

OVERHEAT - Innovative Strategies for Containership Fires Prevention and Management

OVERHEAT project to investigate the use and development of technologies to prevent, detect, manage and respond to fire accidents on board containerships

the challenge

Maritime transport has historically represented the centre of global trade moving 90% of the goods' volumes and values worldwide. Containerships are built with the same design as the older smaller container ships, disregarding possible consequences that could impact safety. Cargo fire represents one of the most important threats for cargo ships. Fire accidents can cause large losses of humans and/or cargoes and unvaluable damages. People are not always well trained and misunderstandings on the correct procedures to be adopted might lead to catastrophic situations. The "Innovative Strategies for Containership Fires Prevention and Management" (OVERHEAT) Project (Horizon Europe funded) has the goal to prevent, detect, manage, and respond to fire accidents on board containerships. The project will develop a Digital Solution that will increase the situational awareness of accountable people to promptly react during fire accidents avoiding cascade effects. Special attention will be given to seafarer Safety Culture to better understand how people perceive safety onboard and company's strategy to safety management. This approach allows to identify, describe, and structure weakness and strengths of safety. In addition, a novel training on fire management will be executed. The project proposes a truly new generation of digital fire management solutions to increase safety. The impact of the proposed solution will be initially evaluated by performing validation activities utilising ad-hoc facilities in Italy and France. Afterwards, demonstration activities will be executed in a real environment to prove the OVERHEAT concept.

the innovation

The OVERHEAT project all along its lifetime will investigate the use and development of several technologies to prevent, detect, manage and respond to fire accidents on board containerships. In particular, different sensors will be investigated such as: IOT sensors, temperature sensors, Thermal Imaging Camera (TIC), smoke detector, sniffer smoke detector, CO/CO2 detector, and gas detector. The OVERHEAT project will also investigate the use of Unmanned Aerial Vehicle (UAV) equipped with thermal cameras to provide to the first responders a clear picture of the fire accident indicating where the fire started, giving the possibility to promptly intervene and avoid a cascade effect. The UAV will be installed on board the ship. All information coming from sensors and UAV will be integrated in an intelligent system called Digital Solution (DS). The DS will show all necessary information to the crew and to the ashore operators to increase the situational awareness of cargo ship in distress. Along the project, a Safety Culture assessment will be performed to better understand how people perceive safety onboard. In addition, based on the results of the Safety Culture assessment, one of the outcomes of OVERHEAT project is the definition of best

practices for firefighting methods and fire prevention. Finally, a novel training for seafarers on fire management will be executed along the project.

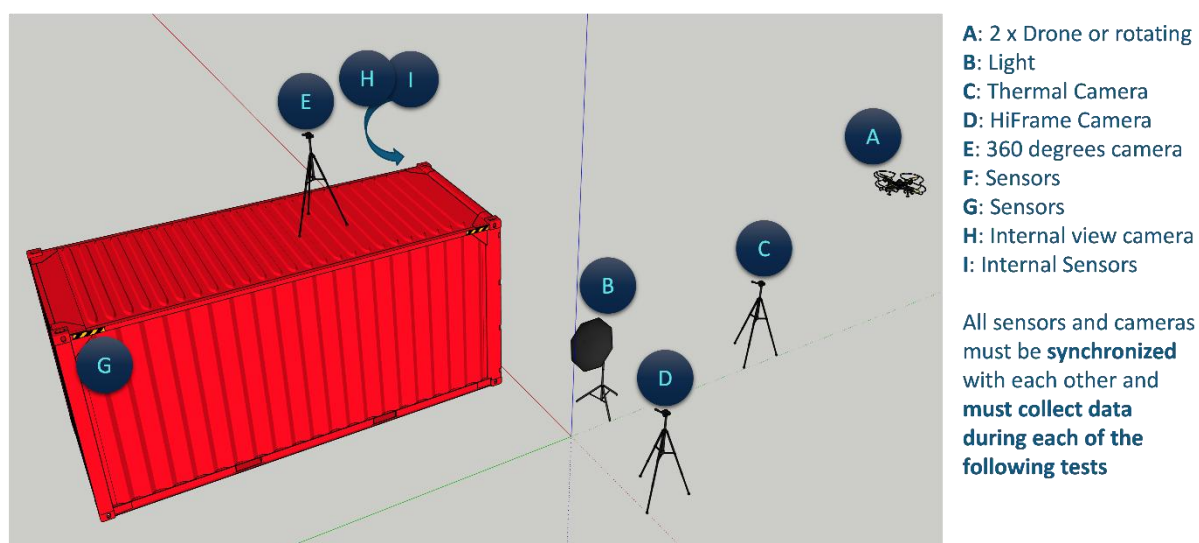


figure 1: Discovery tests

how it was implemented

Although the OVERHEAT project has just started (officially on January 1st, 2024), a clear idea on how to implement the solutions has already been planned, and some preliminary results are already available. In detail, the project will finish with a Technology Readiness Level (TRL) of 7. This means that the development of the digital solution and the implementation of IoT sensors will allow the OVERHEAT project to progress from a lower TRLs to TRL 7. Several infrastructure and associated components (such as, Unmanned Air Vehicle, IoT sensors, Digital Solution S-100, etc.) deployed in the OVERHEAT project will allow to progress on TRL, stepping forward from TRL 5 to TRL 6 by performing initial validation activities based on multiple applicable Use Cases. Both, simulation (already being carried out) and demonstration activities, are and will be conducted. In particular, five scenarios in different European countries (Genova Port (Italy), Brest port (France), Valencia port (Spain), Bremen port (Germany), and Gdynia port (Poland)) will be described and detailed during the research activities to collect the first evidence of feasibility and potential benefits brought by the implementation of the concept. The impact of the proposed solution will be initially evaluated by performing validation activities in simulated environment utilising ad-hoc facilities in Italy and France, respectively at the Italian Maritime Academy Technologies (IMAT) centre and the École Nationale Supérieure Maritime (ENSM) centre. Demonstration activities in real environment will also be executed allowing the progress of OVERHEAT project results from TRL 6 to TRL 7.

result

OVERHEAT project has started from less than one year and for the moment just some tests on the containers (simulating fires on them with detection made thanks to installed sensors, thermal cameras, and drones) have been carried out. The preliminary results are:

- installed sensors can effectively detect and identify smoke and gas (CO₂)
- the difference between the walls irradiated by the sun and those not irradiated reaches up to 30 degrees
- the detection of gas and smoke directly on the vents is 4 times more effective than detection after the vents
- none of the radio signals examined during the test (BLE, WiFi, WiFi 5) are able to receive or transmit from inside the container when the doors are closed
- in consideration of the damage detectable on the walls of each container it is essential to stay within the profile of the container grooves
- the distance between sensors and the location where the event occurs is decisive for the detection speed
- it is not possible to drill holes to the containers
- heat transfer within the container may take several minutes

The research activity has high expectations for the project since some real trial have been executed to demonstrate that drones (equipped with thermal cameras) are capable to provide a clear picture and share a Common Operational Picture (POC) to the first responder in order to prevent, detect, manage, and respond to fire accidents on board containerships

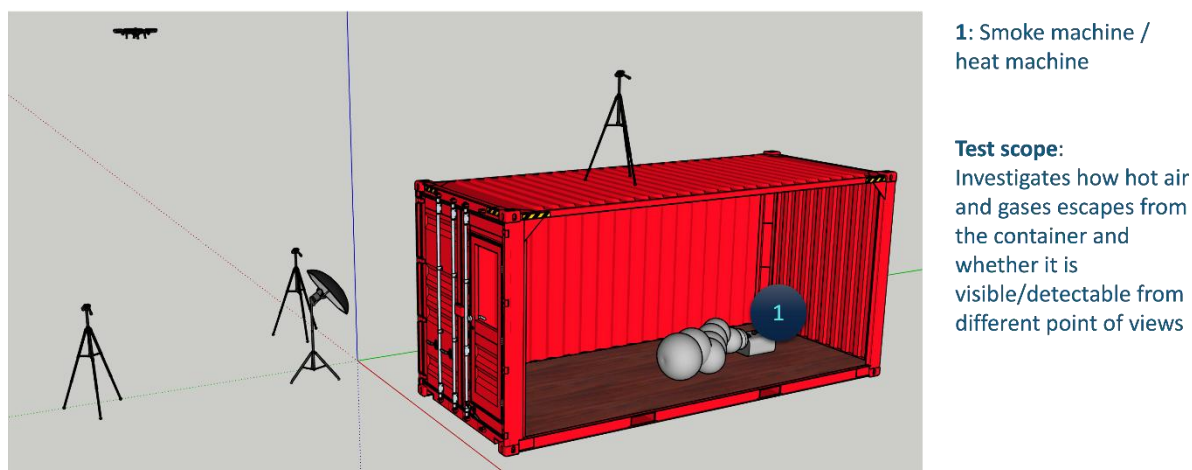


figure 2: Discovery tests

conclusion

The OVERHEAT project proposes innovative solutions to tackle an important topic: fire accidents on board containership. The OVERHEAT has the ambitious goal to prevent, detect, manage, and respond to fire accidents thanks to the development and investigation of several technologies. OVERHEAT project brings together research centres, industry, universities, and

different highly recognised in their own fields stakeholders (e.g. maritime company, firefighters, port authorities). The main technologies we are presently investigating and developing are the use of several sensors, thermal cameras, Unmanned Aerial Vehicles and the integrated digital solution. In addition, the proof of concept will be performed through five use cases with scenarios in different European countries by executing validation activities that include simulation (ad-hoc facilities will be used) and real size demonstration activities. The outcome of the project will provide key results to be explored such as a safety culture assessment and the development of best practices to be applied in the near future. This work has received funding from HORIZON Europe with grant agreement No 101076633 (OVERHEAT project) under European Union's Horizon Europe Innovation Actions Framework Programme

LINK: <https://overheat-project.eu/>



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