

# Fire safety and the ungoverned space

Identifying and combatting issues with gaseous fire extinguishing systems

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**Carl Hunter** Hon DSC FNI  
CEO, Coltraco Ultrasonics

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**F**ires on board ships can be devastating, to crew, vessel and cargo. Fire safety standards on board cannot be allowed to slip. Yet there are areas of ‘ungoverned space’ within fire safety due to a lack of awareness, regulation or compliance. Simply put, an ungoverned space is an area where either the regulations or the protecting systems of the critical infrastructure do not effectively provide consistent and reliable safety. This life-threatening issue must be dealt with, with specific regard to loss of contents in fixed fire extinguishing systems and need for improvements to room integrity testing.

Part of this issue is to do with the maintenance of gaseous fire extinguishing installations. To some extent, this may be a result of the holes in the regulations. However, compliance with regulations should be seen as a starting point, not as a goal. We should respond to regulations with a rigorous attitude; go above and beyond to ensure security of life and infrastructure. In terms of gaseous fire extinguishing systems, this means that they must be maintained so that they can provide the protection that they are intended for, whether or not the schedule is set out in law. This is a call for awareness of the problem and for action to be taken now.

## Fire – the statistics

A study published by the Finnish Transport Safety Agency showed that of almost 800 fires in European waters between 2004 – 2014, one quarter required external support to deal with the fire. 10% were classed as serious. The International Maritime Risk Rating Agency (IMRRA) identified fire safety as the leading tanker deficiency seen by Port State Control for the first six months of 2017. The IMMRA placed 12.5% of tankers it assessed in January 2017 into the higher risk category.

## When systems fail

Where there are maintenance issues, then the system may not provide safety to the vessel even where it is used in good time. *MSC Flaminia* provides a clear case of this. When fire broke out, the CO<sub>2</sub> system activated – but it did so in the engine room, although the discharge was intended for cargo hold 4. This turned off the auxiliary boiler and auxiliary fan for the main engine, and led to an uncontrollable fire which resulted in three fatalities and two severely injured crew members, as well as dire damage to the ship’s structure and its cargo. Three salvage tugs were required to deal with the effects of the explosions and fire, but the extent of the fire meant that the salvage teams could not enter the vessel for four days. Cargo areas 3-7 in the

ship were significantly damaged and the ship’s structure was weakened, requiring replacement.

The UK P&I Club have suggested that extended periods of time on board a ship without a fire incident can lead to complacency and therefore a failure to prioritise prevention methods and fire incident practices. It is impossible to prepare for all eventualities on a vessel, and while fire prevention must be a priority, it is often easier to influence the prompt detection of fires and their effective extinguishment. These factors therefore play a key role in minimising fire damage aboard vessels.

## Why does the risk continue?

Even in 2017, gaseous fixed fire extinguishing systems are often overlooked, and are misunderstood at all levels: by owners, managers, chief engineers and crew.

CO<sub>2</sub> turns totally from liquid to gas at 31°C. In a gaseous fixed fire extinguishing system, CO<sub>2</sub> is permanently under 720 psi or 49 bar of pressure – that is, nearly 50 times atmospheric pressure. Its state changes under increased temperatures to one that is neither a liquid nor a gas.

“Gases under pressure should be considered as active and dynamic systems – and need constant monitoring.”

Critical points of the fire suppressant gases FM-200® and Novec™1230 are 50-55°C.

Gases under pressure are often monitored as if they were single and passive cylinder columns of solid material – that is, it is assumed gas levels will remain the same at the same level as they were when the system was installed. In fact, being under pressure and constantly changing under temperature, they should be considered as active and dynamic systems. All dynamic systems under pressure need constant monitoring.

## System maintenance

Chapter 5, para 2.1.1.3 of the IMO SOLAS FSS Code details how vessels’ fire extinguishing systems should be checked for leaks. Ships’ officers and crew are not qualified to undertake CO<sub>2</sub> servicing, which requires the dismantling, weighing and re-installation of the complete system. This must be done by a licensed organisation when the ship is alongside. However, the code states that; ‘means shall be provided for the crew to safely check the quantity of the fire extinguishing medium in the containers.’

Often, this clause is misunderstood. The code specifically states that the crew must test their extinguishing installations in between the periodic inspection, maintenance and certification. The annual inspection by accredited marine servicing companies is not enough – the crew must take responsibility for its own fire protection.

**According to the same clause, (?) 'If a container shows a loss of agent quantity or a loss of pressure (adjusted for temperature) of more than 5%, it shall be refilled or replaced.'** Gaseous systems are designed specifically to the individual need of the vessel, and a 5% loss of agent may mean that they are unable to fully extinguish a fire. In a recent article in *The Maritime Executive*, Captain Madden urged crews to routinely and properly inspect and test fixed firefighting systems, since; **'too often they are found with... concerns about leakage'**. The only way to determine whether a cylinder is free from leakage is to check its contents.

For many ships, the most obvious way to check the contents of a cylinder is by weighing it. However, the crew are often not trained or certified to shut down, dismantle, weigh and re-install the gaseous cylinders – and this is, in any case, difficult and time consuming. One possible solution is the use of portable liquid level indicators, which allow the crew to meet the code by checking levels between servicing without the need for extensive, and expensive training. This is explicitly allowed for in UK Marine Equipment Directive (MED) UK/EU legislation with US Coast Guard Mutual Recognition 7.3.2.6: **'Means should be provided to verify the liquid level in all the cylinders, either by weighing the cylinders or by using a suitable liquid level detector.'** Encouraging owners and managers to invest in this technology would go a long way towards closing up this 'ungoverned space', and making

it better, faster and cheaper to improve fire safety. The maintenance of installations must be a priority. It need not be expensive nor time consuming.

All levels of the industry from owners, managers, operators, crew on board, marine surveyors, 3rd party servicing teams through to regulators, approval bodies, lobbying associations and governments need to work together to ensure the safety of personnel, cargo and vessel. Incidents such as *MSC Flaminia* prove that fire safety onboard must be a priority. Don't minimally comply with regulations and thereby risk the effectiveness of your installations. The 'ungoverned space' can and must be governed.

### Case Study

A major cruise line chose to improve fire safety within their fleet by introducing portable ultrasonic technology to test for leaks in onboard fire suppression installations. This technology pinpoints the liquid level of suppressant agent in the cylinders of the extinguishing system. An advanced calculator application then converts the liquid level height of CO<sub>2</sub>, NOVEC™1230 and FM-200 into the agent weight/mass. It can also convert expected agent weight back to the required liquid level, allowing users to anticipate where the level should be and spot anomalies more quickly.

Using this technology, each individual cylinder can be tested in under 30 seconds by a single person – particularly important where a large fire suppression system may contain up to 6,000 individual cylinders. The traditional method of checking for leaks takes up to 15 minutes and involves two people laboriously weighing each container. The ease of operation in comparison enables more frequent checks,