

Maritime Summary Note n°230 – April 2021

« Maritime Security and Safety : Focus on container ship »

In 2019, international maritime transport shipped approximately 226 million container units (laden). According to Alphaliner, there are around 6,000 container ships in service as of 2021. Containers can accommodate all kinds of goods (manufactured products, liquids, bulk cargo, dangerous goods, etc.). This versatility drastically reduces transport costs. To adapt to market demands, the profile of the container ship is relentlessly evolving toward increasingly larger carrying capacities. No other mode of transport has experienced such a massive leap in productivity. Compared to conventional maritime transport as practiced in the 1970s, cargo handling times have been divided by 40, crew expenses by 100, and energy expenditures per transported tonne by 3.

Consequently, since the 2000s, there has been a sharp growth in the carrying capacity of container vessels. It tripled between the late 1990s and the 2020s—surging from 8,000 TEUs to 24,000 TEUs—allowing shipowners to achieve substantial economies of scale and meet demand. Due to the scale of their fleet (representing 14% of the total global fleet), their growth prospects, and their profound impact on our globalized economy, container ships capture the full attention of the maritime sector. What are the risk factors attached to this category of vessels?

The risk of fire

Insurers have been warning for years about these Ultra Large Container Vessels (ULCVs, >14,501 TEUs), which can carry up to \$2 billion worth of cargo on a vessel with a new-build value of \$70 million to \$150 million. These giants of the seas can experience structural difficulties when loaded to 100% of their capacity, as is frequently the case today (lateral and vertical forces that strain both the vessel and the cargo), even without factoring in rough sea conditions.

According to underwriters, onboard firefighting, containment, and rescue systems are increasingly complex and sometimes decoupled from this massive scaling up of ULCV capacities. Crews can often do little more than attempt to prevent a fire from spreading, either by boundary cooling with water drenching (on deck) or by injecting CO₂ (in the holds).

According to the 2019 annual marine safety report by the insurer Allianz Global Corporate & Specialty (AGCS), onboard fires and explosions continue to generate significant losses, with an incident occurring every 60 days on average. A report by the European Maritime Safety Agency (EMSA)¹ estimates that emergency strategies and methods, particularly during fire incidents, have not been sufficiently revised. Furthermore, 55% of onboard ship fires occur as a result of misdeclared cargo, according to the National Cargo Bureau². The lack of transparency regarding the contents of the implicated containers in the event of an accident is patent. A container that needs to be protected from heat can thus find itself exposed to direct sunlight and, as an additional hazard, stowed close to products incompatible with its cargo. The risk of fire and explosion then becomes imminent, as was the case for the MSC Flaminia in 2012, or more recently in 2018 with the fire aboard the Maersk Honam. Both accidents caused the deaths of several crew members.

If containers that are heavier than declared are placed in the highest stows, it is easy to imagine that the shifting forces generated by the vessel's movements during a storm could certainly exceed the strength of the lashing and securing systems. Beyond straining the vessel's structure and potentially triggering a "domino effect" on adjacent rows, these misdeclarations can foster fire outbreaks, particularly when dangerous goods are present on board.

¹ Safety Analysis of EMCIP data, analysis of marine casualties and incidents involving container vessels, September 2020

² The National Cargo Bureau assists the US Coast Guard.

The International Cargo Handling Coordination Association (ICHCA) estimated that out of the global container shipments, 6 million containers shipped worldwide contain dangerous goods, and nearly 1.3 million are not properly packed or are misidentified. These misdeclarations applied to dangerous cargo, which is otherwise strictly regulated, are used to evade additional costs and regulatory constraints. Containers carrying chemical substances or hazardous articles are known solely on the basis of declarations made by the shipper and the forwarder, as systematic physical inspections remain impossible to conduct.

Undeclared or misdeclared contents can present an additional risk during transport, storage, or in the event of an emergency response. Indeed, certain dangerous goods are incompatible with the firefighting agents available onboard, and their use is liable to worsen the situation—such as discharging water-based extinguishing agents onto water-reactive cargoes. The crew of container ships does not possess the specialized competencies required to fight the distinct reactivities and instabilities of industrial or technological fires generated by these products.

The supplement to the IMDG Code³ (MSC./Circ.1442) provides for uniform inspection programs for these containers, notably a targeting method for undeclared dangerous goods. Unfortunately, in practice, these inspections are rarely if at all enforced. Shipping lines, such as Hapag-Lloyd, utilize a software called "Profiler" to scan bookings and detect undeclared dangerous cargo. Between 2015 and 2017, the shipping company had identified 11,000 misdeclared shipments.

Classification societies, insurers, and salvors are actively reflecting on new standards to apply to lashing and securing systems (maintenance, inspection) or onboard firefighting. The IUMI (International Union of Maritime Insurance), along with BIMCO (Baltic and International Maritime Council), AGCS, and CESA (representing shipyards), drafted a white paper advocating notably for an early fire detection system incorporating cargo temperature monitoring (infrared cameras on deck and thermal sensors in the holds), water curtains, and CO2 injection systems, among others. These proposed amendments to the International Convention for the Safety of Life at Sea (SOLAS) were submitted by the Maritime Safety Committee (MSC) to the IMO with the objective of being adopted.

The loss of containers at sea

Maritime news frequently reminds us that taking to the sea remains a perilous venture. One recalls last December the *ONE Apus*, which lost more than 1,800 containers at sea, with the cost of the claim estimated at over \$200 million for the damaged cargo alone, followed by the *Maersk Essen* in January with the loss of 750 containers in the North Pacific. Over the period from November 2020 to March 2021, it is observed that just over 3,000 containers were lost at sea.

Container losses at sea can be linked to a maritime casualty (accident) or stem from structural factors: improper cargo lashing or stuffing (empotage), a container in poor condition, faulty gear and equipment, meteorological conditions, hull form, vessel speed and heading, as well as torsional forces and friction exerted on the ship and the container stacks. There is currently no international tracking method deployed by States to monitor container losses. Information collection therefore remains fragmented among various organizations with varying territorial jurisdictions. The higher estimate for these losses could reach tens of thousands of containers per year (10,000 to 15,000 according to CEDRE). The visible tip of the iceberg, represented by heavily publicized major losses, could furthermore conceal more sporadic losses from small feeder vessels that pass entirely under the radar.

According to the World Shipping Council⁴ (WSC), between 2017 and 2019, the average annual loss was 779 containers. However, over the preceding period (2014–2016), the average annual loss stood at 1,390 units, and it reached 2,683 during the 2011–2013 period. Large-scale catastrophic events⁵ heavily impact annual loss averages. Over the last twelve years, more than half of all containers lost at sea are attributable to a limited number of major accidents. According to the IUMI, container losses at sea represent only one-millionth of the total number of units transported annually. Nonetheless, over the last five years, damaged cargo and containers have accounted for one out of every five insurance claims

³ The IMDG Code is an international maritime code that establishes provisions for the transport of dangerous goods by sea.

⁴ Since 2011, the World Shipping Council has conducted a survey among its members (representing three-quarters of global container ship capacity) to accurately estimate the number of containers lost at sea each year.

⁵ The sinking of the *MOL Comfort* in 2013, with the loss of 4,293 containers (representing a cargo loss of €440 million out of a total of €523 million for the P&I Club), or the grounding and subsequent loss of the *M/V Rena* off the coast of New Zealand in 2011, which resulted in the loss of 900 containers.

within the underwriting sector (AGCS 2019 Report). These losses carry a heavy financial cost and tarnish the global image of maritime transport. Container losses at sea pose a dual hazard: a threat to maritime safety (risk of collision with floating surface containers acting as unidentified floating objects — OFNI, or risk of snagging with trawler nets), a financial liability, and a medium- to long-term danger for the environment and public health. Once submerged, location and recovery operations prove complex and extremely expensive, mobilizing significant technical and human resources to map their presence on the seabed. With costs evaluating to tens or even hundreds of thousands of euros, one can legitimately question the actual percentage of recovered containers⁶.

Although the legal status of containers lost at sea remains somewhat blurred, they can be treated as wrecks, whose management and the obligation to mitigate any hazard fall primarily on their owner. Today, the locating of lost containers relies on aerial reconnaissance for drifting boxes, or from dedicated vessels for containers that have sunk. In the event of accidents within Europe, shipowners and insurers frequently exercise due diligence to handle surface containers.

In France, the Maritime Prefect (préfet maritime) disposes of the necessary legal arsenal and can compel operators to act. If the shipowner has not initiated recovery operations, they must reimburse any expenses incurred. At times, recovery procedures can prove complex when dealing with shipowners, especially if the liability of the shipper or the shipowner cannot be clearly established. Very recently, Ordinance No. 2021-266 of March 10, 2021, implementing the Nairobi International Convention on the Removal of Wrecks, inserted provisions into the Environmental Code. These allow the coastal State to formally serve notice to the owner or operator of a vessel, craft, or platform to eliminate any hazard in the event of damage, casualty, or loss of cargo elements, notably within its Exclusive Economic Zone (EEZ). It introduces into the Transport Code a mandatory insurance obligation prescribed by the convention and penalizes non-compliance with a fine of up to €45,000. The State will now have a right of direct action against the insurer to recover any expenses it has incurred.

The container weight

Regarding the accuracy of container weights, amendments to Rule 2 of Chapter VI of the SOLAS Convention, which entered into force in July 2016, place the responsibility on the shipper to declare the Verified Gross Mass (VGM) of stuffed containers in the shipping document prior to loading onboard vessels. Weighing is carried out either by using a calibrated weighbridge or by summing the total weight, including the cargo, its packaging, and the container tare. The shipper chooses one of these two methods, bearing in mind that physical weighing incurs a fee and slows down the process. The shipper must also submit this VGM to the master or his representative and to the terminal representative so that it can be incorporated into the vessel's stowage plan. In France, as well as in the Netherlands, the United Kingdom, Spain, and Portugal, the tolerance threshold between the declared weight and the actual VGM weight is 5%, whether upward or downward. In the event of non-compliance with this threshold, the carrier may refuse to load the container onboard the ship. The contract of carriage will be terminated, and the shipper will be liable for the payment of dead freight (*faux fret*).

In practice, the VGM remains purely declarative. The new regulation imposes no obligation on carriers to verify the reality of the weight declared by shippers. Carriers may, however, at their discretion, check the accuracy of the declared weight. This verification of VGM container weights is viewed by shipowners as too time-consuming and too costly. Furthermore, it would risk congesting the ports, which sometimes lack the resources to enforce these rules. This absence of systematic control and penalties fails to encourage non-compliant shippers to match the actual weight with the declared weight. A 2020 study report by CEREMA indicates that *"18% of containers are reportedly overloaded by more than 6 tonnes, and 15% of boxes exhibit center of gravity and balance defects."* In the event of a casualty, it will prove highly difficult for the carrier to identify the proximate cause behind the loss. It is up to the carrier to prove the shipper's fault. Action must be taken upstream of casualties by encouraging inspections through unannounced checks of proper lashing, container condition, and weight, alongside applying sanctions where necessary. Yet, who should perform these checks? The shipping line? The terminal operator? Customs? In Belgium, the Federal Public Service (FPS) for Mobility and Transport (*SPF Mobilité et Transports*) decided to monitor container weights more drastically. The shipper will have to

⁶ According to a study by Surfrider, this percentage stands at only 2.6% out of the hundreds of containers lost at sea each year.

pay €175 for the handling operation of their container. If the 5% VGM tolerance threshold of the container is exceeded, the shipper faces a fine of €5,000.

Fourteen shipping lines, including CMA CGM, Evergreen, MSC, and ONE, among others, already share information derived from cargo inspections through the Cargo Incident Notification System (CINS), which alerts shipowners to potentially misdeclared cargo, triggering additional inspections or loading bans. According to this information system, one-third of container incidents originate from faulty stuffing (empotage). In October 2018, the CINS proposed a cargo screening system designed to assist shippers in scanning bookings that may contain undeclared or erroneous information, particularly concerning dangerous goods.

Stowage, lashing, and stacking

There exists a non-mandatory code of safe practice for cargo stowage adopted by the IMO in 1991: the Code of Safe Practice for Cargo Stowage and Securing (CSS Code). Lashing and securing systems are calculated individually for each vessel by specialized firms and are inspected and approved by classification societies. The results of these calculations are recorded in a Cargo Securing Manual approved by the flag State, where all specific details can be found. These formulas are based on wave statistics and ship behavior transfer functions. Because container ships continue to evolve in terms of size, speed, and container stacking height, these formulas are constantly being revised.

There is also a joint IMO/ILO/UNECE Code of Practice for Packing of Cargo Transport Units (CTU Code), which aims to provide guidance on safe stuffing. In its Chapter 4, dedicated to chains of responsibility, the CTU Code states that: "...while the carrier assumes, under the contract of carriage, the responsibility to deliver the cargo in the condition in which it was received, it is the shipper's duty to deliver a cargo that is safe and fit to be transported. The shipper therefore remains responsible for any defect in the transport unit resulting from improper loading or securing."

Finally, the International Organization for Standardization (ISO) has revised its standards for container securing, lashing, and stacking equipment. Furthermore, the IMO's Sub-Committee on Carriage of Cargoes and Containers (CCC), during its 6th session in July 2019, proposed to align the stacking strength requirements of the 1972 International Convention for Safe Containers (CSC) with the ISO 1496-1 standard. The ISO standard advocates for a stacking stability of 213,360 kg, whereas the CSC prescribes a lower stacking resistance of 192,000 kg. Although the vast majority of containers comply with the ISO standard, some continue to circulate in accordance with CSC stability. The presence of these two container categories on terminals, which are difficult to distinguish visually, threatens stack stability during vessel loading plan execution, entailing a higher risk of collapse and loss at sea. This harmonization has not yet been adopted by the IMO's Maritime Safety Committee (MSC), but it is expected to be in the near future.

Unlike the 2008 crisis, the one we are currently experiencing does not undermine maritime transport, and even less so for container ships. According to Alphaliner, only 1% of vessel capacity (across all categories) is currently laid up, and charter rates have reached their highest levels in thirteen years. Although global GDP contracted by 3.5% over the year 2020, container traffic posted a decline of only 2%. The maritime consultancy firm projects a 3.4% growth in container traffic for 2021. This is why maritime stakeholders remain heavily mobilized regarding the risks faced by these vessels. The lack of reliable data on container losses at sea complicates their comprehensive understanding.

The IMO will discuss the adoption of a new mandatory reporting system for lost containers with flag States and the shipping industry during the MSC's 103rd session in May 2021. Transparency regarding container loss declarations, as well as the identification of lost cargo within an IMO database framework, could account for the phenomenon and help prevent its causes. Some advocate for full supply chain traceability through connected containers (IoT), such as the French company Traxens, which currently equips more than 100,000 containers.

Every participant in the transport chain must respect, *stricto sensu*, their distinct obligations (declaration, packaging, stuffing, stowage plan, container segregation) and even go beyond them. Commercial imperatives and tight port call schedules must not compromise the absolute imperative of safety for the vessel, its cargo, its crew, port workers, and the marine environment. Each maritime actor holds a part of the solution for greater safety at sea.

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