Project acronym: **LASH FIRE**

Project full title: **Legislative Assessment for Safety Hazard of Fire and Innovations in Ro-ro ship Environment**

Grant Agreement No: **814975**

Coordinator: **RISE Research Institutes of Sweden**

Deliverable D03.8

Final Report on Dissemination, Communication and Cooperation

August 2023

Dissemination level: **Public**

Abstract

This report informs about the strategic approaches that were conceived and applied to maximize the outreach of the LASH FIRE project and thus ensure its sustainable impact. For this purpose, target group-specific measures were identified and implemented through work package 3 Cooperation and Communication. In addition, valuable forums were created through the establishment of two advisory groups, which provide room for qualitative input regarding the need and applicability of the solutions developed concerning fire safety in the maritime domain as well as productive feedback on the proposed innovations.

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Content

1 Executive summary

Main authors of the chapter: Grit Ladage / Carola Dörrie, CMT2

This report is a follow up of the report D03.4 - Updated Dissemination and Communication Report and updated plan, which was submitted in project month 36. It informs about the final communication and dissemination strategy after four years in the project (project month 48). It describes the strategic approaches that were conceived and applied to maximize the outreach of the LASH FIRE project and thus ensure its sustainable impact. For this purpose, target group-specific measures were identified and implemented through work package 3, which is dedicated to cooperation and communication. In addition, valuable forums were created through the establishment of two advisory groups, providing room for qualitative input regarding the need and applicability of the developed solutions on fire safety in the maritime domain, as well as productive feedback on the proposed innovations.

Problem definition

From 2006 to 2015, 32 serious fires were recorded on ro-pax vessels. The LASH FIRE project aims to provide the European industry with knowledge for building safer and more competitive ships for sustainable transport and to provide a basis for the revision of international maritime regulations. To this end, the project will develop innovative and cost-effective measures to increase fire safety at sea. These solutions must not only be tested by shipowners for feasibility and cost-effectiveness, but also consider the mitigation of fire risk in relation to the environmental, cost and crew impact. An impact which causes changes to the environment, costs and crew operations to ensure that fire safety on ro-ro ships is improved in a sustainable, practicable and long-term manner. It is also helpful to cooperate and exchange ideas with other projects that are dedicated to the topic of fire safety or overlap with similar approaches in other areas.

For the proposed solutions to be finally applied and considered in future regulations, they must be brought to the attention of legislative bodies. This will require not only the agreement of maritime stakeholders and other relevant actors, but also the advocacy and support of flag states, CINEA and DG MOVE to submit these proposals for rule adaptations to the International Maritime Organization (IMO) and other authorities.

The work package 3 has been set up to address internal and external communication and to foster potential cooperation opportunities to maximize awareness and support for the project and thus optimize its achievements.

Technical approach

Initially and continuously during the project, WP03 - Cooperation and Communication identified and initiated targeted measures for information exchange and international cooperation with external parties and projects related to ro-ro ship fire safety. The work package further monitors, collects, structures, and analyses the latest research and developments in fire related technologies, fire management, software tools to design and assess fire safety as well as upcoming rules and regulations. The analysis covers European and global developments both in the maritime and other relevant sectors (e.g. other transport modes and land-based building industry). A status update on the collection process is given in chapter 4.2 Establishing cooperation with external partners and projects.

A designated Communication Management Group (CMG) (Figure 1) was responsible for the management of the inbound and outbound communication of the project, thus assisting the project

management. It was led by the leader of WP03 and includes the work package partners as well as the respective leaders of the other work packages in the project. Every three months the CMG convened back-to-back with the Steering Group (SG) meeting, analysing current activities as well as proposing measures for communication and external cooperation opportunities. The group was responsible to push dissemination and exploitation activities in the project and was in addition responsible to prepare public events jointly with other initiatives.

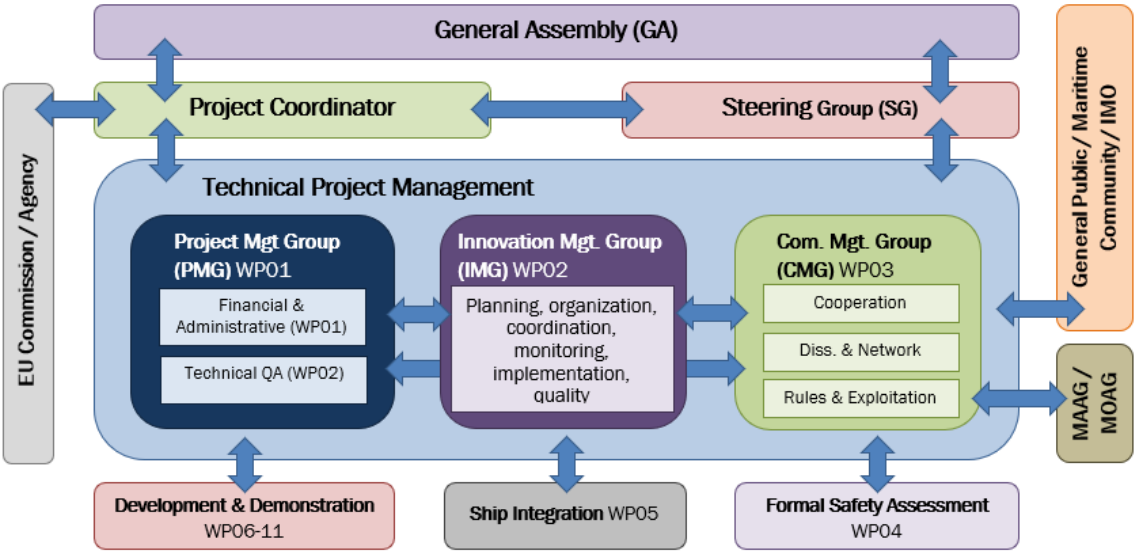

Figure 1: Management structure

The monitoring of research and developments described above was carried out in close relation to the Maritime Advisory Groups, which served both to collect input on external developments and to discuss the developments in LASH FIRE as well as future regulatory proposals.

Results and achievements

By the time of this report (PM48), the WP03 related milestones MS02, MS04, MS07, MS18 and MS25 have been accomplished, while the proposals for submission to the IMO regarding new fire safety regulations are drafted until the end of the project and will be submitted at a later stage. The milestone MS02 relates to the establishment of two advisory boards, the Maritime Authorities Advisory Group (MAAG) and the Maritime Operators Advisory Group (MOAG). A joint kick-off meeting took place during an IMO SSE07 meeting in March 2020. During this kick-off meeting at the facilities of the IMO, the project LASH FIRE was presented to strategic delegates of the organization. A detailed description can be found in chapter 4.3.1 Acceptance by and consensus with Maritime Advisors. Following IMO meeting SSE08 has been postponed due to the Covid-19 pandemic and was finally held in March 2022 as a virtual meeting. IMO SSE09 took place as a physical event from February 27 to March 3, 2023; the LASH FIRE partners Johan Roos (INF2), Martin Carlsson (STENA) and Franz Evegren (RISE) attended the meeting.

To complete MS04 a first communication kit has been prepared to support partners in their communication activities. A variety of communication, dissemination and cooperation initiatives have been successfully implemented, including MS04 requirements, namely the set-up of the website and the design of a brochure. Since the first report, the brochure has undergone three updates. The following chapters will provide a detailed overview of the various actions taken.

MS07 includes on the one hand the project-internal publication of the data collection on relevant developments, innovations and projects related to the objectives in LASH FIRE. A summary of the current status is given in chapter 4.2.1 Take up of external developments and innovations.

MS18 was accomplished with the submission of the deliverable “D03.4 Updated Dissemination and Communication Report and updated plan” on 31 August 2022 as follow-up to deliverable “D03.3. First Dissemination and Communication Report and updated plan”.

Between MS18 and MS25 the deliverable “D03.6 Project video” was submitted. This deliverable describes the production and content of the final project movie. 20 videos were produced during the project run-time. A PowerPoint presentation with the main results was produced and made available to all project partners for further use.

Finally, MS25 can be considered as accomplished with the submission of the deliverable “D03.7 Final Project Brochure”, this deliverable “D03.8 Final Report on Dissemination, Communication and Cooperation”, the deliverable “D03.9 Final Exploitation Plan” by the end of August 2023 and the preparation of the draft proposal for submission to the IMO regarding new fire safety regulations by the end of August 2023.

Contribution to LASH FIRE objectives

The general principle of communication and dissemination is to maximise the impact of the project by promoting, communicating, and disseminating research results throughout the lifetime of the project and beyond. In LASH FIRE the communication and dissemination strategy serves the fourth specific objective aiming at “proposing new regulations and guidelines founded on common positions by drawing upon global research and experience and by facilitating international cooperation”.

Exploitation and implementation

The exploitation strategy was developed in reporting period 2 and was defined in an internal report “IR3.4 - First exploitation plan” due in the end of August 2022. The IR3.4 is incorporated in “D03.9 Final Exploitation Plan”.

A workshop was organised during the seventh General Assembly which took place on the 20 and 21 September 2022, in Trondheim, Sweden. In this 90 min workshop, for each of the actions the exploitation and dissemination strategy was mapped in small groups to assure proper implementation of each action.

Deliverable “D03.9 Final Exploitation Plan“ describes the final exploitation plan of the project relying on the technical input from all partners and work packages.

2 List of abbreviations

AFV	Alternative(ly) Fuelled Vehicle
AR	Augmented Reality
BIM	Building Information Modeling
CFD	Computational Fluid Dynamics
CMG	Communication Management Group
CMT / CMT2	Center of Maritime Technologies gGmbH
CNG	Compressed Natural Gas
CNN's	Convolutional Neural Networks
DBI	The Danish Institute of Fire and Security Technology
DIFF	Deck integrated Firefighting
DSS	Decision Support System
EV	Electric Vehicle
FDS	Fire Dynamic Simulator
ICT	Information and Communication Technology
IMO	International Maritime Organization
IoT	Internet of Things
IR	Infrared
LCC	Life Cycle Cost
LCCA	Life Cycle Cost Assessment
LM	Lane Meter
MAAG	Maritime Authorities Advisory Group
MEV	Mass Evacuation Vessel
MOAG	Maritime Operators Advisory Group
MSC	Maritime Safety Committee
PEDR	Plan for the Exploitation and Dissemination of Results
PM	Project Month
SMS	Safety Management System
SSE	Sub-Committee on Ship Systems and Equipment
RFI	Request for information

3 Introduction

Main authors of the chapter: Grit Ladage / Carola Dörrie, CMT2

The general principle of dissemination and communication is to maximise the impact of the project by promoting, communicating, and disseminating research results throughout the lifetime of the project and beyond.

Dissemination and communication activities in LASH FIRE focus on innovative and engaging ways to share results with the identified target groups and the corresponding most suitable channels. LASH FIRE uses a broad range of dedicated channels to collect and communicate information in order to raise awareness for the project, its cause and its results.

3.1 Scope and objectives

In LASH FIRE the communication and dissemination strategy serves the fourth specific objective aiming at "proposing new regulations and guidelines founded on common positions by drawing upon global research and experience and by facilitating international cooperation".

The fourth objective though serves the aim to maximise the impact of the three preceding objectives, namely to:

1. strengthen the independent fire protection of ro-ro ships by developing and validating effective operative and design solutions addressing current and future challenges in all stages of a fire (addressed in WP06-11);
2. evaluate and demonstrate ship integration feasibility and cost of developed operational and design risk control measures for all types of ro-ro ships and all types of ro-ro spaces (addressed in WP05);
3. provide a technical basis for future revisions of regulations by assessing risk reduction and economic properties of solutions (addressed in WP04).

In line with the fourth objective, WP03 pursues a well-defined management of the communication, for both, data received (inbound) and data provided (outbound).

3.2 Methodology and structure

In regards of the inbound communication flow, data related to fire safety (innovative technologies, new developments in legislation and latest research data) have been collected, assessed, consolidated, and made accessible to all consortium partners. Collaborations with related projects and other external parties have been established to ensure a continuous exchange of information. Finally, two established advisory groups provide feedback on project developments and results.

In contrast to the inbound communication flow, for the outbound communication flow, project developments and outcomes have been shared with key stakeholders as well as the general public; and cooperation and exchange of information with projects and external platforms have been promoted. In addition, consolidated exploitation and market uptake plans have been developed to ensure the adoption and advancement of results and provide further input to the maritime regulatory bodies.

The theme throughout the LASH FIRE project builds upon four lines of work. The work packages had been developed along these lines, with strong collaboration in-between each other, as illustrated in Figure 2. The four lines of work are marked red/orange, grey, purple and green in Figure 2 and are described further below.

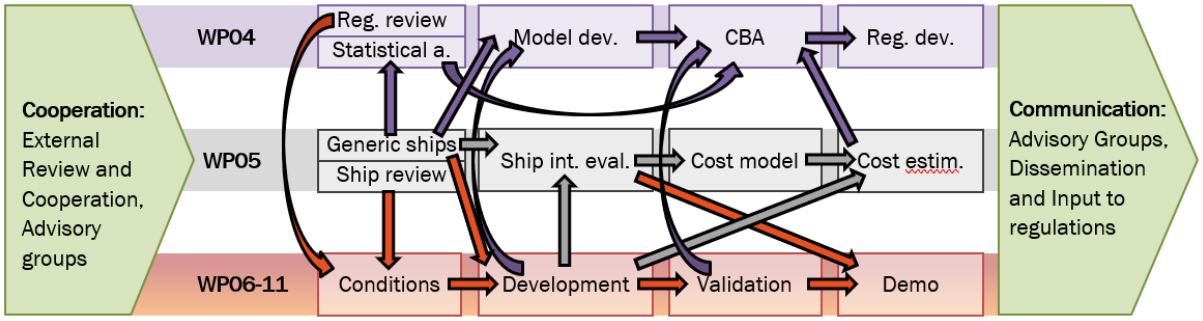

Figure 2: Workflows of the project

The green line of work relates to the Cooperation & Communication layer. WP03 interconnects with all parts of the other work packages. Therefore, arrows have been omitted in Figure 2. Initially and continuously during the project, WP03 identified and initiated targeted measures for information exchange and international cooperation with external parties and projects related to ro-ro ship fire safety. The work package further monitored, collected, structured, and analysed the latest research and developments in fire related technologies, fire management, software tools to design and assess fire protection as well as upcoming rules and regulations. The analysis covers European and global developments both in the maritime and other relevant sectors (e.g. other transport modes and land-based building industry).

The monitoring of research and developments described above was conducted in close conjunction with the Maritime Advisory Groups, which served both to gather input on external technologies and to discuss developments in LASH FIRE and future regulatory proposals.

A preliminary guideline for the exploitation and dissemination has been prepared already during the proposal stage of the project defining initial procedures for the first activities, and is to be found in the LASH FIRE DoA part B.

The first updated Plan for the Exploitation and Dissemination of Results (PEDR) was part of deliverable “D03.3 - First Dissemination and Communication Report and updated plan” which was delivered in February 2021. A follow-up was given in “D03.4 - Updated Dissemination and Communication Report and updated plan” (PM36).

4 Raising awareness – the project communication strategy

Main authors of the chapter: Grit Ladage / Carola Dörrie, CMT2

This chapter provides a brief overview of the dissemination channels utilised to raise and improve the awareness of the project addressing the identified target groups. The following table shows the goals that were aimed at during the project in terms of communication. Below this, it shows the activities that have been taken for the respective target groups, which are described in detail in the following chapters.

Table 1: Plan of communication and dissemination activities executed during the project runtime

To **WHOM?**	**WHY** and **WHAT?**	**HOW?**	**WHO?**
Improving Public Perception and Societal Image			
General public (European citizens), Science community	Make a wider community aware of the impact of EU research funding, improve the public image of the maritime sector, enable contact to the project	Public project website; press releases; innovative media (e.g. LinkedIn); project dissemination material; interviews in local media and science magazines; project videos	**CMT2**, RISE, MAG
Establishing cooperation with external partners and projects			
Maritime RDI Community	Inform on work and results, receive feedback on technical developments, foster knowledge uptake	Publication in specific newsletters, research and professional magazines	**CMT2**, WP Leaders
Other RDI project consortia	Use synergies, e.g. joint resources, uptake of suitable external developments, exchange of results	European TPs and their websites, project newsletter, joint meetings, conferences and user groups, cooperative work	**CMT2**, WP Leaders
School graduates, Students & Young professional	Attract young people to RDI and maritime industry, inform about job opportunities, improve technical skills for under- and post graduate students	Training material, presentations at universities, network of WEGEMT (www.wegemt.com), support to EMSHIP (www.emship.eu) actions, internal placements for students	**RISE,** academic partners
Identification and Communication of requirements			
Ship owners and operators	Inform potential customers about the benefits and potentials, of the emerging solutions and receive qualitive and quantitative feedback to the work being conducted in the project.	Direct contact with end-users (consortium), establishment of a MOAG (Maritime Owners Advisory Group), newsletters and conference presentations. MOAG to provide input to future regulations and legislation to find consensus of the proposals elaborated in the project.	**INF2**, MAG, BV, CMT2
Maritime rule making authorities	Monitor upcoming rules and regulations, direct communications to class, flag states and NGOs represented in IMO	Direct contact with consortium partners; installation of MAAG (Maritime Authorities Advisory Group), specific issue papers, see also paragraph above	**SEA**, RISE. BV, INF2
European Ship-building & Equipment Community	Increase critical mass on the market, foster wider commercialisation of results, receive information on latest developments	Dedicated workshops, conferences and flyers using related networks and national, international and global associations, Public conferences (CFIS)	**CMT2**, BV, SEA Shipyards, Equipment suppliers
Remove external Barriers towards Application			
Policy Makers	Communicate achievements, potential impact and needs to future legislation and infrastructure	EU policy makers and administration (proposals IMO)	**MAG**, RISE

To **WHOM?**	**WHY** and **WHAT?**	**HOW?**	**WHO?**
Research Admin. and funding authorities	Ensure consideration of achievements and RDI needs for future research programmes	Reports to COM, WATERBORNE network (TRA2022 participation), EU associations, national networks, contact with national governments	**CMT2,** MAG

4.1 Improving Public Perception and Societal Image

Dissemination and communication activities in LASH FIRE focus on innovative and engaging ways to share results with the identified target groups and the corresponding most suitable channels. LASH FIRE uses a broad range of dedicated channels to collect and communicate information to raise awareness for the project and its cause. Relevant channels are the project website, partners' websites, brochures (printed and PDF versions), Linkedin and Twitter accounts, project videos (published on YouTube and made available on websites), posters, roll-ups, PowerPoint presentations, webinars, conferences, trade fairs and others.

4.1.1 Website and Social Media

As part of the dissemination activities within WP03, a project website (www.lashfire.eu) has been established to connect stakeholders with the project partners while also highlighting additional social media platforms. Using the well-established content management system WordPress, the project website guarantees a responsive platform.

A major purpose of the LASH FIRE website is to inform on the progress made in the different WPs. To highlight this feature, "Work Packages" can be found both on the start page and under the top bar "Project". During Q1 WP03 interviewed all the WP leaders to fill the section with the latest information. Since the last report, there have been many updates like e.g. more detailed descriptions on the current working status and progress including pictures and movies. Also, all our public deliverables were made available for download after their approval by the European Commission. A series of partner interviews called Meet the partners" was launched in the News section of the website. At regularly intervals an interview with one of the LASH FIRE partners was published on the website in a form of text and as a short audio interview. The interviews present the core of the project and highlight expectations from the work as well as the partners particular angle on fire safety.

During the reporting period 3 the project website was restructured to ensure that the visitors find the tabs "LASH FIRE results" and "Videos" at the top bar (see Figure 3).

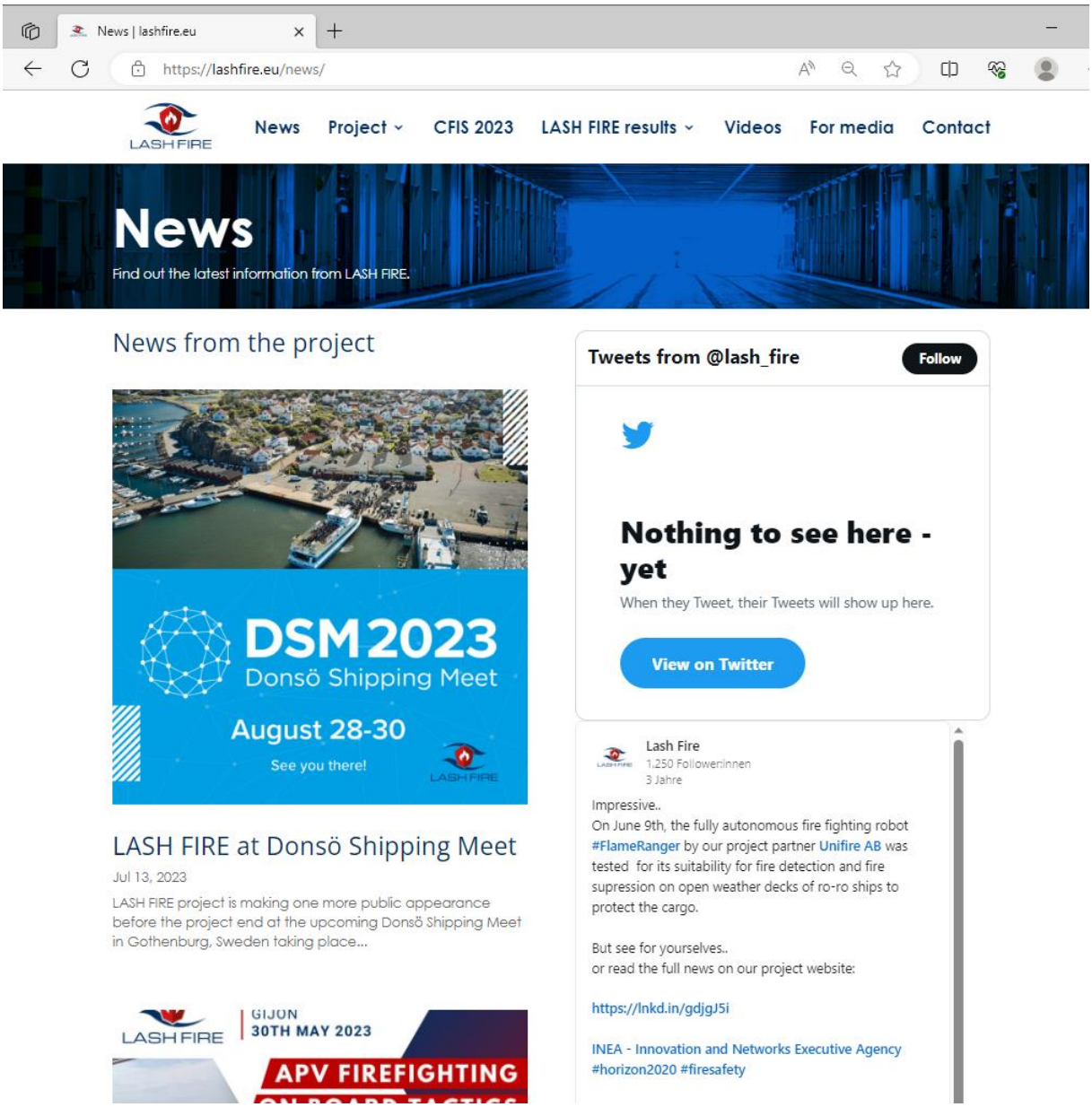

Figure 3: News section of the project website

Under the tab “Project” the pages “Consortium” and “Work Packages” can be found. Under the tab “CFIS 2023” the visitors can find links to the pages CFIS 2021, CFIS 2022 and CFIS 2023. Under the tab “LASH FIRE results” links to “Deliverables”, “2-pager Information sheets” and “LASH FIRE Guidelines” are available. All LASH FIRE movies can be found under the tab “Videos” (see Figure 4).

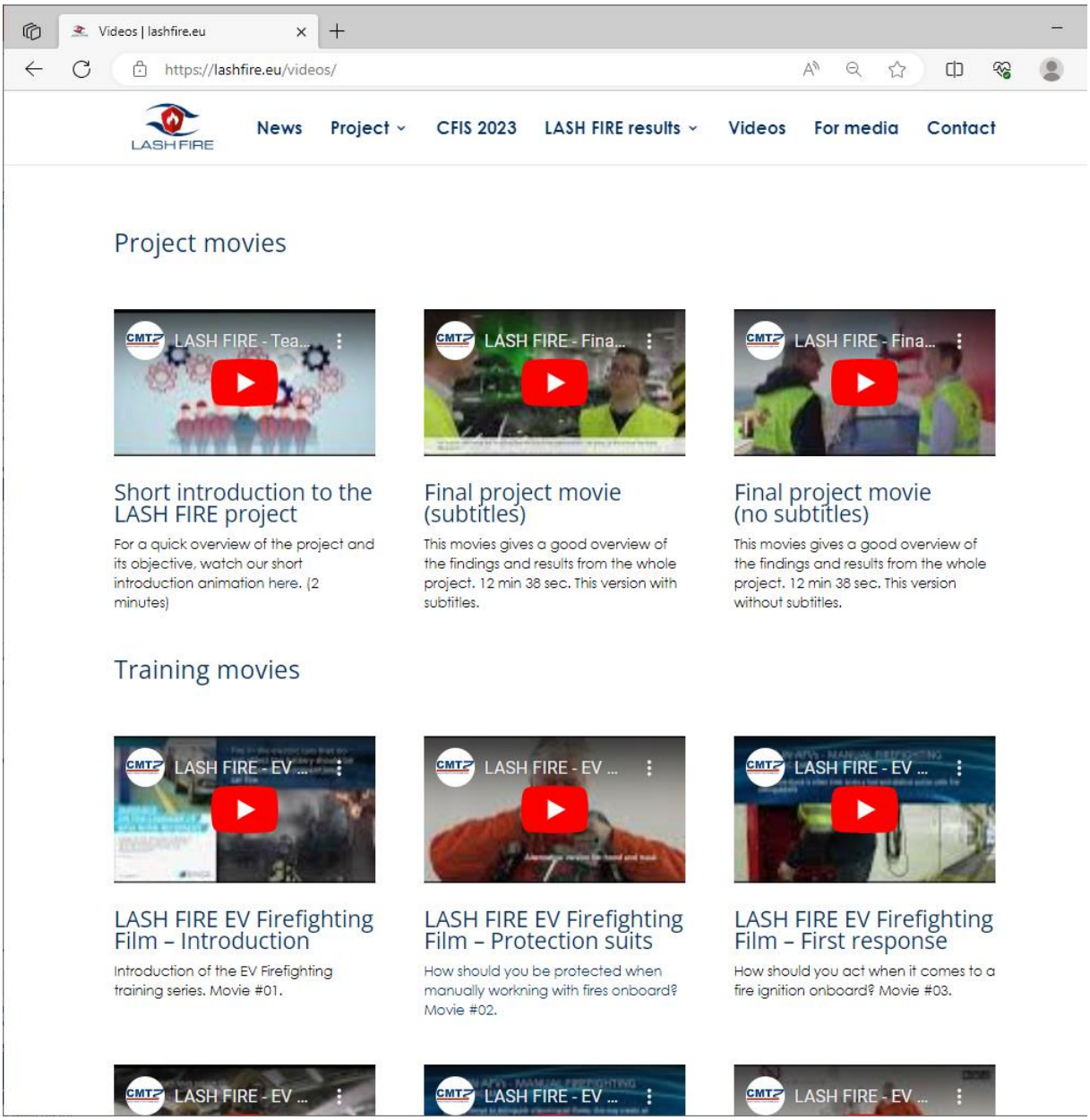

Figure 4: Videos section of the project website

Under the tab “For media” links to press releases, the LASH FIRE logo, the “LASH FIRE - Teaser” video and the final project brochure are provided. The 8-page brochure can be downloaded as a PDF.

Under the tab “Contact” the contact details of the project manager and the project coordinator are displayed. On all pages of the project website the EU emblem is displayed together with the funding acknowledgement and the disclaimer (see Figure 5).

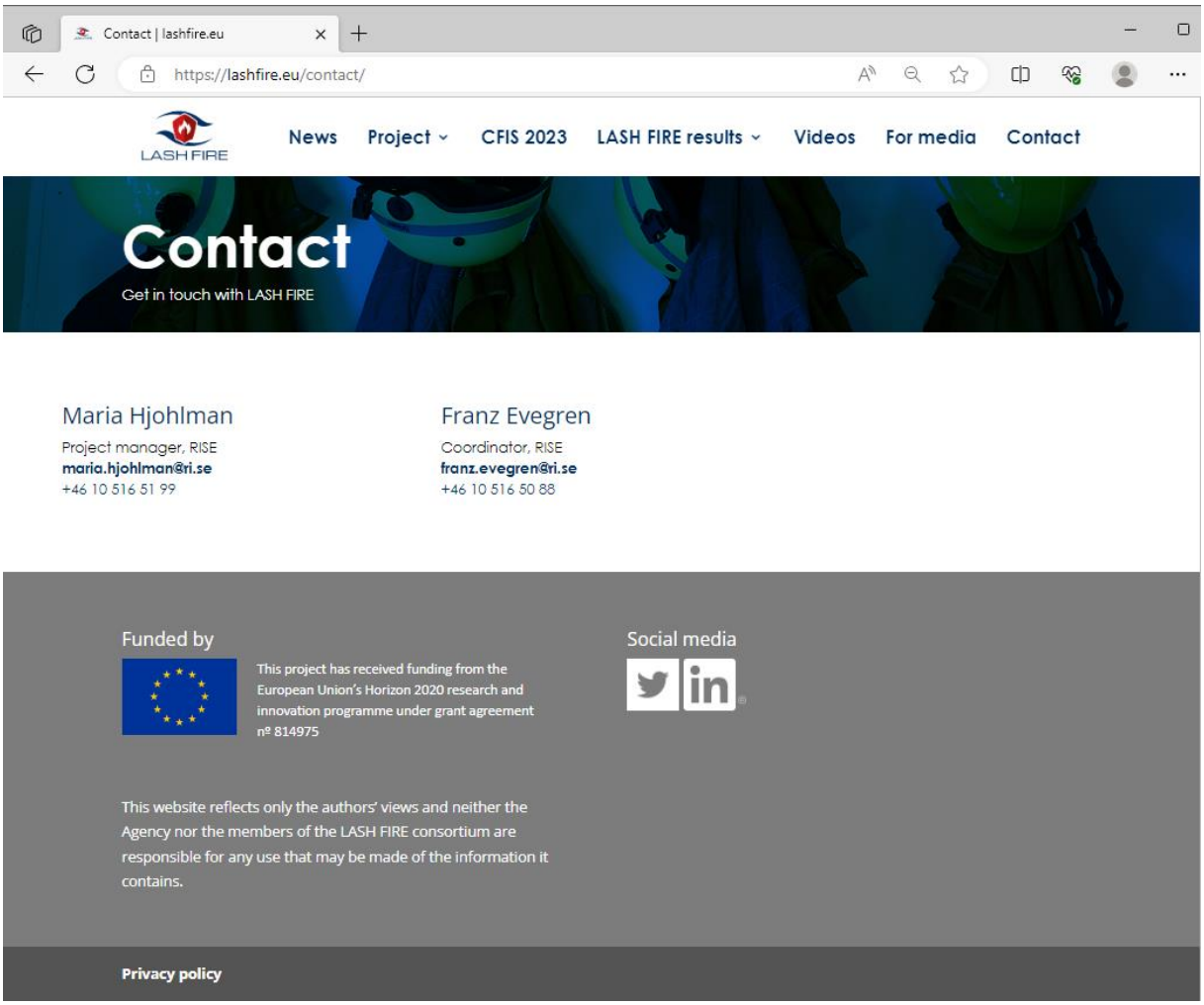

Figure 5: Contact section of the project website

The project website will be kept online for at least five years until after the end of the project.

4.1.2 Dissemination and Communication Activities (overview)

Within the project all partners were requested to engage in dissemination and communication activities.

After 48 months, the project counts 165 dissemination and communication activities in total. The number of activities reported for each category is specified Figure 6 (Status 2023-08-03).

The coordinator Franz Evegren gave serval interviews. In July 2023 he was interviewed for the CORDIScovery podcast #27 Safety at sea. The podcast was promoted on the LASH FIRE website and via Linkedin. LASH FIRE gained more than 1250 followers on Linkedin, many of them commenting or sharing the posts.

In the end of the project a press release with the main results was published by RISE and provided to all project partners in English for further use.

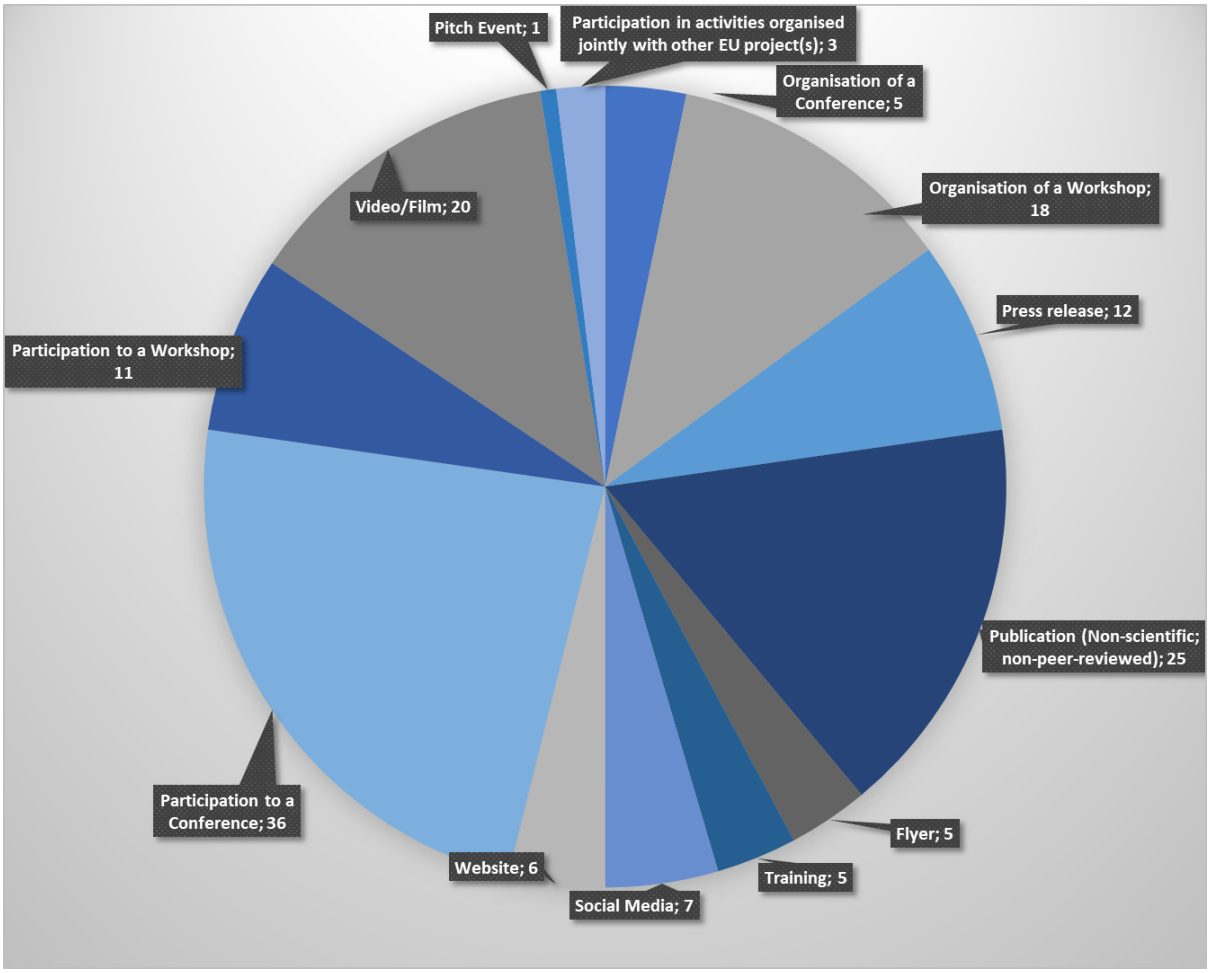

Figure 6: Reported Dissemination and Communication Activities (Status: 2023-08-03)

Project brochures (flyers) serve as an instrument to raise awareness for the project, addressing not only the respective stakeholders but also the general public. The main objective of the project brochure is to provide the audiences with an appealing project overview. It serves as instrument to support the consortium partners in the communication activities. Therefore, a 4-page DIN A5 project brochure (flyer) was designed already at an early stage of the project. Since the first report, the brochure has been updated several times. The second version already counted 8 pages. In the end of 2022 the format was changed from A5 to A4, and content was added, still counting 8 pages. This version was distributed at the TRA 2022. The final project brochure was produced in 2023 containing amongst others results of the cost-effectiveness assessment of so-called Risk Control Options (RCOs) and distributed as hard copies at the MSC107, the CFIS 2023 and the Donsö Shipping Meet 2023. Copies were provided to the project partners to be distributed at organisation level. The printed brochure can be distributed on a personal level by the partners at conferences, trade shows, seminars, workshops, and other occasions. In addition the final brochure was made available to all partners and all interested parties as PDF. One print version and one version to be read as a PDF (see Figure 7) was provided. To assist the dissemination effort, a digital version of the brochure has been uploaded to the project website and is available for download at https://lashfire.eu/media/2023/07/LASH_FIRE_Final_Brochure_2023-1.pdf. Furthermore, the electronic version can easily be distributed via email on a larger scale, making use of partners' networks as well as on LASH FIRE social media accounts.

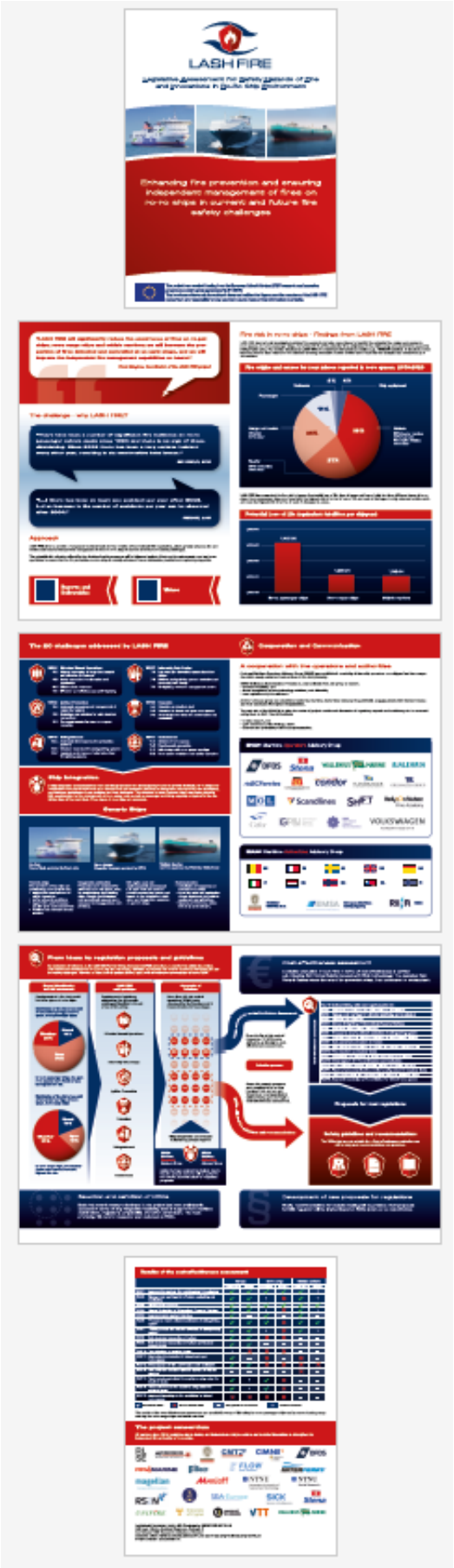

Figure 7: Final Project Brochure (screenshot of reading version)

4.1.3 LASH FIRE video productions

Since the beginning of the project, WP03 has regularly called on partners to document important results of their work, preferably by recording a video or simulations, but also through other media that can be used to publish information about project developments.

One animated short film has been produced during Q2 2021 that presents the objectives of LASH FIRE: the project, the problem, and the approach. It was made available on the Center of Maritime Technologies gGmbH YouTube channel https://www.youtube.com/@centerofmaritimetechnologi2860/videos (see Figure 8). The manner and graphical expression are illustrations/animation and infographics. This short animation / video teaser was made available to be used by the partners to start up a presentation as well as a tool to increase awareness and interest on the partners web sites and in their social media channels. This video was also shown at the waterborne booth during the TRA 2022.

Figure 8: Video LASH FIRE - teaser

In addition, an explanatory video for the hazard detection workshop was produced and uploaded on YouTube 2021 (see Figure 9).

Figure 9: Video LASH FIRE - Expert judgement explanatory published on YouTube

During the course of the project 20 LASH FIRE videos were produced and made available on YouTube. A playlist called “LASH FIRE - Legislative Assessment for Safety Hazard of Fire and Innovations in Ro-ro ship Environment” https://www.youtube.com/playlist?list=PLi4tb8wkruNdRwLD525MQnC_zqx73-

ZU6 was created at an early stage. The videos were promoted via Linkedin posts and tweets shortly after they were uploaded.

The LASH FIRE videos are also available on the LASH FIRE project website at https://lashfire.eu/videos/ . Here the videos are grouped according to the following five categories: Project movies (see Figure 10), Training movies (see Figure 11), LASH FIRE Webinars (see Figure 14), LASH FIRE Interview videos (see Figure 15) and LASH FIRE Test & Demo videos (see Figure 16).

The category project movies includes the teaser (2:25 min) mentioned above and the final project video/movie with and without subtitles (12:38 min) described in D03.7. The final movie serves to raise awareness of the final results produced within the framework of the LASH FIRE project. The target groups of the movie are operators and regulatory bodies like IMO, but it also addresses the general public in an easy to grasp manner. The movie provides short examples of the outcomes from each work package and how this work can contribute to increased fire safety onboard ro-ro cargo ships, ro-pax ships and vehicle carriers. Stena has been very supportive in giving permission to use their ferry Stena Scandinavica for the shooting of the final video.

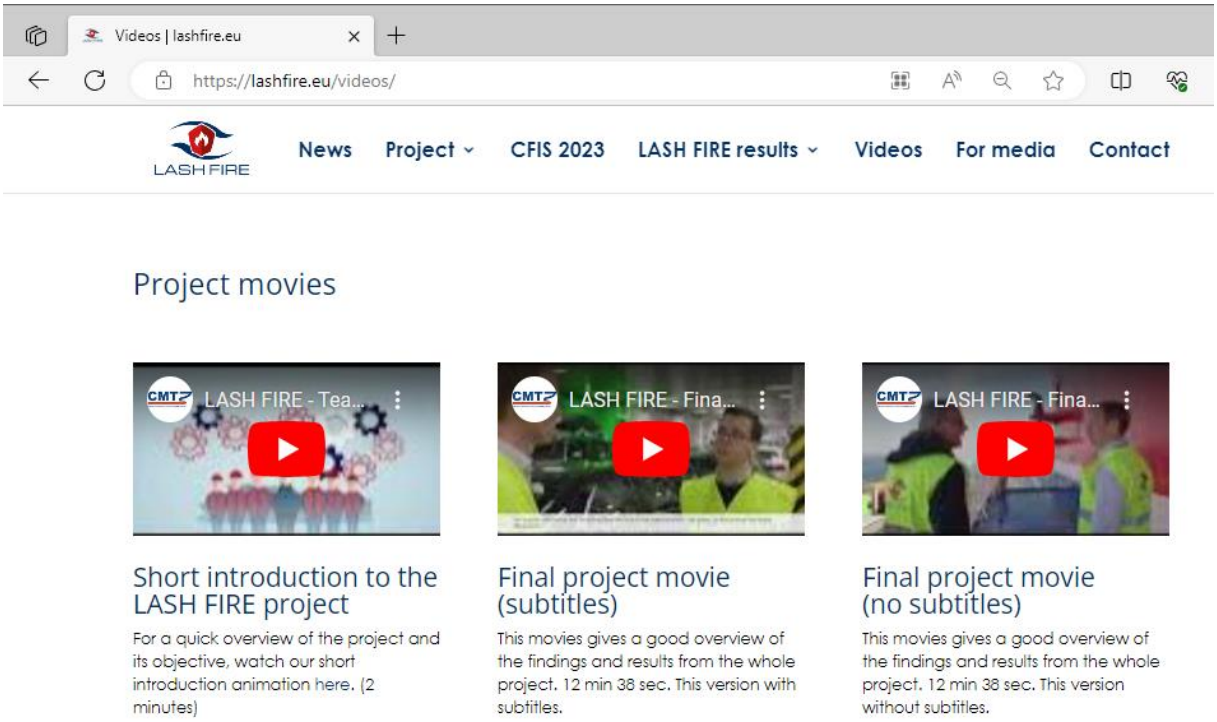

Figure 10: Project movies on LASH FIRE website

The category training movies includes six videos: LASH FIRE EV Firefighting Film - Introduction (#01), LASH FIRE EV Firefighting Film - Protection suits (#02), LASH FIRE EV Firefighting Film - First response (#03), LASH FIRE EV Firefighting Film - Fire fighting methods (#04), LASH FIRE EV Firefighting Film - Manual firefighting of gas vehicles (#05) and LASH FIRE EV Firefighting Film - Post fire (#06) (see Figure 11).

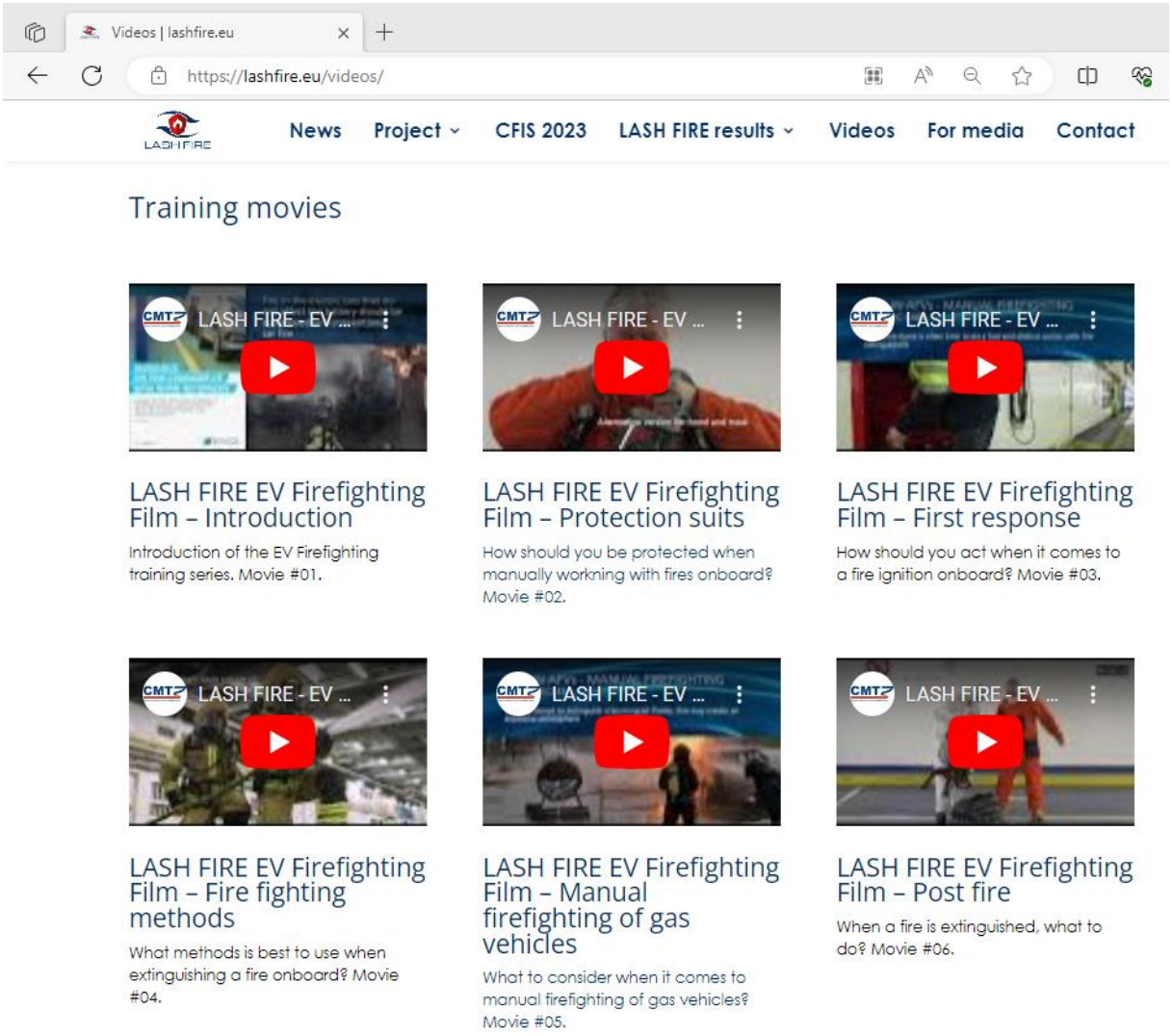

Figure 11: Training movies on LASH FIRE website

The training videos are also published at Seably, a marketplace for online maritime training. An overview on the course "Crew Training on Effective Manual AFV Firefighting" is given at https://www.seably.com/courses/crew-training-on-effective-manual-afv-firefighting (see Figure 12) and the lessons can be found at https://www.seably.com/courses/crew-training-on-effective-manual-afv-firefighting/lessons (see Figure 13).

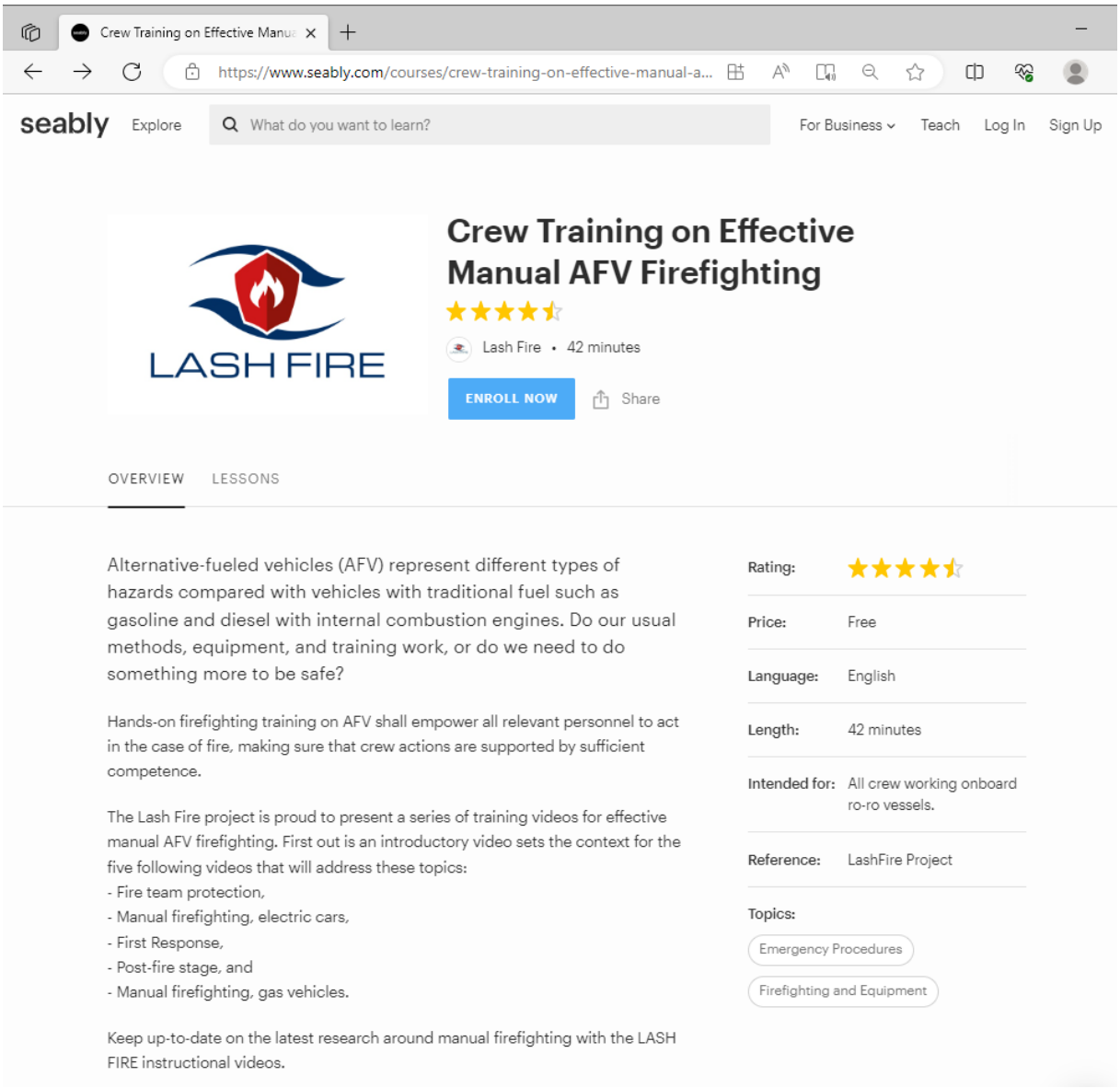

Figure 12: Overview on the course "Crew Training on Effective Manual AFV Firefighting" at Seably

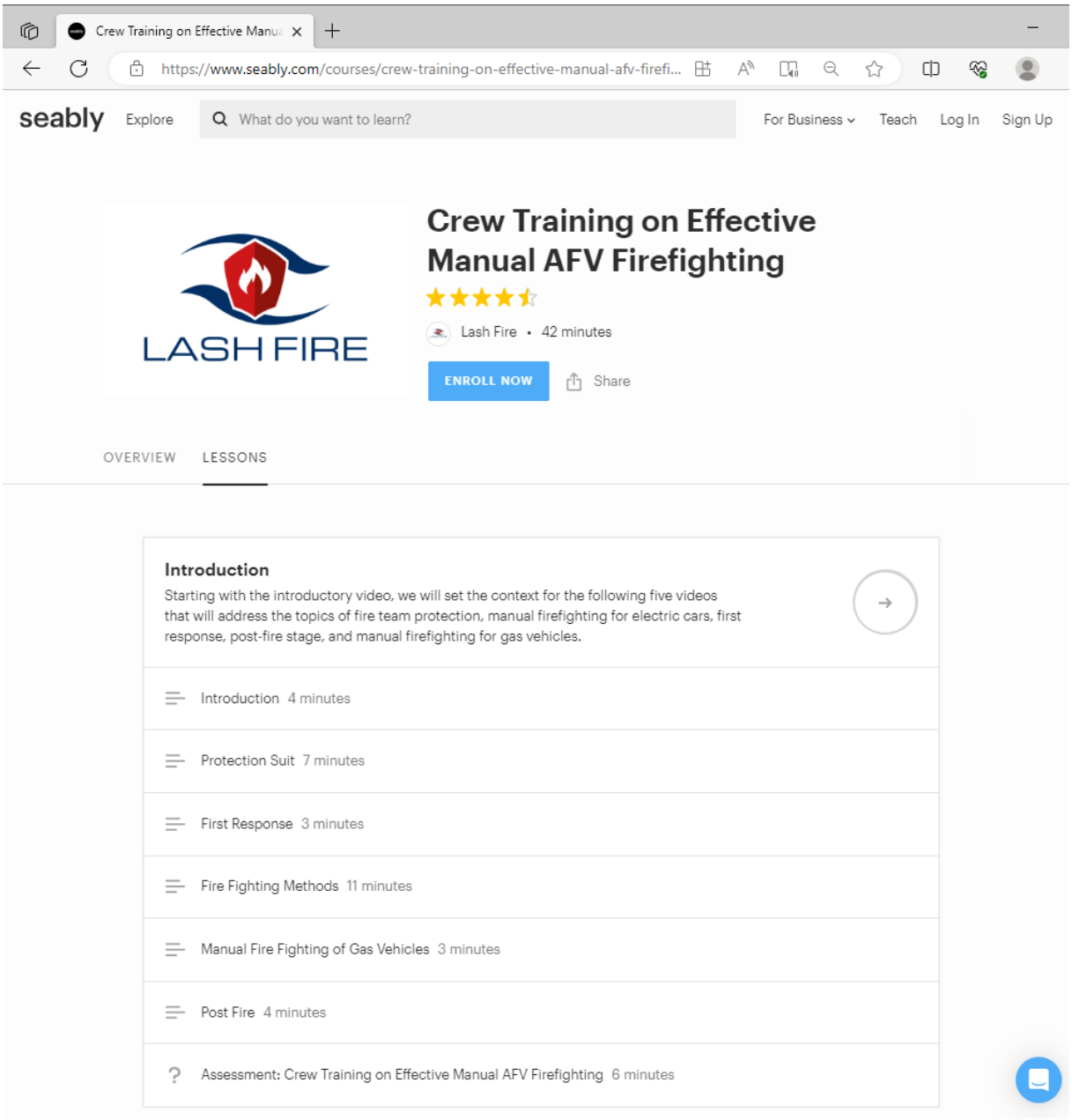

Figure 13: Lessons of the course "Crew Training on Effective Manual AFV Firefighting" at Seably

The LASH FIRE "Webinar – Fire on ro-ro deck" took place on 5 April 2023 and included a moderated discussion (in a studio at Stena) between the LASH FIRE partners Johan Roos (Interferry), Lena Brandt (DFDS) and Martin Carlsson (Stena), presentations given by Magnus Arvidson (RISE) and Jaime Bleye (Sasemar) and a Live-Demo at Sasemar moderated by Jaime Bleye and conducted by Sasemar firefighters. Due to early and intense promotion via e-mail, project website, Linkedin, Twitter and word of mouth, a total of 700 persons registered, and 360 persons participated. The link to the video recording was made available to all registered persons. The presentations were also made available. The feedback received via Linkedin, and other channels was very positive.

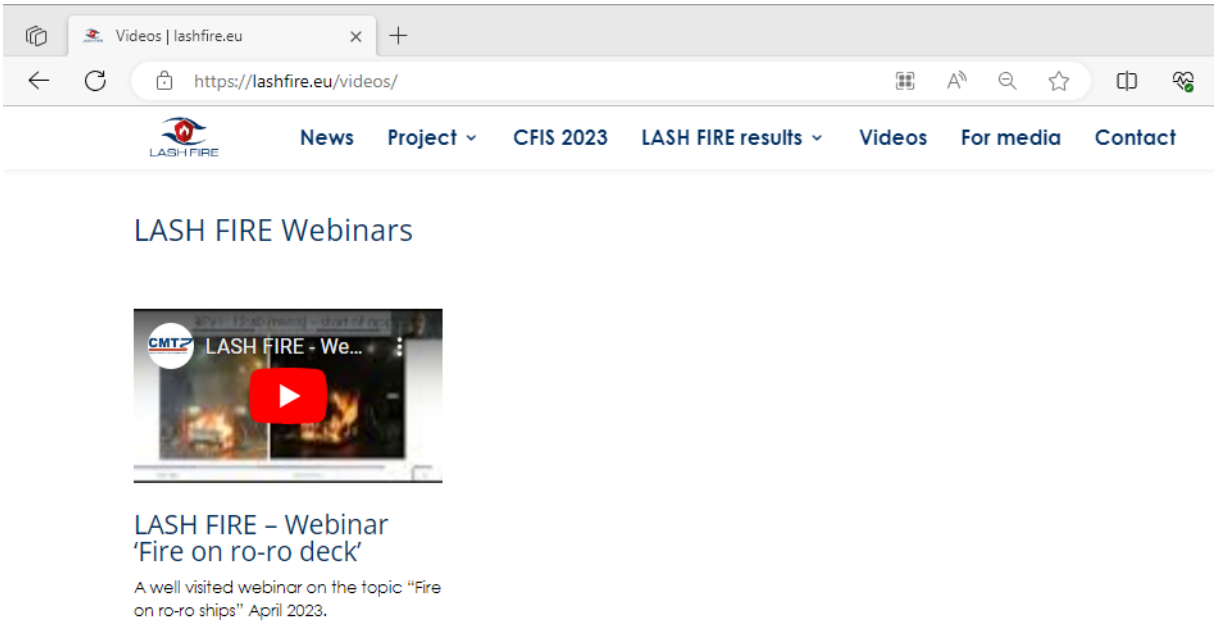

Figure 14: LASH FIRE Webinar on LASH FIRE website

At the Donsö Shipping Meet 2022 (DSM2022) three interviews were conducted by Grit Ladage, CMT2 and published on YouTube and the project website (see Figure 15).

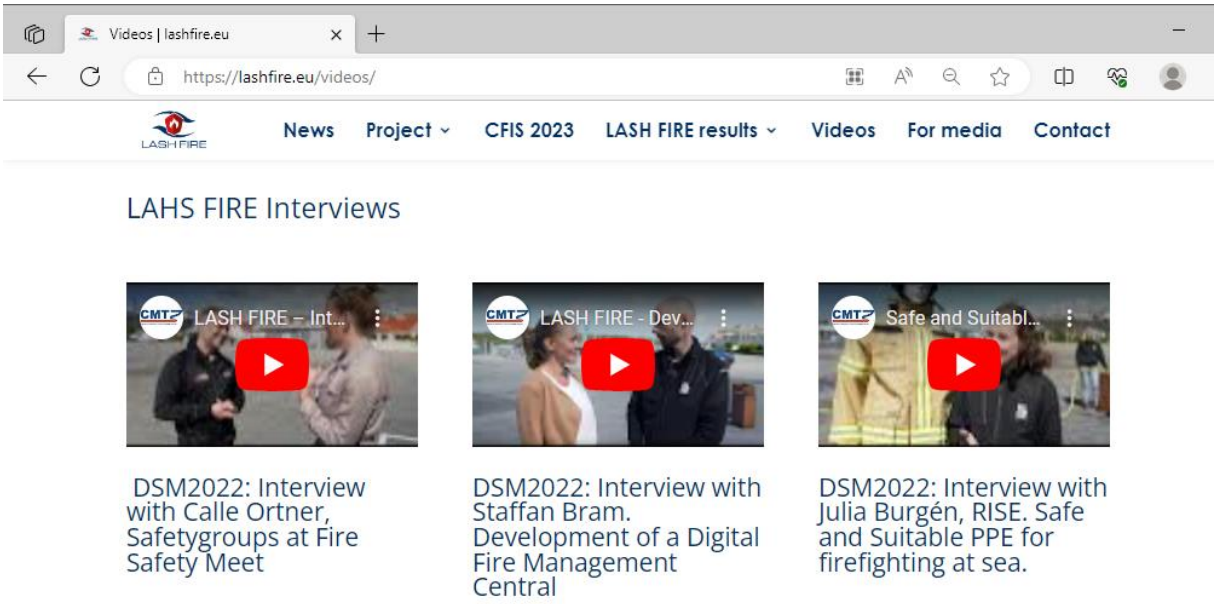

Figure 15: LASH FIRE Interview videos on LASH FIRE website

Eight Test & Demo videos are published on LASH FIRE website (see Figure 16).

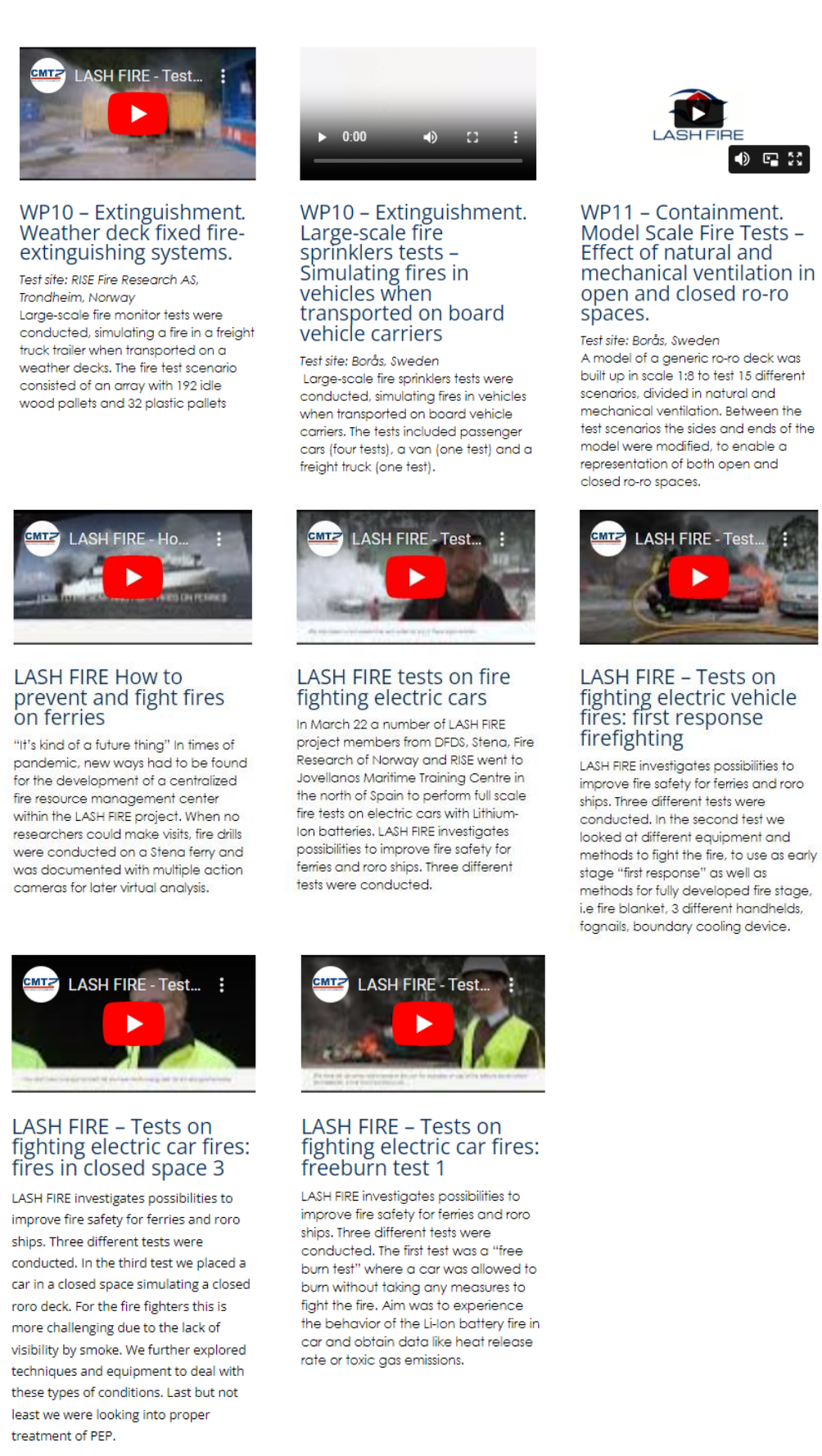

Figure 16: LASH FIRE Test & Demo videos on LASH FIRE website

4.2 Establishing cooperation with external partners and projects

The objective within this part of Task 3.2 is to monitor the market for innovative technologies and potential cooperation opportunities, that might be of interest for the consortium partners. The partners look at the totality of LASH FIRE and analyse each cooperation by phase/duration, what joint activities it held together, and the outcomes of those cooperative activities.

A first status has been shared with partners in "IR03.2 – First Report on external knowledge and established cooperation" followed by an updated version in IR03.4.

4.2.1 Take up of external developments and innovations

One of the tasks assigned to LASH FIRE is to develop intelligence and data gathering of relevant developments and projects external to the LASH FIRE project to facilitate knowledge transfer to all project partners. This task is focussing on reviewing potential technologies, research projects, industry data, European projects repositories, the LASH FIRE consortium partners' internal knowledge and databases, and input from both the project advisory groups namely the Maritime Operators Advisory Group (MOAG) and the Maritime Authorities Advisory Group (MAAG). The process splits into three different areas:

- Latest research and developments in fire-related technologies (hardware),
- Fire management, software tools to design and assess fire protection,
- Upcoming rules and regulations.

All the results from the data gathering are populated in the LASH FIRE External Research & Innovation Repository. Besides populating the repository, LASH FIRE conducted an in-depth analysis and provided guidelines for successful application to the end-users.

In order to understand the projects place amidst the multiple innovation developments and activities during the project runtime underway in this sector, it was important to gather the biggest possible amount of data related to those developments and see how they can relate to LASH FIRE's own activities and outputs. Thus, and within WP03, a methodology for review, analysis and cooperation with external developments and projects was developed. The focus lay on reviewing literature, research pertinent databases and news outlets, gather academic information, industry data, European projects repositories, the Partner's own internal knowledge and databases, and eventually also other LASH FIRE documents, such as internal reports and deliverables that might have been of use to the analysis.

The result is a repository of third parties' latest technologies and research initiatives, a live document which kept gathering and structuring information, and which at the end of the day facilitated communication between LASH FIRE, external entities acting within this sector and new innovative projects that complemented the work underway in the project.

Work description and timeline

Date	- July 20	Aug 20	Sep - Dec 20	02/'21	03/'21	04-06/'21	07/'21	08/'21	09/'21-07/'22	08/'22	Sep 22 -Jul 23	Aug 23
	Collection				Structuring			Analysis				
Description	1. Methodology 2. External development and projects collection phase 1	IR03.2	3. External development and projects collection phase 2	D3.3	1. Template and KPI for Rating system	2. Rating system process	3. Final selection	1.Template for analysis	2. Analysis 1	D3.4	3. Analysis 2	D3.8
WHO	CMT, MAG	CMT, MAG	WP03 + MAAG,MOAG	CMT, MAG	CMT, MAG	WP03 + MAAG, MOAG	CMT, MAG	CMT, MAG	WP03 partners		WP03 partners	

Figure 17: Overall methodology for developing external research and innovation repository

The methodology was organized in three phases, data collection, structuring, and analysis. In the first phase, WP03 partners identified and collected external developments and projects which looked promising to facilitate knowledge transfer to all project partners.

The focus of the research was directed to these sources:

- Direct contact with ship end users and authorities (MOAG and MAAG)
- Conferences
- Journals
- Technology Transfer from other industries
- The past and current national and international projects

From the collection process until February 2021, WP03 partners listed 32 external technologies as well as 25 RDI activities with reference to fire safety technology across industries that related to the objectives of LASH FIRE project.

The two Maritime Advisory Groups gave feedback to the ideas based on their expertise. In October 2020, MOAG and MAAG representatives were invited to review existing ideas and complement with any additional external developments and projects related to the LASH FIRE objectives. In particular, the MOAG members were provided with a Request for Information (RFI) on the technologies to include in relation to (ii) Ship operation and fire management on 16th October 2020. This was the first of three different phases of collection, structuring and analysis of the past and current developments as well as upcoming rules and regulations related to (ii) Ship operation and fire management. Seven MOAG members and seven MAAG members reviewed the external developments and projects provided and returned the data sheets to the project team by 30th November 2020.

The second phase, the structuring process, started in March 2021. In pursuance to find the most important external developments that would be analysed, the LASH FIRE project also inquired the inputs from MOAG and MAAG members during the structuring phase. Finally, the collected ratings led to the final selection of external development for further analysis.

The final phase concerns data analysis, where the selected projects/developments/research are studied in detail on. This analysis process started in September 2021. In this stage, there were three categories for analysis that would be shared between partners according to the expertise and network.

The last phase investigated the following features:

- requirements and targets in the shipbuilding, ship operation, specifically Ro-Ro ship environment
    - To understand the pertinence of the technology to LASH FIRE's own objectives
- technology readiness level
    - TRL level is ideally close to LASH FIRE's (5-7), that is, close to commercial application
- the impact / application
    - On which specific subsector(s) or areas does the technology impact
- technology gaps and Repeatability & Reproducibility
    - How the technology advances the state of the art, and how practical it is to reproduce
- technology advancement/Key Enabling Technology
    - Is it directly affecting a Key Enabling Technology as defined by Horizon 2020
- technology roadmap to fully application

- Near term (1-5 years), mid-term (5-10 years), far term (10+ years)
- analysis and recommendation for successful implementation
  - From the design, manufacturing, assembly, testing, and approval process

Table 2: List of external developments and projects (in alphabetical order)

External developments	External projects
Acoustic wave for fire suppression system	Albero - Transport of alternative powered vehilces on RoRo vessels
Adaptive escape routing signage	Beredskab Øst
Alphatrone – Visual fire detection	BREND 2.0
AR technology to facilitate Fire Safety Equipment (FSE) inspection and maintenance	CONTAIN – Fire Safety Strategies for Container Ships (DBI)
Autonomous Fire- fighting Robot (SAFFIR Project)	DNV Fire Safety EV Transport
CNG vehicle cylinders exposed to local fire	ECOPRODIGI
Consilium - Smart detection system	E-TOX project (Toxic gases from fires in EVs)
DAFO CO gas detector	FIRESAFE I and II
DBI Digital Emergency Planning	FIRST – Fire Strategies for Unmanned Island Ferries (DBI)
DBI Digital Self-Check & Control (conformity assessment)	Health risks and health effects of firefighters' work: Exposure, diseases, and preventive measures
DBI Projects	HydroPen
DIFFS nozzles (pop-up or non pop-up)	International Journal of Hydrogen Energy. Volume 39, Issue 11, 4th April 2014, pages 6169 – 6175
Drone for firefighting	Lagging fires
DRY-FLO	Lion Fire II
DryFlow drencher testing system	PALAEMON - A holistic passenger ship evacuation and rescue ecosystem
Electronically activated sprinkler system	PFAS Free firefighting agents
ElideFire	Safe and Suitable Firefighting
HydroPenTM system	SAFEMODE
Integrated fire safety information presentation	SafePASS
Intelligent Fire Monitor for Fire Robot Based on Infrared Image Feedback Control	SH2IFT
Interface fire detection and voice alarm	Suveren – Safety of Urban Underground Structures due to the Use of New EnergyCarriers
Laser-based sensor for fire detection	The Spread of Fire from adjoining vehicles to a hydrogen fuel cell vehicle
Rapid Early Fire Smoke Detection System Using Slope Fitting in Video Image Histogram	Water wall curtain system
Real-time video-based smoke detection with high accuracy and efficiency	White Paper on Electric Vehicles (Final)

External developments	External projects
Retrofitting IOT for fire detection system	Zoning for rescue operations against vehicles with alternative fuels
SICK rolling drone for gas detection	
Smoke and fire curtains for fire containment	
TWIN Fire detection system	
ULTRA FOG - High Pressure water mist sprinkler system for fighting fires	
UPTEKO	
Using BIM for simulating fire growth and evacuation performance	
Vision based fire detection system	

4.2.2 Cooperation with other RDI consortia and other external parties

LASH FIRE also looked into direct cooperation opportunities with other projects or third parties acting in sectors relevant to it. The different Work Packages have been doing various activities involving entities not within the consortium, but who have helped or contributed to the continued advancement of LASH FIRE. Such examples come in different forms, such as the collaboration with the ALBERO Project, the participation of Bridgehill, a sponsor of fire blankets in the WP06 EV fire trials but also contacts and trips onboard ships from operators external to the project, or aid of local firefighters.

The intention was to collect information regarding these different cooperation shelfs by LASH FIRE and aggregate them, which went through the different WP leaders, but since priority has been given to the external developments and projects repository and analysis.

From the collection process, WP03 partners listed 28 external projects with interesting topics related to fire safety technology across industries that related to the objectives of LASH FIRE project. The complete list of the external developments and projects can be seen in ANNEX A.

Several collaborations have been established with third parties which have cooperated in some fashion with LASH FIRE. Entities like Opel, Volkswagen or Bridgehill have in some way contributed to activities of the project, by donating materials or know-how towards the development of specific tasks.

A valuable collaboration was with the German project ALBERO, which set focus on the transportation of alternatively fuelled vehicles and associated risks. The project, which concluded in October 2021 was coordinated by the ISV, the German Institute for Ship's Safety and Safety Technology. LASH FIRE and Albero both investigated solutions for the improvement of safety of ro-ro ferries by adapting safety measures and facilities based on the new challenges. The Swedish LASH FIRE consortium member Swedish ferry operator STENA Line was engaged as associated partner in the Albero project managing the initiation of the cooperation between both projects. LASH FIRE partner CIMNE and Albero experts from the Fraunhofer FIKE collaborated and exchanged their findings in the field of ignition prevention and joined forces in the development of a system/software solution. In addition, regarding the aspect of cooling down a single vehicle, both projects set up a plan for a variety of joint tests, that took place at LASH FIRE partners Sasemar and RISE as well as at the respective Albero experts.

One important moment where external contribution was evident was the activity of Work Package 06 in which partners gathered at SASEMAR's centre in Gijon, Spain, to implement tests on fire in electric vehicles. This was a particular case in external cooperation as there were contributions from a couple of third parties, namely by Opel who made three EVs (Mokka) available for fire trials, and Bridgehill who brought one of their fire blankets to undertake a few tests as well as the boundary cooling device developed in the ALBERO project. The participation in some of ALBERO's events, and vice-versa, is further proof of this. The fire tests with the electric cars took place in April 2022 and were accompanied by a professional film team as well as a number of GoPro cameras from the project partners. Furthermore several posts were published on the social media platforms during these trials which gained the project a lot of awareness. Three videos of these tests, one per scenario, have been published in August 2022 as promotion for the second public conference CFIS on Fire Safety at Sea, which took place in October 2022.

Exchange of expertise in the various fields, joint tests and workshops (e.g. HazID) or contributions to each other's participation in the Formal Safety Assessment preparation were beneficial for both parties in order to achieve their specific objectives of the project.

Other important collaborations have been with ship operators, and on this point it is worth mentioning SAS's long-standing relationship with Spanish operator Balearia, which has allowed the project to undertake field work on board one of their ships, the "Abel Matutes", between Barcelona and the islands of Menorca and Mallorca, for Work Package 06, which has proven productive in terms of results by clarifying and putting to the test some ideas which had been developed within that WP.

It is also worth referring the participation of LASH FIRE partners in several different events and/or conferences, in which we can highlight the SEAFUTURE Conference 2021 in La Spezia, the Shippax Conference 2021 in Copenhagen (on board a ship which sailed to Oslo and back), as well as the collaboration with EMSA for the CFIS Conference.

There are further projects that were of interest for the LASH FIRE project, like the H2020 project SafePASS, which was investigating lifesaving appliances and systems for swift evacuation operations on high-capacity passenger ships. The LASH FIRE project management team received an invitation by this project for a collaboration workshop to exchange on possible opportunities to join forces and share work and results. This resulted in a participation to the SAFEPASS webinar, where first results from WP11 where shared by a presentation from the respective WP leader Pascal Boulet from Université Lorraine.

4.2.3 Conferences and scientific papers

The publication of scientific work, which shared concrete project developments and results addressed the scientific community and academia.

Scientific papers offer the opportunity to ensure the widest and most sustainable dissemination and use of research results that have been publicly funded, thereby improving the reproducibility of research results and facilitating knowledge transfer between different actors in the field of innovation.

In LASH FIRE, by the time of this report thirteen (13) scientific publications have been accepted or published, not counting the public project deliverables. Most of the published conference papers have been archived on the Zenodo repository and with reference set to the OpenAire platform.

4.3 Identification and communication of requirements

4.3.1 Acceptance by and consensus with Maritime Advisors

The Maritime Advisory Groups consist of two pre-identified, selected and committed external parties which have a prime interest in the work of the project due to their daily business and expertise.

4.3.1.1 Maritime Operators Advisory Group

The first group, the Maritime Operators Advisory Group (MOAG) involved ship end-users and users of innovative firefighting technologies, facilitators (equipment suppliers and shipyards), and other maritime stakeholders such as insurance companies. The main purpose of the MOAG is to ensure practical feasibility and broad acceptance of new technologies, rules and regulations by the users.

The MOAG is coordinated and facilitated by Interferry (INF2), an association representing the ferry industry on an international level. Interferry is the partner who facilitates and monitors the activities of the MOAG and provides direct contact between the MOAG members and the partners of the consortium.

The membership of the Maritime Operators Advisory Group (MOAG) is as follows:

Eleven ship end-users:

- Balearia Lines, Spain
- British Columbia (BC) Ferries, Canada
- Calmac Ferries, Scotland
- Condor Ferries Ltd, UK
- DFDS, Denmark
- Grimaldi Group, Italy
- Mitsui O.S.K. Lines, Ltd., Japan (MOL)
- Scandlines, Denmark
- Stena Rederi AB, Sweden
- Wallenius Marine AB, Sweden
- Volkswagen Konzernlogistik

One end-user of innovative firefighting technologies:

- RelyOn Nutec, Holland

Two facilitators, one equipment supplier and one shipyard:

- SHIFT, previously Sterling PBES Energi Solutions Ltd, Canada
- FSG Design GmbH, Germany

Three associations of marine insurers;

- International Group of P & I Clubs
- International Union of Marine Insurance (IUMI)
- The Nordic Association of Marine Insurers (Cefor)

The establishment of the Maritime Operators Advisory Group (MOAG) is complete with a total of seventeen members, eleven of which are first class operators and end-users of ro-ro passenger, ro-ro cargo and pure car carrier vessels, an end-user of innovative firefighting technologies, two facilitators

consisting of an energy equipment supplier and a shipyard and three associations of marine insurers (see Figure 18).

Figure 18: The Maritime Operators Advisory Group (MOAG)

4.3.1.2 Maritime Authorities Advisory Group

The Maritime Authorities Advisory Group (MAAG) consists of representatives of Flag states Authorities/Organisations and was established with the following objectives:

- to collect input regarding future regulations and legislations, to analyse and discuss this and to find consensus in view of the proposals to be elaborated by the project
- to allow for review of the project results and discussion of regulatory aspects and proposals prior to communicating them to the International Maritime Organisation (IMO) with a view at facilitating a wide support and consensus of the findings and increases the probability of formal implementation.

The membership of the Maritime Authorities Advisory Group (MAAG) is shown in Table 3 and Figure 19.

Table 3: Membership of the Maritime Authorities Advisory Group (MAAG)

The membership of the Maritime Authorities Advisory Group (MAAG) is as follows:
Belgium
Finland
France
Germany
Italy
The Netherlands
Norway
Panama
Sweden
United Kingdom
European Maritime Safety Agency (EMSA)

For the purposes of MAAG coordination the following organisations are also part of the MAAG:

Bureau Veritas (Partner in LASH FIRE Consortium)
Magellan (Partner in LASH FIRE Consortium)
RINA (external to the LASH FIRE consortium in support of the Italian Authorities)

Liaison with the Project will be facilitated by the MAAG Member through one person, the appointed MAAG Member's representative. This representative is appointed by the national authorities as an expert with specific expertise on safety hazards of fire and innovations in ro-ro ship environment.

As a partner in the LASH FIRE Consortium, SEA Europe (the European Association of Shipyards and Maritime Equipment Manufacturers) is coordinating MAAG's activities. Memorandum of Understanding Agreements have been signed with MAAG members (except for those partners in the LASH FIRE consortium).

Figure 19: The Maritime Authorities Advisory Group (MAAG)

4.3.2 Joint MAAG and MOAG workshops

The two advisory groups were established under Task 03.3, their meetings were arranged and documented and the consortium was informed of the outcomes. Both groups met more than ten times during the duration of the project, focusing on specific topics. Meetings were arranged, as far as practicable back to back with other events, such as the relevant IMO working group meetings, Interferry and CFIS conferences. The status of the advisory groups and the outcomes of discussions were documented in internal reports, which are included in the dissemination and exploitation reports.

The Memorandum of Understanding (MoU) envisaged the Advisory Groups meeting four times as a minimum during the duration of the project. Unfortunately, the significant impact of the COVID – 19 pandemic has made physical meetings impossible since the end of March 2020 but a series of 10 solution workshops has been conducted since the first report, D03.3 where both groups were represented for the assessment of the 20 actions of the project.

4.3.2.1 First Joint Advisory Group Meeting 5th March 2020, London, attended by MAAG & MOAG

A joint advisory group meeting was held of the MAAG and the MOAG on 1400 – 1730 on 5th March 2020 London, "back to back" with IMO SSE 7 session. The meeting was very well attended by ten MAAG members, EMSA, four MOAG members, and co-ordinated by the partners of CMT2, RISE, Sea Europe, Interferry, and Flow Ship Design.

The meeting consisted of presentations providing General Introduction to the LASH FIRE project, Ship Integration and Selected Generic Ships, Facilitation of Maritime Advisory Groups, Formal safety assessment and New Risk approach, based on space type cargo capacity, Horizontal Action on Fire and Electric Vehicles, Prioritisation of safety Challenges addressed in LASH FIRE and a Workshop.

4.3.2.2 Fires in Alternatively Powered Vehicles on board Ships Webinar, 14th October 2020

A webinar on Fires in Alternatively Powered Vehicles Onboard Ships webinar was hosted by the Consortium on 14th October 2020, co-ordinated by Interferry, Sea Europe, CMT2 and Magellan.

A range of presentation were given which are available on the LASH FIRE website. The webinar was attended by more than 300 persons from all aspects of industry and the public. The webinar was considered a great success and an excellent way to disseminate information to all parties.

4.3.2.3 Series of solution workshops

Between June 2021 and June 2022, a series of 9 technical workshops (See Table 4: Meeting schedule of MAAG and MOAG workshops) were held with the representatives of the two LASH FIRE Advisory Groups, the Maritime Operators Advisory Group (MOAG) and the Maritime Authorities Advisory Group (MAAG), to assess the 20 challenges/actions and the 40 associated Risk Control Measures (RCMs).

During the workshops #1to #8 action leaders presented solutions / Risk Control Measures (RCMs) and the MOAG / MAAG ensured practical feasibility & consensus. During workshop #9 a final review of the risk control measures was conducted.

Table 4: Meeting schedule of MAAG and MOAG workshops

No	Date	Action	Title of action
#1	2 June 2021	6-A 10-A	Manual screening of cargo fire hazards and effective fire patrols Automatic first response fire protection systems
#2	1 Sep 2021	6-B 11-A	Quick manual fire confirmation and localization Division of ro-ro spaces
#3	13 Oct 2021	11B 11C	Ensuring Safe Evacuation Safe design with ro-ro-space openings
#4	24 Nov 2021	7-A 9-A	Improved fire detection system interface design Detection on weather deck
#5	15 Dec 2021	6-C 8-B 10-B 11-D	Efficient first response Guidelines and solutions for safe electrical connections Weather deck fixed fire-extinguishing systems Ro-ro space ventilation and smoke extraction
#6	23 Feb 2023	9-B 10-C	Detection in closed and open ro-ro spaces Updated performance of alternative fixed fire-fighting systems
#7	6 April 2022	7-B 8-A 9-C	Efficient extinguishing system activation and inherently safe design Automatic screening and management of cargo fire hazards Technologies for visual fire confirmation and localisation
#8	11 May 2022	6-D 7-C 8-C	Effective and efficient manual firefighting Firefighting resource management centre Fire requirements for new ro-ro space materials
#9	1 June 2022	all	Final review of risk control measures

4.3.2.4 Level of Support workshop

A final concluding workshop was organised on 7 and 8 June 2022 to involve the representatives of the two Advisory Groups in the decision making and selection process of the Risk Control Options

(RCOs) emerging from the review results of the of the Risk Control Measures (RCMs). In doing so, the stakeholders of the two Advisory Groups were invited to indicate their level of support for the solutions to be taken forward. The Advisory Groups' input served as an indication in the assessment process by the LASH FIRE Consortium along other categorized assessment criteria i.e. Ship's integration, Cost, Regulatory compatibility and Risk reduction (see Table 5).

WP05	WP05	WP03 (BV)	WP04	WP03
Ship integration	Cost	Regulatory compability	Risk reduction	Inputs from maritime stakeholders
High	Low	Easily integrable	High	High support
Medium	Medium	Integrable	Medium	Medium support
Low	High	Hardly integrable	Low	Low support
Not integrable		Change of philosophy	Increase of fire risk	
N/A	N/A	N/A	N/A	N/A
		No opinion		

Table 5: Mentimeter rating

In order to ease the evaluation during the final workshop organized, the 'Mentimeter' application was used (www.menti.com) allowing participants to score the various solutions from 'No support' to 'Full support'.

4.3.2.5 Advisory Group Meeting during CFIS 2022 , attended by MAAG & MOAG

An advisory group meeting was held in the evening before the CFIS 2022 - Conference on Fire Safety at Sea, on 10th of October 2022 to sum up the input received from both Advisory Groups and inform on the way forward of the LASH FIRE project.

4.3.2.6 Final Advisory Group Meeting during CFIS 2023 , attended by MAAG & MOAG

The final advisory group meeting took place in the afternoon before the CFIS 2023 in Pula, Croatia on 27 June 2023. Project partners presented project results, FSA and Risk Control options and the MAAG / MOAG members gave feedback (see Figure 20).

Figure 20: Final MAAG / MOAG meeting in Pula, Croatia

4.4 Remove external Barriers towards Application

4.4.1 Increasing critical mass amongst European Shipbuilding and Equipment Community

For assuring appropriate dissemination, three public conferences were organised to share information on the research conducted in the project, share findings from fire test, simulation studies, and other trials with the stakeholders.

The series of "CFIS – Conferences on FIre safety at Sea" started with a virtual meeting in October 2021. The second CFIS conference, which set focus on safe carriage of AVFs and effective fighting of AVF fires, took place on 11 October 2022 as a hybrid event in Lisbon, Portugal. The conference was hosted by the partners, CIMNE, Sasemar and Magellan, with strong support from RISE and CMT. The event took place in the great hall of EMSA, the European Maritime Safety Agency, which further underlines the strong support the project receives from the authorities (see Figure 21).

Figure 21: Therese Bornemann Christensen from Danish Maritime Authority speaking at the CFIS 2022

The final CFIS conference took place in-person only in Pula, Croatia on 28 June 2023. The event was hosted by project partners FLOW Ship Design and CMT2 with strong support from Magellan. 130 persons attended the meeting. Roll-ups were produced for each work package and displayed during the event. A calendar for 2024 with LASH FIRE results was produced and handed out together with the final project brochure to the CFIS 2023 participants as a give-away. The agenda of the CFIS 2023 can be found in the Annex B.

Advertising the conferences and speakers / panelists via e-mail, on the LASH FIRE website, and social media (Linkedin and Twitter) made the conferences a huge success. In 2023 more than 1250 person followed LASH FIRE on Linkedin.

LASH FIRE organised a webinar on Weather deck fire safety moderated by Interferry on 19 January 2023.

The project and its results were presented at a Joint EMSA / Sea Europe Workshop in Lisbon on 23 February 2023.

The work package 6 leader was invited as an expert to give a presentation (remotely) at the Australian 'Carriage of Alternatively Fuelled Vehicles (AFV) on RoPax Ferries Workshop' organised by SEALINK and Thompson Clarke on 8 March 2023.

Due to substantial advertisement through the channels mentioned above the Webinar - Fire on ro-ro deck with live discussion, presentations and demo held on 5 April 2023 was a huge success. 700 persons registered and 360 persons participated in the workshop.

The Swedish Club hosted a two-part webinar named "Fire! Electric vehicles on board - should we be worried?" on 26 April 2023 and 26 May 2023. Presentations were given by the coordinator, the work package 10 leader, a member of the Maritime Operators Advisory Group (MOAG) and two representatives of ship operators.

An APV fire workshop for regional stakeholders at Jovellanos Training Centre (SAS) was held on 30 May 2023.

LASH FIRE participated with a seminar and demos at Donsö Shipping Meet - Fire Safety Meet - 28-30 August 2023.

4.4.2 Proposal administration, review and input

In the context of LASH FIRE WP4: Formal Safety Assessment, the Consortium partners were seeking to develop a Comprehensive ro-ro space fire database. The objective being to decrease the degree of accident under-reporting, to consolidate information from various sources, and to include near-misses and other casualty-related data into one single database.

The importance of the availability of a comprehensive casualty database has been highlighted numerous times at IMO (III 4/4/3). In addition, the IMO FSA experts group also noted that near-miss data may facilitate the hazard and risk analysis (MSC 93/6/2).

The information relevant to the Consortium partners would include any casualty related information (structured databases, accident investigation reports, or lessons learned…) concerning fire/explosion events on ro-pax, ro-ro cargo ships, and vehicle carriers.

The collection of information through MAAG took place by correspondence. SEA Europe also facilitated exchange of information between the partners in the LASH FIRE consortium responsible in charge of WP4 and EMSA. EMSA was very supportive with the retrieval of data available under the EMCIP and MARINFO data bases and the correlation with the IMO GISIS database. Due to the potential sensitive nature of sharing such data, a limited amount of MAAG representatives have been able to share data from their national casualty database.

Furthermore, there was a request from Work Package (WP) 04 leader on 24th June 2020 for the MOAG ship end-user members to provide lane metre (LM) data for their whole fleet of vessels. This was used in a fleet analysis to calculate the exposure time of their fleet in terms of LM in closed/open ro-ro/weather deck. A template was provided which was returned by August providing fleet data as requested for more than 240 vessels.

4.4.3 Review, collation and co-operation of external developments and projects

LASH FIRE also aimed to develop a dialogue with policy makers, Flag States and other international stakeholders who actively participated in the definition of rules and legislation in this field. In order to achieve this, several channels of communication have been initiated during the project to facilitate the adoption of the developments and breakthroughs of LASH FIRE by these entities. Thus, more

than impacting these players via public events and general awareness activities within the project, it was important to engage them by constantly sharing information, results and outputs of LASH FIRE directly, making the most of the not only the broad existing network that the Consortium have, but also the structure set up by the project itself, such as the Advisory Groups and activities that involve external players.

The necessity of establishing this constant communication cannot be understated – it was paramount that the main international decision makers of this sector are aware of the developments and results of LASH FIRE, and what it intends to do. So, when ultimately the policy recommendations, guidelines proposals, methods and techniques developed and tools created were ready to be put in place, there is no growing pains or any other barrier for them to be incorporated into the normal procedures for which all these players are responsible.

What is more, this approach means the project will help improve cooperation between sub-sectors, authorities and active players, which was identified as an issue within the current context and indeed one of the reasons why some of these actions were foreseen: by setting up this dialogue with these entities in a multilateral fashion, LASH FIRE also increased their awareness for these horizontal issues, making them more involved and engaged with these matters.

Despite 2020 not having been the most conducive time to engage in direct, personal communication with these contacts, the actions taken by LASH FIRE have aimed to start that conversation, by making policy makers aware of the objectives of the project and the early developments of the actions already underway.

The public availability of project results, the publication of LASH FIRE-related content in various sectoral publications, the continuous dissemination of activities through communication LASH FIRE organizations responsible for policy-making, in terms of more concrete planned actions help to exploit the project results. To this end, there is still the Exploitation Plan, which will help to understand in detail how LASH FIRE ensures its intended impact with policymakers. These barriers will be reduced and removed for the application of its results.

4.5 Exploitation and Implementation

The development and update of the exploitation plan of the project was published with the deliverable D03.9 *Final exploitation plan* presenting how to initiate, facilitate, monitor and report dissemination activities and to elaborate the exploitation plan, relying on the technical input from all partners and work packages.

The LASH FIRE report D04.8 on the *Impact on regulations by new solutions and consolidation of new proposals for regulations* provided an assessment of the cost-effective technical and operational solutions against the current status of the regulations to identify any potential conflicting regulations or barriers to their implementation. The specific regulatory proposals are developed in a way to be presentable to the relevant decision makers in an auditable and traceable manner.

Whilst the amendment opportunities are coming to an end and concern the output on the revision of SOLAS Chapter II-2 and associated codes to minimize the incidence and consequences of fire in ro-ro spaces and special category spaces of new and existing Ro-ro passenger ships, LASH FIRE provides input in the current IMO process. However, any other recommendations related to Ro-ro cargo and Vehicle carriers could be communicated to IMO for future work. Concrete proposals for amendments to IMO regulations are provided in LASH FIRE Report D04.8 on the *Impact on regulations by new*

solutions and consolidation of new proposals for regulations, containing the results from the cost-effectiveness assessment and the screening of impact on regulations.

Moreover, the LASH FIRE findings related to Alternative Powered Vehicles will supported the IMO new output on '*Evaluation of adequacy of fire protection, detection and extinction arrangements in vehicle, special category and ro-ro spaces in order to reduce the fire risk of ships carrying new energy vehicles'*.

Finally, LASH FIRE results might be subject to recommendations for additional IMO guidance involving classification societies/P&I or for request for new outputs in the context of SOLAS 2028. Outside of IMO framework, the LASH FIRE outcome may serve as a basis for stand-alone P&I Clubs or classification societies to issue guidelines (input on revision of class notations), or national/EU regulations.

A lunch-time presentation on LASH FIRE results was given at MSC107 on 2 June 2023.

An Information (INF) paper with the outcome of the project was prepared during the project run-time and will be submitted to MSC108 [IMO Maritime Safety Committee], which will take place in 2024.

5 Monitoring and evaluation of activities

Main author of the chapter: Grit Ladage / Carola Dörrie, CMT2

All activities, which are assigned to the field of Dissemination and Communication, are regularly reported by the partners in a prepared Excel table. Partners are requested and reminded to report latest activities through the monthly newsletters and project internal meetings, e.g. WP03 or CMG meeting addressing all the work package leaders but also the General Assemblies addressing all partners. The table is monitored on a regular base.

5.1 Management of communication and dissemination activities

The table for reporting on communication and dissemination activities is based on the queries of the ECAS - Participant portal, the official platform to report the current status of the projects to the European Commission. The reporting table is divided into three tabs. The first tab is for reporting any activity without scientific and peer-reviewed requirements. This includes their general communication activities, as there are interviews and articles in scientific journals, organisations of participations in conferences and workshops, and media campaigns amongst others. The second tab concerns scientific and peer-reviewed papers. These are subject to a publication obligation towards the EC, the so-called open access, and are reported separately. Scientific papers can be student master theses or diploma theses but also scientific contributions which are presented at congresses.

Each partner is requested to enter its activities in the reporting table immediately, i.e. already at the idea stage but at the latest after implementation. During the General Assemblies the project partners are regularly reminded to use this table and asked to add outstanding entries.

The third tab contains information on the individual queries and thus serves as an aid to the partners in reporting the activities. This ensures consistent and nearly complete reporting.

The current status amounts to 165 communication activities in various fields as well as 13 entries on scientific publications. A list of the scientific publications can be found in Table 6.

Table 6: List of scientific publications

Title	Authors	Title of the Journal/Proc./Book
Experimental study of radiation attenuation using water curtains in a reduced-scale deck of a ro-ro ship	Zeinali, Davood; Ingold, Florian; Acem, Zoubir; Rabah Mehaddi; Parent, Gilles; Collin, Anthony; Boulet, Pascal	1st International Conference on the Stability and Safety of Ships and Ocean Vehicles
A Geolocation and Smart Alert System for Nearby First Responders on Roll-on/Roll-off Vessels	Paschalis Mpeis; Jaime Bleye Vicario; Demetrios Zeinalipour-Yazti	ERCIM News 123, Special theme: Blue Growth
The Anyplace 4.0 IoT Localization Architecture	Paschalis Mpeis; Thierry Roussel; Manish Kumar; Constantinos Costa; Christos LaoudiasDenis; Denis Capot-Ray; Demetrios Zeinalipour-Yazti	21st IEEE International Conference on Mobile Data Management (MDM), Versailles, France, 30 June-3 July 2020
Indoor Quality-of-position Visual Assessment Using Crowdsourced Fingerprint Maps	Christos Laoudias; Artyom Nikitin; Panagiotis Karras; Moustafa Youssef; Demetrios Zeinalipour-Yazti	ACM Transactions on Spatial Algorithms and Systems
SMAS: A Smart Alert System for Localization and First Response to Fires on Ro-Ro Vessels	Paschalis Mpeis; Jaime Bleye Vicario; Demetrios Zeinalipour-Yazti	The 16th ACM International Conference on Distributed and Event-based Systems (DEBS '22), Association for Computing Machinery, Copenhagen, Denmark, 27th June – 30th June 2022.
Zero Infrastructure Geolocation of Nearby First Responders on Ro-Ro Vessels	Paschalis Mpeis; Jaime Bleye Vicario; Demetris Zeinalipour	International Conference on Computer Applications in Shipbuilding 2022, 13-15 September, 2022, Yokohama, Japan
Miten hallita ro-ro-tilojen aukkoihin liittyviä paloriskejä?	Tissari, Alexandra; Verma, Nikhil; Korhonen, Timo; Kling, Terhi; Hakkarainen, Tuula	Palotutkimuksen päivät 2021, Pelastustieto Special Issue
AnyplaceCV: Infrastructure-less Localization in Anyplace with Computer Vision	Paschalis Mpeis; Athina Hadjichristodoulou; Ioannis Ioannides; Demetrios Zeinalipour-Yazti	23rd IEEE International Conference on Mobile Data Management (MDM '22), Paphos, Cyprus, June 6 - 9, 2022.
“Seafarers should be navigating by the stars”: barriers to usability in ship bridge design	Brit-Eli Danielsen, Margareta Lützhöft, Torgeir Kolstø Haavik, Stig Ole Johnsen & Thomas Porathe	Cognition, Technology & Work
Method for the definition of fire ignition frequency based on type of ro-ro spaces in ro-ro ships	Eric De Carvalho; Matthieu Gadel; Léon Lewandowski; Antoine Breuillard	
Main Causes of Cargo Fire Incidents in Ro-Ro Spaces: An analysis over the last 25 years	África Marrero, Paco Gasparín, Francisco Rodero and Pablo Sanz	Urban and Maritime Transport
Water Spray Fire Suppression Tests Comparing Gasoline-Fuelled and Battery Electric Vehicles	Magnus Arvidson and Örjan Westlund	Fire Technology
Lash fire – reitti ro-ro-alusten parempaan paloturvallisuuteen	Hakkarainen, Tuula; Tissari, Alexandra; Verma, Nikhil; Korhonen, Timo; Kling, Terhi	Pelastustieto: Palontorjuntatekniikka-erikoisnumero

5.2 Open Access for scientific publication and research data

"Open Access" (OA) stands for the practice of online access to scientific information that is publicly available, free of charge and re-usable. Following a pilot action in the Seventh Framework Program for Research and Technological Development (FP7), OA was enshrined as a general principle in the current EU Framework Program for Research and Innovation Horizon 2020. It states that:

"Each beneficiary must ensure open access (free of charge, online access for any user) to all peer-reviewed scientific publications relating to its results." - Annotated Model Grant Agreement Art. 29.2

This means that, in principle, scientific publications under a Horizon 2020 funded project must be made available online free of charge and in the public domain. With respect to research and innovation, "scientific information" includes:

1. peer-reviewed scientific research articles (published in academic journals), and

2. research data (data on which publications are based, curated data, raw data).

In practice, the transition to open access as a publication standard involves two steps: storing publications in repositories/online archives and providing open access to these data. Open access can be provided via two strategies:

- 'gold' open access (open access publication):

First publication of articles, monographs, edited volumes, etc. in an OA journal or with an OA publisher. Gold Open Access publications usually incur publication fees.

- Green" Open Access (self-archiving):

Simultaneous or subsequent archiving of the published article or final peer-reviewed manuscript in an online repository (institutional or subject-specific). There is usually no direct cost to the author. For the LASH FIRE project, the Zenodo platform is the main repository for the publication of research data and scientific publications. Zenodo is the general Open Access repository developed under the European OpenAIRE program and operated by CERN. Since nearly no deliverable in the project is subject to confidentiality but all are public, the Zenodo platform is used to publish the scientific papers.

6 Project internal communication

Main authors of the chapter: Grit Ladage / Carola Dörrie, CMT2

WP03 also monitored and managed the internal communication flows of the project consortium. The work package leader also contributed to the monthly consortium newsletter distributed by the Project Management Group. Support and guidelines to inform the partners about the communication possibilities and rules are necessary to assure that certain requirements set by the European Commission are fulfilled and also to prevent confidential information from leaking to the outside.

6.1 Templates and guidelines

In the LASH FIRE project, a guideline for dissemination and communication activities was developed and uploaded to the common project management platform Microsoft Teams to ensure access to the partners. It contains, among other things, instructions for the use of the funding reference or the procedures for the approval process of scientific publications. In addition, a wide variety of templates have been created for communication purposes to ensure a uniform presentation when

disseminating information. For example, there are templates for internal and external reports, Word templates or PowerPoint templates for presentations within the project (e.g. for the general assemblies) or for external events that require the funding reference. In addition, a clear and comprehensive PowerPoint presentation template was made available to the partners, which depicts the project in its entirety. If required, the respective partner can use the relevant slides and incorporate them into his own presentation. Finally, a narrow version was also created, which summarizes the project on two PowerPoint slides as can be used for short mentions in the course of a presentation.

7 Conclusion

Main author of the chapter: Grit Ladage / Carola Dörrie, CMT2

This report outlines the communication strategy and reports on the measures taken. As identified in the plan, key undertakings have been carried out, ensuring that the project reaches a large number of persons to help achieve the goals. The project relied on the constant and committed cooperation of all consortium members in order to communicate their involvement and to promote their work within the project. This is to assure the greatest possible reach and thus an optimized influence, finally paving the way for the adaptation of the existing fire safety regulations to significantly improve fire safety for ferries. In addition, the project collation on external research and innovation activities can be found in the Annex A.

8 Indexes

8.1 Index of tables

8.2 Index of figures

Annexes

A: List of external developments and projects resulting from the structuring process

Table 1: Input gathered from partners

Name of Technology	Link	Related Work Package	Related Action	Related Partner
Acoustic wave for fire suppression system	Webpage	WP10	10-A	RISE
Electronically activated sprinkler system		WP10	7-B, 10-A	NSR, RISE
Vision based fire detection system	PDF-File	WP09	9-C	FRN
Interface fire detection and voice alarm	PDF-File	WP09	7-A, 9-C	NSR, FRN
Laser-based sensor for fire detection	PDF-File	WP07, WP09	7-A, 9-C	NSR, FRN
Using BIM for simulating fire growth and evacuation performance	PDF-File	WP11	11-B	LUL
AR technology to facilitate Fire Safety Equipment (FSE) inspection and maintenance		WP06	6-A	SAS
Adaptive escape routing signage	PDF-File	WP11	11-B	LUL
Smoke and fire curtains for fire containment	PDF-File	WP11	11-A	LUL
Intelligent Fire Monitor for Fire Robot Based on Infrared Image Feedback Control	PDF-File	WP06, WP07, WP08	8-A, 7-A. 6-A	SAS, NSR, CIM
Rapid Early Fire Smoke Detection System Using Slope Fitting in Video Image Histogram	PDF-File	WP09	7-A, 9-C	NSR, FRN
DIFFS nozzles (pop-up or non pop-up)	PDF-File	WP10	10-B	RISE
HydroPenTM system	Webpage	WP10	10-B	RISE
TWIN Fire detection system	Webpage	WP09	9-B, 9-C	FRN
CNG vehicle cylinders exposed to local fire	Online-Report	WP11		LUL
ElideFire®	Webpage	WP10	10-A	RISE
Real-time video-based smoke detection with high accuracy and efficiency	PDF-File	WP09	9-B, 9-C	FRN
DryFlo drencher testing system	Webpage	WP10	10-B	RISE
DAFO CO gas detector		WP09	9-B, 9-C	FRN
Consilium - Smart detection system		WP09	9-B, 9-C	FRN
DBI Digital Emergency Planning	Webpage	WP05	5-D	ULJ
DBI Digital Self-Check & Control (conformity assessment)	Webpage	WP09	9-B	FRN
DBI Projects	Webpage	WP05	5-D	ULJ
UPTEKO	Webpage	WP05	5-B	ULJ
Ultrafog	Webpage	WP10	10-C	RISE
SafePASS - Next generation of life Saving appliances and systems for saFE and swift evacuation operations on high capacity PASSenger ships in extreme scenarios and conditions	Webpage	WP05, WP09	5-B, 9-B, 9-C	ULJ, FRN
SAFEMODE - Strengthening synergies between Aviation and maritime in the area of human Factors towards achieving more Efficient and resilient MODE of transportation	Webpage	WP05	5-B	ULJ

Name of Technology	Link	Related Work Package	Related Action	Related Partner
PALAEMON - A holistic passenger ship evacuation and rescue ecosystem	Webpage	WP06	6-D	SAS
Albero - Transport alternativ betriebener Fahrzeuge auf RoRo-Fährschiffen	Webpage	WP05, WP08, WP09	5-B, 8-B, 9-B	ULJ, CIM, FRN
Lion Fire II	Webpage	WP10	10-B	RISE
PFAS Free firefighting agents	Webpage	WP10	10-B	RISE
Lagging fires	Webpage	WP09, WP11	9-B, 11-C	FRN, LUL
CONTAIN – Fire Safety Strategies for Container Ships (DBI)	Webpage	WP09, WP11	9-B, 11-B	FRN, LUL
FIRST – Fire Strategies for Unmanned Island Ferries (DBI)	Webpage	WP09, WP10	9-B, 10-B	FRN, RISE
ReliS - Reliable Sprinkler		WP10	10-B	RISE
Protective clothing during fires and thermal rush in Li-ion batteries in e-vehicles	PDF-file	WP06, WP07	6-D, 7-A	SAS, NSR
Zoning for rescue operations against vehicles with alternative fuels	PDF-file	WP06, WP07	6-C, 6-D	SAS

B: CFIS 2023 - Conference on Fire Safety at Sea - Agenda

Table 2: Agenda

CFIS 2023

FINAL AGENDA

28 JUNE 2023 | PULA, CROATIA

CONFERENCE ON FIRE SAFETY AT SEA

CFIS 2023

CFIS 2023 CONFERENCE ON FIRE SAFETY AT SEA

FINAL AGENDA

28 JUNE 2023 | PULA, CROATIA

Time	Title	Speaker	Organisation
	Morning theme: LASH FIRE		
08:30-09:00	Registration, check-in and sound check		
09:00-09:10	Welcome by LASH FIRE Coordinator and Host	Franz EVEGREN, Vito RADOLOVIC	RISE, Flow Ship Design
09:10-09:30	Introduction to the LASH FIRE Project	Franz EVEGREN, Eric DE CARVALHO	RISE, Bureau Veritas
09:30-09:50	Effective and Efficient Alternative Fuelled Vehicles (AFV) Firefighting	Jaime BLEYE VICARIO	SASEMAR
09:50-10:10	Workable Fire Safety - Human-centered Design for Onboard Fire Safety Installations	Staffan BRAM	RISE
10:10-10:40	*Coffee break & mingling*		
10:40-11:00	Fire Hazard Management of Cargo Distribution Supported by a Risk Assessment of the Units Based on Historical Data	Francisco RODERO	CIMNE
11:00-11:20	Detection on Weather Deck	Davood ZEINALI	RISE Fire Research AS
11:20-11:40	Development of a Fire Monitor System Concept for Ro-Ro Weather Decks	Francine AMON	RISE
11:40-12:00	Ventilation in Case of Ro-Ro Space Fire: What Improves Safety?	Anna OLOFSSON	RISE
12:00-13:20	*Lunch & mingling*		
	Afternoon theme: General (Fire safety at sea)		
13:20-13:40	Li-ion Battery and Electric Vehicles Fires on Ships – Is There an Answer?	Ken SHORTALL	TMC Marine
13:40-14:00	Pure Car Truck Carrier (PCTC) Fires - Application of Current Knowledge and Next Steps	Torben STADTAUS	Volkswagen Konzernlogistik
14:00-14:20	Responding to an EV Fire - From the Front Line	Adrian SCALES, Dennis KUSTERS	Brookes Bell, REACT
14:20-14:50	*Coffee break & mingling*		
14:50-15:10	Containership Fires and the Difficulties of Fighting Fires while at Sea	Nick CAREY	Hawkins & Associates
15:10-15:30	Battery Electric Vehicle firefighting tests with Outside Air High Expansion Foam	Chizue MASUDA, Yosuke SUZUKI	Kashiwa Tech
15:30-15:50	Actions for Safe Carriage of Alternative Fuelled Vehicles (AFV)	Martin CARLSSON, Lena BRANDT	Stena, DFDS
15:50-16:10	*Coffee refill*		
16:10-16:20	EMSA Guidance on the Carriage of AFVs in Ro-Ro Spaces	Monica RAMALHO	EMSA
16:20-16:50	Panel Discussion - Alternatively Fuelled Vehicle Fire Safety Onboard	Martin CARLSSON Adrian SCALES Geir JORGENSEN Serge HEYRAUD	STENA BROOKES BELL SKULD Centre de Sécurité des Navires PACA Corse
16:50-17:00	Outlook & Closure	Franz EVEGREN	RISE
17:00-18:00	*Closure cocktail & mingling*		