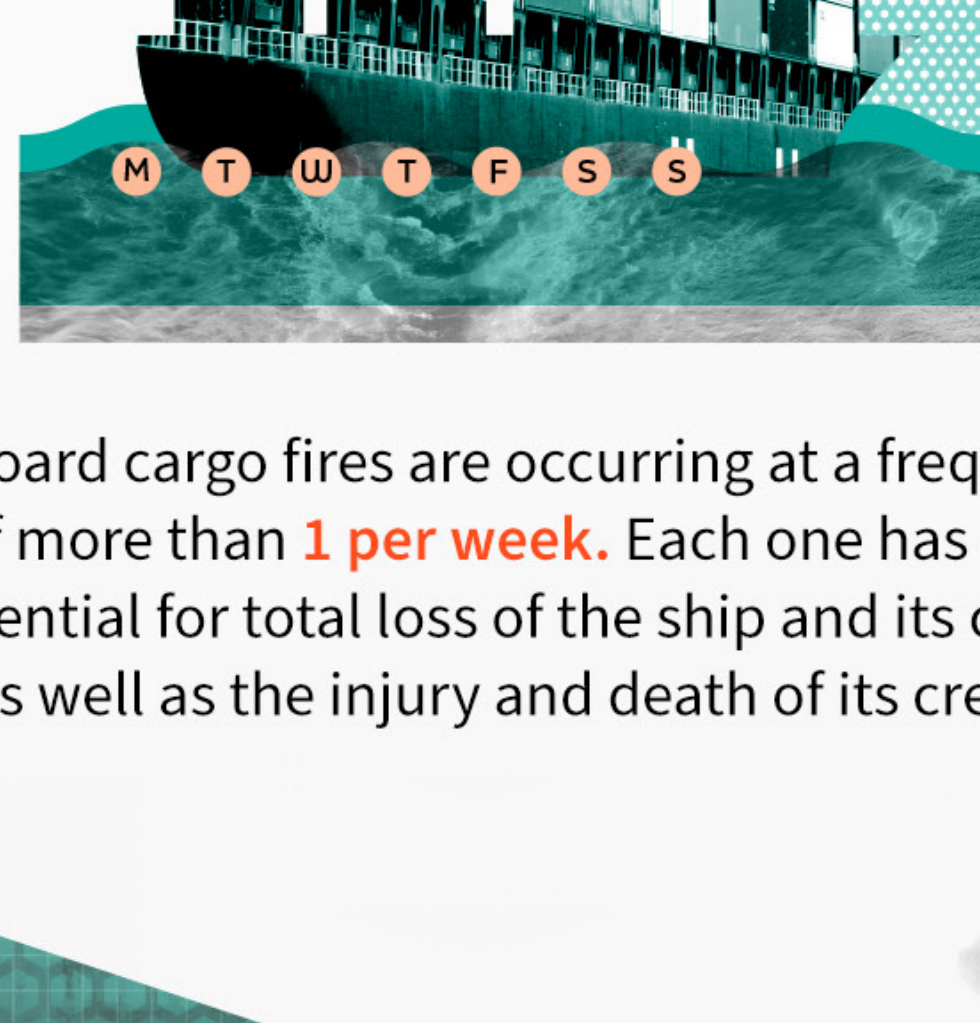


Cargo Fire & Loss Innovation Initiative (CFLII)

Cargo fires and loss result in significant human, environmental and financial impacts and are now headline grabbing events that negatively impact the perceptions of global seaborne trade.



Onboard cargo fires are occurring at a frequency of more than **1 per week**. Each one has the potential for total loss of the ship and its cargo as well as the injury and death of its crew.



In **2022**, fire emerged as the second top cause of loss for shipping vessels, after foundering.

The Cargo Fire & Loss Initiative (CFLII) recognises the urgency of addressing these issues, bringing together industry leaders and cutting-edge technologies to mitigate these risks and create a safer, more sustainable maritime environment.

Approach

The Cargo Fire and Loss Innovation Initiative (CFLII) is a **collaborative tech acceleration program**, established by Safetytech Accelerator, aiming to prevent large-scale cargo fires and losses in the maritime supply chain.

Through thought leadership, technology road mapping, challenge development and efficient tech sourcing, **Safetytech Accelerator** and **Initiative Anchor Partners** are collaborating to identify and pilot practical, high-potential technologies to mitigate the impact of these maritime incidents.

Current Anchor Partners



Working with shipping owner/operators representing **53%** of the **global container cargo capacity**.

3 Significant areas of concern



Onboard cargo fires



Emergency response



The loss of containers overboard

We are committed to talent training to help provide a safe, high quality working environment for our seaman. By participating in an enterprise such as the Cargo Fire & Loss Innovation Initiative we aim to work closely with all stakeholders to guard the safety of container shipping transportation.

Erik Hsieh, President of Evergreen Line

The importance of collaborative initiatives, such as CFLII, is recognised. Working together as an industry is the most effective way to develop and implement advanced solutions, as it allows us to pool our expertise and resources.

Mehdi Majid, Manager, Fleet Engineering (Electrical), Seaspan Corporation

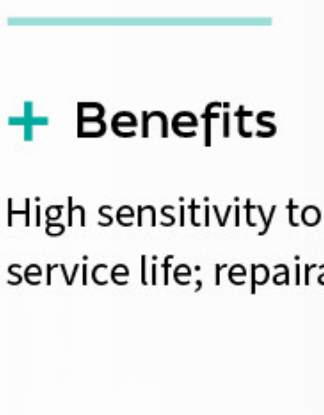
Technology landscape for early fire detection in cargo holds

Traditional cargo hold fire detection relies on sample smoke detection, offering delayed fire indication without pinpointing the exact container location. To revolutionise this, Safetytech Accelerator scouted globally, **identifying 200+ companies** and various technologies.

After rigorous selection, **13 companies** and **8 technology types**—both core and disruptive—emerged. These cutting-edge solutions, tailored for diverse environmental conditions, are showcased in CFLII to redefine early fire detection and location.

Core technologies represent established approaches, while **disruptors** are leading edge approaches not yet deployed fully in industrial environments.

Core Technologies



Fibre optic Linear Heat detection (LHD)

+ Benefits

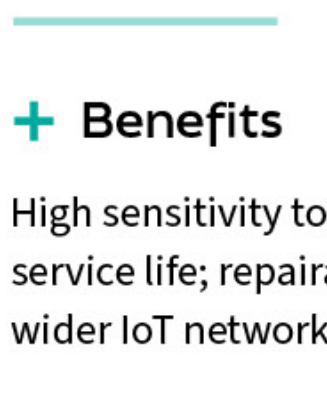
High sensitivity to temperature, spatial resolution, service life; reparability; established technology

— Limitations

Complexity of install; large footprint open to damage

Technology maturity	
-	LOW
MED	HIGH

Marine market presence	
NONE	LOW
MED	HIGH



Sensor-based LHD

+ Benefits

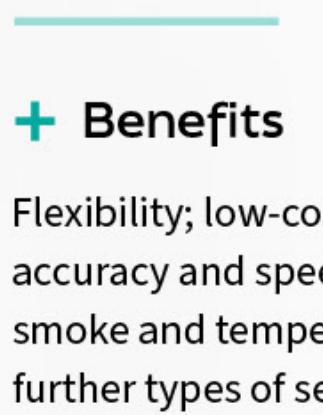
High sensitivity to temperature, spatial resolution, service life; reparability; able to integrate with wider IoT network

— Limitations

Cost, complexity of install; large footprint open to damage

Technology maturity	
-	LOW
MED	HIGH

Marine market presence	
NONE (MURK)	LOW
MED	HIGH



IoT networks

+ Benefits

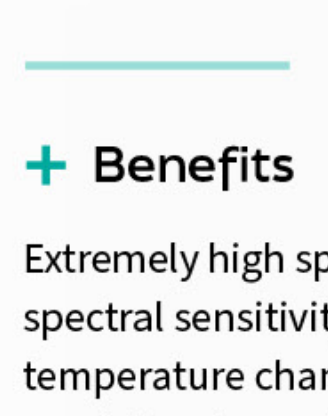
Flexibility; low-cost options, potential for high accuracy and speed; mixing sensing types e.g., smoke and temperature; capability to embed further types of sensor

— Limitations

Networking challenges presented by ship infrastructure, resilience of sensors; potential over reliance on distributed supply chains

Technology maturity	
-	LOW
MED	HIGH

Marine market presence	
NONE	LOW
MED	HIGH



Infrared (IR) cameras

+ Benefits

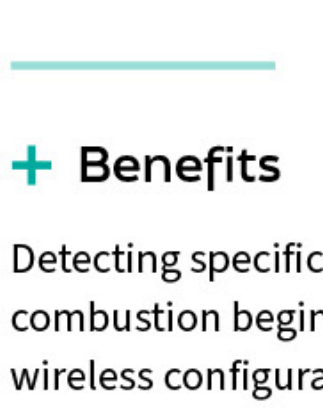
Extremely high spatial resolution; Extremely high spectral sensitivity enabling early detection of temperature changes; high radiometric resolution in modern sensors; track systems and mounts can mitigate some line of site issues

— Limitations

Line of site difficulties in cargo hold environment; high cost per sensor; large physical footprint open to damage; lack of easy reparability

Technology maturity	
-	LOW
MED	HIGH

Marine market presence	
NONE	LOW
MED	HIGH



Traditional gas sensing

+ Benefits

Detecting specific pre-fire gases before combustion begins to occur; some advanced wireless configurations; established technology

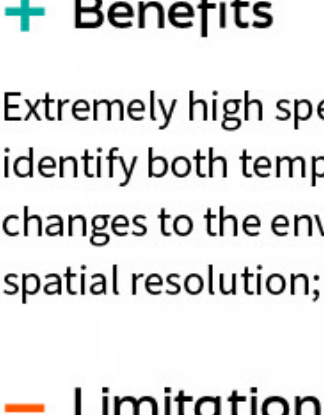
— Limitations

High cost per unit; natural degradation due to exposure to gases; limited spatial resolution, mostly limited to wired configurations

Technology maturity	
-	LOW
MED	HIGH

Marine market presence	
NONE	LOW
MED	HIGH

Disruptors



Radio signal state disruption analysis

+ Benefits

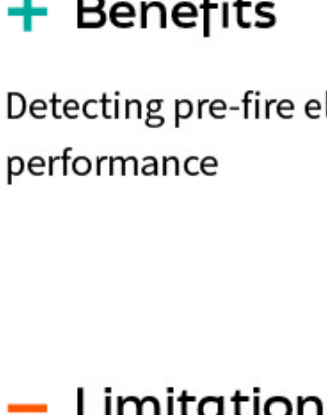
Extremely high spectral resolution; able to identify both temperature, gas and physical changes to the environment; potential for spatial resolution; low-cost

— Limitations

Disruption from structures and existing radio waves; early-stage technology needs further testing

Technology maturity	
-	LOW
MED	HIGH

Marine market presence	
NONE	LOW
MED	HIGH



Distributed IR lens networks

+ Benefits

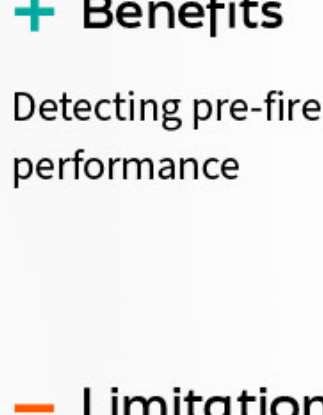
Detecting pre-fire elements; low-cost high performance

— Limitations

Early-stage technology needs further testing

Technology maturity	
-	LOW
MED	HIGH

Marine market presence	
NONE	LOW
MED	HIGH



Nanotube chemical signature analytics

+ Benefits

Detecting pre-fire elements; low-cost high performance

— Limitations

Service life; limited spatial resolution; early-stage technology needs further testing

Technology maturity	
-	LOW
MED	HIGH

Marine market presence	
NONE	LOW
MED	HIGH

5 technologies that were ruled out during the sourcing process



Distributed wired smoke detection systems



Optical beam smoke detectors



Non-Infrared (IR) video detection



Linear heat detection cables that degrade on contact with heat or do not represent adequate performance



Graphene-based smart materials

Are you interested in **maritime supply chain sustainability and safety**, would you like to know more about this initiative or, are you a technology company that could make a difference?

Find out more here



About Safetytech Accelerator

Safetytech Accelerator, established by Lloyd's Register, is the first fully dedicated technology accelerator focused on advancing innovation in safety critical industries, with a mission to make the world safer, more resilient, and more sustainable through the wider adoption of technology.