EMERGING FIRE RISKS

WHEN REGULATIONS CHANGE ONLY AFTER THE ACCIDENT

WHY COMPLIANCE IS NO LONGER ENOUGH

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EXECUTIVE SUMMARY

Cruise and ferry operations have transformed dramatically in recent decades. New technologies, green energy systems and increasingly remote sailing routes offer significant opportunities, but also create new risks. Maritime regulations and fire-testing standards, however, evolve slowly and often only after major incidents have occurred.

This brief highlights three core insights from our talk with **Danish Institute of Fire and Security Technologies**:

- **Regulations look backward, not forward**. Standards are updated primarily in response to accidents.
- **New technologies introduce new fire scenarios** that existing test methods cannot fully capture – particularly batteries, plastic piping and alternative fuels.
- **Ships must be able to save themselves.** In remote waters, external rescue is rarely realistic, and passengers cannot be evacuated quickly.

For operators, this means that compliance is merely a minimum threshold. Understanding the unassessed risks – before IMO and class societies do – is essential for safety, continuity and reputation.

BACKWARD-LOOKING RULES

WHEN STANDARDS CHANGE AFTER CATASTROPHE

The global fire-testing and documentation system carries an inherent limitation: it evolves in the rear-view mirror. New requirements rarely arise from foresight or anticipation. Instead, they emerge when something has already gone wrong; when a major accident exposes a weakness, when an incident proves that long-standing assumptions no longer hold true, or when international bodies can finally reach agreement because real-world evidence leaves them no alternative.

In practice, compliance becomes a reflection of history rather than present reality. It tells us what was once considered safe, but not necessarily what is safe today. This creates a dangerous illusion for an industry that prefers clarity: the sense that following the rules equals being protected.

A simple image captures the problem. Relying solely on compliance is like steering a vessel while looking only at its wake. You can see with perfect clarity what has struck you, but only after impact.

For operators investing in ships expected to sail for three to five decades, this backward-facing framework is no longer sufficient. Designing vessels solely around yesterday's scenarios introduces risks that grow with each technological shift and each expansion into new, more remote sailing regions. The future requires a wider field of vision than the rulebook currently provides.

The maritime sector is undergoing a shift toward electrification and alternative energy. Large battery packs, hybrid propulsion systems and new fuel technologies are finding their way onto vessels of every kind.

One fundamental challenge remains among this transformation:

Existing fire-testing standards were written for yesterday's technologies.

Battery systems behave fundamentally differently from traditional machinery:

- They do not require oxygen to burn
- They can continue thermal runaway even underwater
- They generate extreme heat and toxic gases
- Traditional sprinkler systems cool but do not stop the reaction

When operators ask: "Can we just add sprinklers?", the answer is:

- Sprinklers help,
- but they do not eliminate the underlying risk,
- and current standards do not fully address the fire dynamics of modern energy systems.

THE SHIP MUST BE ABLE TO SAVE ITSELF

The fire strategy is simple on land: get people out of the building and into open space. At sea, that option does not exist. A ship has no parking lot or safe zone beyond its own decks. This becomes especially evident in remote regions, where the distance to help is measured not in minutes but in hours or days.

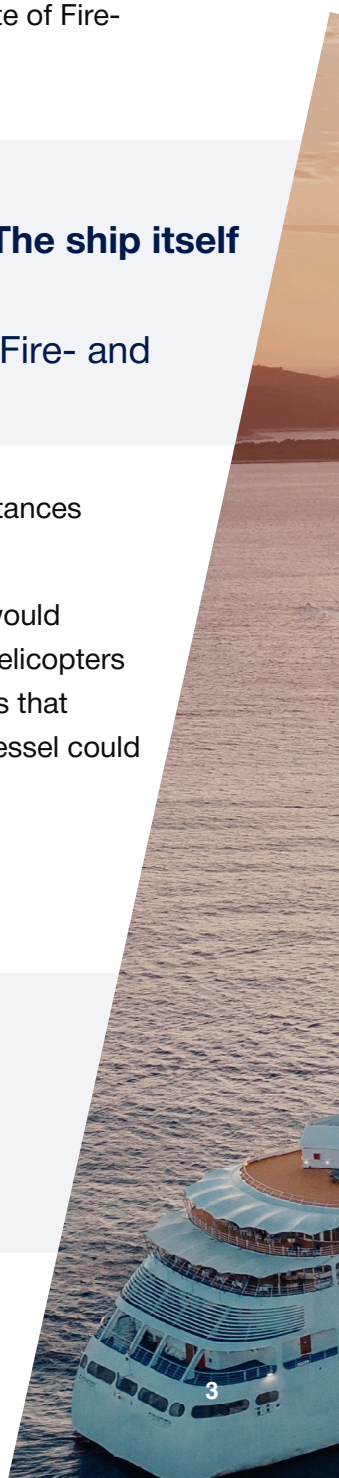
In such areas, evacuation is rarely a viable strategy. Even when search-and-rescue assets are deployed, helicopters have limited lift capacity and must return for fuel or maintenance long before thousands of passengers can be moved. As Dan Lauridsen, expert from Danish Institute of Fire- and Security Technology (DBI), puts it:

> **At sea, you cannot evacuate people to safety. The ship itself must be the safe place.**
>
> Dan Lauridsen, Civil Engineer | Danish Institute of Fire- and Security Technolog

Nowhere is this more apparent than in Arctic waters, where cold, darkness and vast distances amplify every challenge.

Exercises conducted in Greenland have demonstrated just how quickly a real incident would overwhelm available capacity. Emergency facilities on land fill up almost immediately. Helicopters are forced to suspend operations for refueling or servicing. And the stark reality emerges that passengers taken ashore may face life-threatening cold, while those remaining on the vessel could be sheltered, warm and protected.

> **A modern vessel must be its own fire brigade, its own rescue center and its own safe haven.**



FIVE CORE PRINCIPLES:

MODERN MARITIME FIRE STRATEGY

A. COMPARTMENTATION

Ships are divided into fire-safe sections so that an incident can be contained and passengers can be moved to unaffected areas.

B. SELF-RESCUE

In remote waters, outside help may not arrive in time; the vessel must be able to manage the emergency with its own systems and crew.

C. CONTROLLED SHELTER-IN-PLACE

Passengers often remain safer onboard than in lifeboats or ashore, so the strategy focuses on keeping them inside protected areas.

D. AUTOMATIC & MANUAL FIRE SUPPRESSION

Sprinklers and detection systems work alongside trained crew, slowing the fire and preserving critical escape routes.

E. DESIGNATED SAFE ZONES WITHIN THE VESSEL

Specific areas must remain smoke-free and habitable so passengers can stay there as long as needed during the incident.

Downward fire spread through plastic pipes

Among the technical fire risks at sea, few are as underestimated or as consequential as the behaviour of pipe materials. Traditional fire science rests on a simple principle:

Fire spreads upward.

Maritime compartmentation, safe-zone integrity and evacuation strategies are all built on this assumption. Yet DBI has observed scenarios where this does not hold. Under certain conditions:

Fire can spread downward through plastic piping.

This possibility disrupts the foundation on which current designs rely. If downward spread occurs:

- compartment boundaries may fail in unexpected ways,
- designated safe zones may no longer be safe,
- core design assumptions lose validity,
- and existing IMO test standards offer no evaluation of this mechanism.

In response, DBI has taken a proactive role. They have:

- engaged both plastic- and steel-pipe manufacturers,
- requested robust data to verify or eliminate the risk,
- and escalated the issue to authorities when industry evidence proved insufficient.

This leads to a fundamental design question for the ship owners:

?

When investing in a vessel expected to operate for decades, is “legal today” really good enough?

Or should we design for the risks the industry has not yet fully understood?

WHO OWNS THE RISK?

Responsibility for fire safety at sea is distributed across several actors, yet each operates within boundaries that can leave emerging risks unaddressed.

INSURERS

Insurers hold substantial financial exposure when fires occur. In theory, they could be strong drivers of preventive action. In practice, they tend to focus on what has already happened rather than what could happen. As Dan Lauridsen from DBI remarked, insurers often act only when “if there’s a risk that we will lose money” which limits their incentive to influence safety standards ahead of time.

AUTHORITIES AND IMO

Flag states must report fatalities and major incidents to IMO, but the international regulatory process is slow by design. It often takes years before new risks translate into updated standards, and those updates usually follow significant accidents rather than anticipate them. In Lauridsen’s words, “rules evolve in hindsight”

DBI’S ROLE

DBI does not promote one material or manufacturer over another. Its mandate is to identify underexamined fire scenarios, test them, validate them and then document whether current assumptions still hold. When industry data is insufficient, DBI brings concerns to the authorities, offering evidence that can support future regulation.

In other words, DBI attempts to do what current rules cannot:

> **A modern vessel must be its own fire brigade, its own rescue center and its own safe haven.**

SHIPOWNERS

Shipowners are required to follow existing regulations and to act “in good faith.” But this creates a structural paradox. If an owner becomes aware of a risk that is not covered by the rules and chooses not to act, that knowledge could later be interpreted as acting against better judgment. Compliance becomes both a shield and a constraint. As Dan Lauridsen, DBI, noted:

“Shipowners are required to follow existing regulations and to act “in good faith.” But this creates a structural paradox. If an owner becomes aware of a risk that is not covered by the rules and chooses not to act, that knowledge could later be interpreted as acting against better judgment. Compliance becomes both a shield and a constraint.”

This dynamic makes many operators understandably reluctant to engage with new or untested risk scenarios unless authorities formally require it.

THREE STRATEGIC ACTIONS OPERATORS CAN TAKE NOW

As vessels grow more complex and routes push into more remote regions, owners face risks that compliance alone cannot fully address. While regulations will continue to evolve, operators cannot afford to wait for IMO processes or industry consensus before acting.

The following three actions outline where forward-looking owners can strengthen resilience today.

1. REVISIT YOUR FIRE SCENARIOS

Move beyond the narrow question:

- “Is this compliant?”

and ask instead:

- “Does compliance reflect current risk or outdated assumptions?”
- “Have batteries, plastic piping and remote operations been fully considered?”
- “Can the vessel manage a worst-case event without external assistance?”

This shifts fire safety from a checkbox exercise to a design and operational decision.

2. ENGAGE INDEPENDENT EXPERTISE EARLY

Independent institutes such as DBI bring perspectives shipyards and suppliers cannot. They can:

- challenge design assumptions
- surface risks outside current regulations
- support evidence-based discussions with class and authorities
- reduce late-stage redesigns and retrofits

Early intervention limits risk and preserves design flexibility.

3. BRING INSURERS AND CLASS ON RISK

Fire risk is technical, but its impact is financial. Ask directly:

- “What scenario drives your largest exposure?”
- “How are emerging risks like battery fires and downward fire spread assessed?”
- “What concerns you most about operations far from rescue support?”

Early dialogue helps align expectations, reduce uncertainty and lower long-term exposure.

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