the response actions module should cover at least the following aspects:

- Coordination of response efforts;
- Response procedures for the entire spectrum of possible accident scenarios, including methods that protect life, the marine environment and property;
- The person or persons identified by title or name as being in charge of all response activities;
- The communication lines used for ready contact with external response experts;
- Information concerning the availability and location of response equipment; and
- Reporting and communication procedures on board ship.

Reporting procedures

A ship involved in an emergency situation, or a marine pollution incident needs to inform accordingly the appropriate ship interest contacts and coastal State or port contacts. To

develop and implement an effective emergency reporting plan, the following elements should be considered:

- The emergency/contingency plan implemented onboard the vessel must include detailed procedures for making the initial report to the parties concerned.
- The emergency reporting procedures should be regularly updated. Contact details (telephones, telex and telefax numbers, etc.) must be routinely updated to take into account any organizational/personnel changes.
- The establishment and maintenance of rapid and reliable 24-hour communication lines between the ship in danger and emergency control centre(s), the company's main office and national authorities, is important.
- Those managing response operations on board and services assisting ashore should keep each other mutually informed of the situation.
- Clear guidance should be provided regarding the preferred means of communication.
- The emergency reporting procedures should be developed taking into account the relevant IMO guidelines and national plans, which provide sufficient guidance on the following reporting activities necessary:
    - When to report;
    - How to report;
    - Whom to contact; and
    - What to report.

Implementation of emergency plans, instructions and procedures

General safety characteristics of the ship – ship architecture and subdivision

The crew members must become conversant with the ship's plans and arrangements, including the identification of and familiarization with the following aspects:

- Deck arrangement and numbering;
- Doors and stairs numbering;
- Location of evacuation routes and alternative escape systems;
- Assembly/muster stations reference system;
- Locating all life-saving appliances; and
- Any particular or unusual characteristics and data about the ship.

Location of essential safety equipment in case of emergency, including life-saving equipment at sea

As per SOLAS Convention, the ships must be equipped with appropriate life-saving equipment that passengers and crew members can use to protect their lives at sea. The type, number, capacity, etc. of this equipment is stipulated by the relevant rules and regulations and depends on the type, size, activity and voyage pattern of each ship. Furthermore, the International Life-Saving Appliance (LSA) Code comprises specific technical requirements for the design and manufacturing of life-saving appliances. The Code covers personal life-saving appliances, visual aids, survival crafts, launching and embarkation appliances, marine evacuation systems, line throwing appliances and general alarm and public address systems.

The personal life-saving appliances (as per SOLAS Ch. III, Reg. 7 and 22, and LSA Code) are the following:

- Lifebuoy;
- Lifejacket;
- Immersion suit;
- Anti-exposure suit (AES);
- Thermal protective aid (TPA).

Additionally, the following categories of collective life-saving appliances are also in use on board passenger ships:

- Liferafts (throw overboard, davit-launched, free fall);

- Lifeboats (partially enclosed lifeboats);
- Marine evacuation systems (slide/cute);
- Rescueboats; and
- Fast rescue boats.

All the above crafts (required by the SOLAS Convention to ensure the abandonment of the ship by all persons on board) must be able to be launched (with full crew and equipment) within 30 minutes from the moment the signal of abandonment was given (after all the persons on board have been summoned to the muster station and they put on lifejackets).

Familiarizing crew and passengers with emergency exits in case of danger is one of the prerequisites for an orderly, panic-free evacuation in a real emergency. All persons on board the ship should be familiar with the location of the emergency exits near their cabin or the place of work. It is also very important to know alternative routes of evacuation in case of blockage of the primary routes, presence of smoke or fire, etc. All emergency exits on board the ship, as per the other means of escape, should be marked with appropriate markings to enable the passengers and crew members to readily identify them (Figure 42).

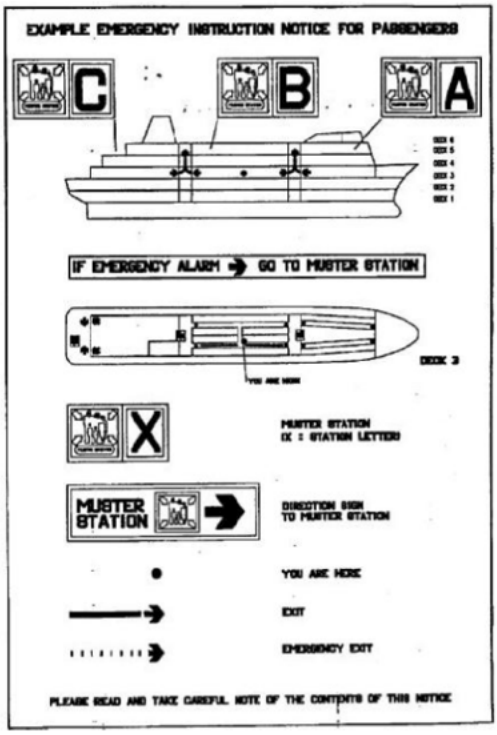


Figure 42: Example emergency instruction notice for passengers (www.imorules.com)

An example of a checklist for assembly station personnel is provided in Table 11.

Table 11: An example of a checklist for assembly station personnel

	ACTION	CHECK
1	MAINTAIN CALM. SEAT ALL PASSENGERS IF POSSIBLE	
2	EXPLAIN LIFEJACKET ISSUE IS PRECAUTIONARY ONLY	
3	ISSUE LIFEJACKETS	
4	SILENCE – STAND WHERE YOU CAN BE SEEN – DEMONSTRATE	
5	INSTRUCT PASSENGERS TO DON LIFEJACKETS	
6	ASSIST WHERE NECESSARY. ENSURE ALL ARE WORN CORRECTLY	
7	MAINTAIN CALM – RESEAT PASSENGERS – ASK FOR SILENCE	
8	COMMENCE PASSENGER AND CREW COUNT	
9	DETAIL CREW MEMBERS TO ASSIST OLD AND INFIRM PASSENGERS	
10	EXPLAIN WHAT IS HAPPENING. (Use “INCIDENT” not Fire) a) Control parties dealing with an incident b) Captain on bridge full control c) Boat preparation (as a precaution) d) Passenger may be moved around for convenience e) Update information as required	
11	EXPLAIN EVACUATION PROCEDURE AND INDICATE EXITS	
12	REASSURE PASSENGERS THAT THE SHIP IS THE BEST LIFEBOAT	
13	EXPLAIN THE ABANDON SHIP PROCEDURE	
14	PASS PASSENGER AND CREW HEADCOUNT TO THE INFORMATION DESK	
15	CONTINUE TO MAINTAIN CALM AND REASSURE PASSENGERS	

The importance of personal behavior in emergency situations

In the event of an emergency, at the sound of the general alarm signal, crew members who have responsibilities for passenger evacuation must act according to the procedures described in the muster list.

In the event of an emergency, it takes some time before people accept the situation. The reasons are the following:

- Attention is not paid to announcements, written instructions and familiarisation with the area;
- Passengers believe that disasters will never happen to them;
- Disbelief of even the most obvious signs of danger;
- Passengers are afraid of being seen as foolish by drawing attention to themselves when reacting to a non-apparent danger;
- Continual false alarms result in no response;
- Passengers are reluctant to issue warnings for fear of starting a panic;
- Passengers will try to find some way of confirming that the warning is correct rather than making an escape.

Some people may panic and not behave with a normal level of rationality, that their ability to comprehend may be impaired and they may not be as responsive to instructions as in non-emergency situations.

- Panic involves not only anxiety but genuine fear;
- The fear is not irrational but well founded;
- There is a perception that action must take place immediately and people move as quickly as possible to an escape route;
- It also involves escape without concern for others;

- Panic may also occur when people make decisions on false information;
- As the mind is focused only on escape, often in unfamiliar surroundings, direction by personnel or information broadcast are ignored;

The passengers and other personnel may start looking for relatives, friends and/or their belongings as a first reaction when something goes wrong.

- Instinctive reaction to look for members of the group especially those who are vulnerable (e.g., children, elderly, disabled);
- Passengers are normally content that children will be safe on a ship as trained staff are always available;
- Family groups will have different interests, play areas, gaming machines, bars, cinemas etc.;
- A group could easily be spread throughout the ship;
- Passengers on passenger ships will have dedicated assembly stations so groups will reunite;
- Passengers on ro-ro passenger ships will be directed to the nearest assembly station, re-allocation of passengers to other assembly stations will be undertaken by the crew should one area become overcrowded;
- Muster personnel must reassure family groups that every effort to locate other members is being made-announcements on the public address system, telephone or radio communication between those in charge of the assembly areas must be made;
- Personnel may also be sent to other assembly stations to locate missing members and escort them to the family group;
- Once passengers have assembled, they must not be allowed to leave
- Continually reassure them that the ship’s organisation is designed to resolve this problem.

Passengers may seek safety in their cabins or in other places on board where they think they can escape danger.

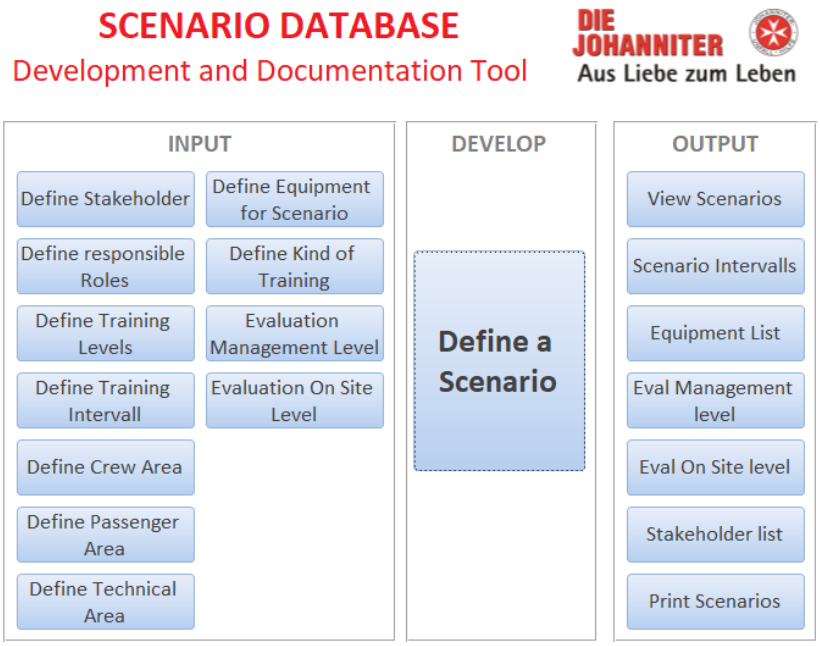
- All cabins, public spaces and other areas must be searched to ensure that the evacuation to assembly stations is complete;
- Follow the ship’s emergency procedures to ensure that all areas have been searched either by direct messages to a control point, or marking plans and/or doors, so that no time is wasted in duplicate searches.

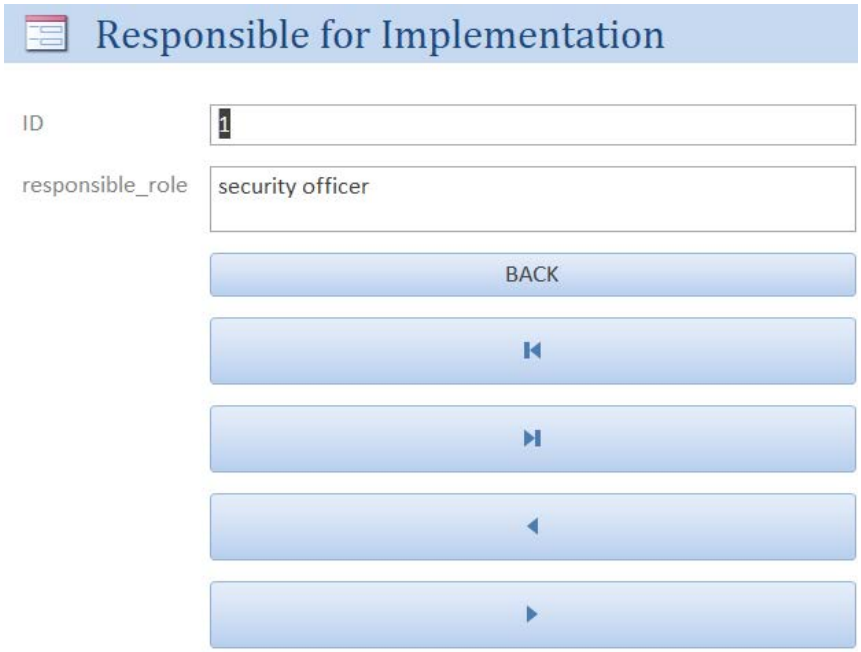
The passengers will tend to move to the upper side of the ship.

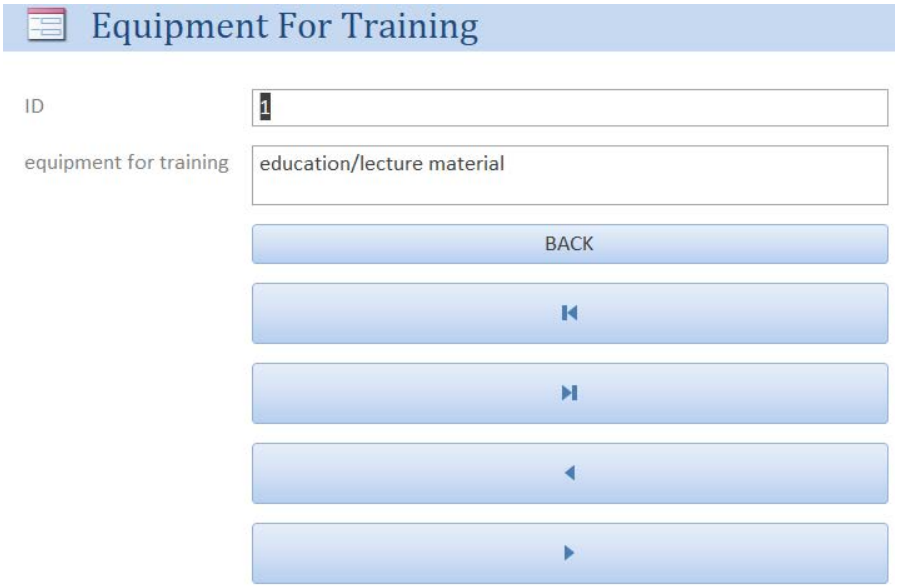
- Effective marshalling of passengers to their lifeboat/raft station appreciate that passengers may go to the high side where, because of the ship’s list, some life-saving appliances may be outside of their launching limits;
- Appreciate the possible problem of panic resulting from separating families;
- Family members will be concerned for the safety of their group;
- Group leaders may go to areas that are dangerous to search;
- Orders from muster personnel may be ignored;
- Orders must be calm, clear, informative and reassuring;
- Assign a specific crew member to calm those concerned and explain the ship’s procedures.

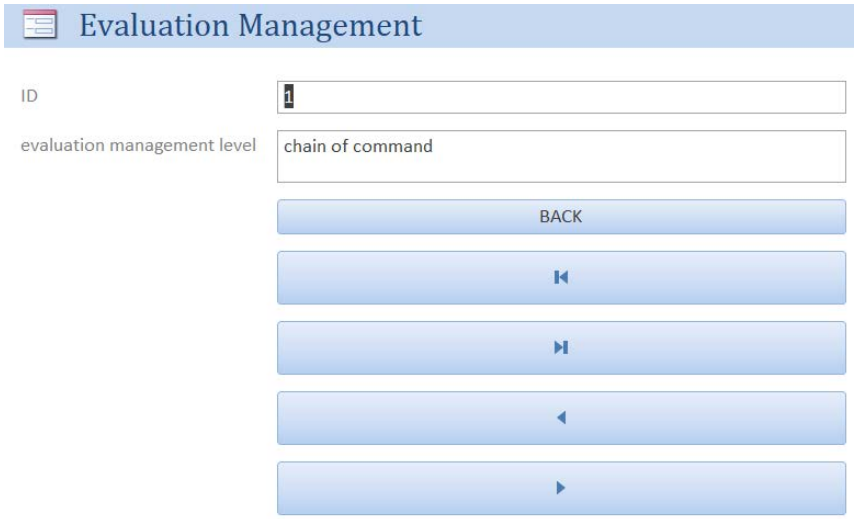
Annex III - Screenshots of Database

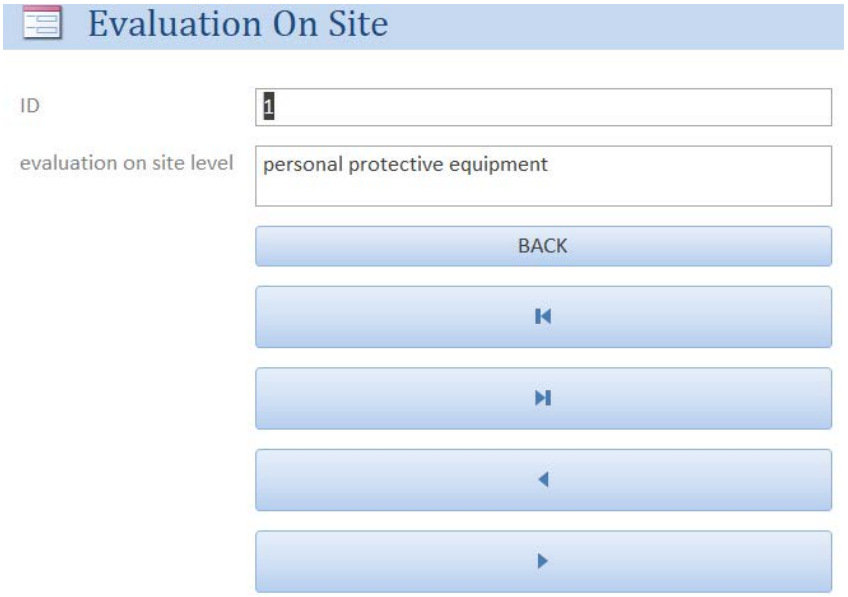
In this Annex all forms and reports (excluding the final scenario description) are visualized with screenshots. The screenshots start with the dashboard and follows the structure from left to right and from up to down. The screenshots of the reports are not the last version of the database content but show how the content is structured with several forms and summarized in a list.




Responsible for Implementation
ID
1
responsible_role
security officer
BACK


Equipment For Training
ID
1
equipment for training
education/lecture material
BACK


Evaluation Management
ID
1
evaluation management level
chain of command
BACK


Evaluation On Site
ID
1
evaluation on site level
personal protective equipment
BACK

Scenario Development and Documentation Template

DIE JOHANNITER
Aus Liebe zum Leben

ID	1		
scenario title:	SMALL FIRE	Define the preparation status for this scenario:	no previous information
scenario description:	A small fire occurs near a trash can. A lot of smoke arise near the fire. There are no persons involved so far.	Define the time information status for this scenario:	alert training - unknown
		Define the location of the crew area for this scenario:	cabine, TBD
Identification of Stakeholder:	security officer, safety officer, crew	Define the location of the passenger area for this scenario:	cabine, TBD
Responsible for Implementation:	security officer	Define the location of the technical area for this scenario:	bridge, TBD
Define the training/ education level:	application level	Specify the kind of training of the scenario:	on site training
Define the training intervall:	monthly	Which equipment is needed for preparation of the scenario:	exercise dummy, fog simulation, safety equipment
		Define which evaluation parameters are relevant on management level:	exploration, decision making process, mission briefing
		Define which evaluation parameters are relevant for on site level:	personal protective equipment, equipment handling, scenario management

Defined Intervalls of Scenario Trainings

Wednesday, June 9, 2021
3:34:50 PM

ID	scenario title	Define the training intervall
5	FIRE - kitchen	monthly
6	heart attack - bridge	quaterly
7	symptoms of poisoning	on demand
8	gas leakage	quaterly
9	Pluvial Flood	on demand
4	explosion on deck - level B	on demand
1	SMALL FIRE	monthly
2	INJURED PERSON	weekly
3	explosion on deck - level A	half-yearly

page 1 of 1

Complete Equipment List

Wednesday, June 9, 2021
3:35:20 PM

Number	Equipment
1	education/lecture material
2	exercise dummy
3	wound simulation
4	fog simulation
5	chemical agent simulation
6	safety equipment
7	VR On Ship training simulator
8	roleplayer
9	scenario description
10	plans, lists, photos, etc.

page 1 of 1

Evaluation parameter on Management Level

Wednesday, June 9, 2021
3:35:51 PM

Number	Evaluation parameter on management level
1	chain of command
2	timing
3	exploration
4	decision making process
5	mission briefing
6	communication
7	scenario management
8	NO EVALUATION

page 1 of 1

Evaluation parameter On Site level

Wednesday, June 9, 2021
3:36:25 PM

Number	Evaluation on site level
1	personal protective equipment
2	equipment handling
3	scenario management
4	wound care
5	patient care
6	fire fighting procedure
7	barrier measures
8	NO EVALUATION

page 1 of 1

Stakeholder Role List

Wednesday, June 9, 2021
3:36:57 PM

Number	Stakeholder role
1	captain
2	security officer
3	safety officer
4	passenger
5	crew
6	Thief

page 1 of 1

Annex IV – Sample Scenarios

Scenario Definition Sheet

Wednesday, June 9, 2021
3:43:07 PM

number	5
scenario title	**FIRE - kitchen**
scenario description	A small fire occures in the kitchen caused by overheated oil!!!! Huge smoke is in the room and 2 persons are injured: Person A: burning injuries arms and head - without consciousness Person B: Fall injury on the shoulder - crying
stakeholder for the Scenario:	crew
responsible for Implementation:	security officer
Training/education level:	consolidation level
Training intervall:	monthly
Preparation status:	no previous information
Information status:	planned training - known
Location of crew area	kitchen
Loc of passenger are	NOT HERE
Loc of technical area:	NOT HERE
Kind of training:	VR training
Equipment for preparation:	VR On Ship training simulator
Evaluation parameters on management level:	decision making process, communication

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number	6
scenario title	**heart attack - bridge**
scenario description	One of the persons at the bridge falls down due an heart attack during duty.
stakeholder for the Scenario:	captain, crew
responsible for Implementation:	safety officer
Training/education level:	application level
Training intervall:	quaterly
Preparation status:	no previous information
Information status:	alert training - unknown
Location of crew area	NOT HERE
Loc of passenger are	NOT HERE
Loc of technical area:	bridge
Kind of training:	on site training
Equipment for preparation:	roleplayer
Evaluation parameters on management level:	timing, decision making process

number	7
scenario title	**symptoms of poisoning**
scenario description	A huge amount of passengers have symptoms of poioning at the end of the dinner. Most of them are crying and abdominal pain. Some are without consciousness.
stakeholder for the Scenario:	security officer, crew
responsible for Implementation:	safety officer
Training/education level:	consolidation level
Training intervall:	on demand
Preparation status:	partly introduction/briefing
Information status:	alert training - unknown
Location of crew area	NOT HERE
Loc of passenger are	dinning hall
Loc of technical area:	NOT HERE
Kind of training:	paper work
Equipment for preparation:	scenario description, plans, lists, photos, etc.
Evaluation parameters on management level:	decision making process, mission briefing

number	8
scenario title	**gas leakage**
scenario description	Near the sector "TBD" two crew members are without consciousness. They were able to report that they identify some strange smell, than the connection was lost.
stakeholder for the Scenario:	security officer, crew
responsible for Implementation:	safety officer
Training/education level:	consolidation level
Training intervall:	quaterly
Preparation status:	no previous information
Information status:	alert training - unknown
Location of crew area	NOT HERE
Loc of passenger are	NOT HERE
Loc of technical area:	engine room
Kind of training:	on site training
Equipment for preparation:	exercise dummy, chemical agent simulation, roleplayer
Evaluation parameters on management level:	exploration, decision making process, mission briefing, communication

number	4
scenario title	**explosion on deck - level B**
scenario description	A small explosion on deck during daylight (about 13:00 hours) cause some infrastructure damages as well as 4 injured persons. The explosion trigger is unknown but the injuries are directly assigned to the explosion pressure as well as the fire.
stakeholder for the Scenario:	passenger, crew
responsible for Implementation:	security officer
Training/education level:	consolidation level
Training intervall:	on demand
Preparation status:	partly introduction/briefing
Information status:	planned training - known
Location of crew area	NOT HERE
Loc of passenger are	pool
Loc of technical area:	NOT HERE
Kind of training:	on site training
Equipment for preparation:	education/lecture material, exercise dummy, wound simulation, safety equipment
Evaluation parameters on management level:	chain of command, timing, exploration, decision making process, mission briefing, communication

number	1
scenario title	**SMALL FIRE**
scenario description	A small fire occurs near a trash can. A lot of smoke arise near the fire. There are no persons involved so far.
stakeholder for the Scenario:	security officer, safety officer, crew
responsible for Implementation:	security officer
Training/education level:	application level
Training intervall:	monthly
Preparation status:	no previous information
Information status:	alert training - unknown
Location of crew area	NOT HERE
Loc of passenger are	corridor
Loc of technical area:	NOT HERE
Kind of training:	on site training
Equipment for preparation:	exercise dummy, fog simulation, safety equipment
Evaluation parameters on management level:	exploration, decision making process, mission briefing

number	2
scenario title	**INJURED PERSON**
scenario description	Near the pool a person slip out and crash on the floor. Status of the person: bleeding on the head; not able to go; can speak
stakeholder for the Scenario:	passenger, crew
responsible for Implementation:	safety officer
Training/education level:	teach in stage
Training intervall:	weekly
Preparation status:	preparation scenario briefing
Information status:	planned training - known
Location of crew area	cabine
Loc of passenger are	cabine - balcony
Loc of technical area:	bridge
Kind of training:	on site training
Equipment for preparation:	education/lecture material, exercise dummy, wound simulation
Evaluation parameters on management level:	communication

number	3
scenario title	**explosion on deck - level A**
scenario description	A small explosion on deck during daylight (about 13:00 hours) cause some infrastructure damages as well as 4 injured persons. The explosion trigger is unknown but the injuries are directly assigned to the explosion pressure as well as the fire.
stakeholder for the Scenario:	crew
responsible for Implementation:	safety officer
Training/education level:	teach in stage
Training intervall:	half-yearly
Preparation status:	preparation scenario briefing
Information status:	planned training - known
Location of crew area	NOT HERE
Loc of passenger are	pool
Loc of technical area:	NOT HERE
Kind of training:	VR training
Equipment for preparation:	VR On Ship training simulator
Evaluation parameters on management level:	chain of command, timing, exploration, decision making process, mission briefing, communication