DUTCH SAFETY BOARD

BSU
Bundesstelle für Seeunfalluntersuchung
Federal Bureau of Maritime Casualty Investigation

Loss of containers overboard from MSC ZOE

1-2 January 2019

Report on the implementation of the safety recommendations of the joint investigation report of 25 June 2020

1 February 2022

The legal basis for obtaining information on the implementation of the safety recommendations results from No. 7 of the Annex to Commission Regulation (EU) No 1286/2011 of 9 December 2011 adopting a common methodology for investigating marine casualties and incidents developed pursuant to Article 5(4) of Directive 2009/18/EC of the European Parliament and of the Council. According to this, the European investigative bodies are to endeavour to determine which measures in detail have been taken in response to safety recommendations.

Accordingly, the Federal Bureau of Maritime Accident Investigation (BSU), in close consultation with the Dutch Safety Board (DSB), contacted the addressees of the safety recommendations and received the information summarised in the following report. The addressees have agreed to publication due to the special public interest.

In interpreting the report, the English version shall prevail.

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Response on the recommendations made in the Joint Investigation report into the loss of containers by the MSC ZOE.

In the late evening of January 1, 2019 and the early morning of January 2, the containership MSC ZOE lost a total of 342 containers whilst sailing on the North Sea, in the Traffic Separation Scheme (TSS) Terschelling - German Bight. Now following is a summary of the follow up of the recommendations by the addressees.

The Merchant Marine General Directorate, Panama, the Dutch Safety Board, Netherlands, and the Bundesstelle für Seeunfalluntersuchung, Germany made the following recommendations.

To **their responsible administrations** in their capacity as representative of the flag states in the various committees of the IMO:

1.1 Revise the existing technical and legal regulations for container ships regarding the design limits of cargo securing equipment, approved loading and stability conditions and the consideration of shallow water effects and speed on ship motions and resulting accelerations and forces.

The German Ministry of Transport and Digital Infrastructure (BMVI/BMDV)[1] started several initiatives with respect to the questions raised in the report pertaining to the stability, cargo and cargo security standards. The guidelines adopted at MSC 102 (… for the second generation intact stability criteria" (MSC.1/Circ.1627)) which already address the said effects, in particular for large ships, and are also based on German initiatives and studies in important areas, should be examined with regard to the question whether they are adequate for large container ships. Depending on the result of this examination, Germany aims at an internationally binding application of the directive after expiry of the trial period. With respect to the complex topic of the adequate cargo security, the BMDV conducts a conversation with the industry and science in Germany. At the same time, the BMDV jointly prepares an extensive study with the Netherlands and the industry, in order to lay the foundation for further initiatives.

The Dutch Ministry of Infrastructure and Water Management endorses the request for adequate international rules and regulations and will intend, together with Panama and Germany, to initiate a broader analysis of the degree to which the international rules and regulations possibly lag behind the increase of scale of containerships. In doing so they will take into account the provisions and aspects mentioned in the recommendation, as well as the results of relevant national and international research undertaken so far or planned to be undertaken. Furthermore, the Ministry will plead in IMO to make the Interim second generation intact stability criteria mandatory after the trial use of these guidelines. These criteria have been approved at the 102nd session of IMO's Maritime Safety Committee and promote a uniform international safety level for ships encountering stability problems.

1.2 Generate an obligation on all container ships

1.2.1 to install electronic inclinometers or similar (inertia) systems to measure and display this information in real-time to the captain/crew, and

[1] Since 8 December 2021, the new name of the Ministry is "Ministry of Digital and Transport" (BMDV). In the following, this new designation will be used throughout.

1.2.2 to install sensors on critical locations on the ship in order to measure accelerations and to provide this information in real-time to the captain/crew in order to allow them to monitor these;

1.2.3 and for ships with mandatory equipped VDR to record actual roll angle, roll period and accelerations for the purpose of safety investigations.

Together with the Netherlands and the International Chamber of Shipping (ICS), Germany filed a submission for MSC, in order to make the equipment with an electronic inclinometer binding for container ships and bulk carriers with a dimension of more than 3000 GT. Unfortunately, the corona pandemic caused a delay. This necessitated a formal submission to MSC to ensure a timely entry into force. Initiatives for a binding introduction of further sensory system are being discussed with the Netherlands.

The installation of sensors to measure accelerations is an issue that the Dutch Ministry of Infrastructure and Water Management intends to address under the broader analysis as mentioned under recommendation 1.1. This would also require a new output on the work programme of the Maritime Safety Committee of the IMO, which needs substantial argumentation and justification.

1.3. Evaluate and assess possible technical solutions that can assist the captain/crew in the detection of the loss of containers and propose international standards for implementation of such solutions.

Together with other EU member states the Netherlands and Germany have submitted a proposal to MSC for a new output for the development of measures regarding the detection and mandatory reporting of containers lost at sea that may enhance the positioning, tracking and recovery of such containers. Due to restrictions imposed by the COVID pandemic this proposal will be considered by the next session of MSC.

In 2019 research has been undertaken by the Netherlands Organization for applied scientific research, TNO, on order of the Dutch Minister of Infrastructure and Water Management regarding the monitoring and detection of containers lost at sea, titled "Inventory of technologies for monitoring, tracking and identification of maritime containers and their cargo". Once the mentioned new output has been approved and is considered the Dutch Ministry of Infrastructure and Water Management will bring this report to the attention of IMO, in order to support the development of such measures. In the meantime several shipowners have already taken initiatives in this respect. In 2019 a great number of sensors have been placed in containers by the three largest containership owners in order to gain experience with such equipment.

At the same time, Germany is in consultation with big container shipping companies having developed innovative sensor technology for tracing containers and already testing these at a large number of containers.

To **the responsible administrations of Netherlands and Germany** in their capacity as responsible authorities for the conservation and protection of the Wadden Sea, in cooperation with the Trilateral Wadden Sea Cooperation:

2.1. Ascertain whether the existing tracks of the German Bight Traffic Separation Schemes (TSS) north of the Wadden Sea have to be adapted, or measures have to be taken particularly for large containerships to maximize the safety of the voyage on the sailing routes. In doing so, the following aspects and hydrodynamic phenomena have to be taken into account:

- Extreme ship motions and accelerations;
- Ships speed;
- Green water effects;
- Slamming;
- Possibility of contact with the seabed;
- Status of the Wadden Sea as Particularly Sensitive Sea Area (PSSA)

2.2. If determined that adaptation is necessary or measures have to be taken, the responsible administrations in their capacity as representative of the flag states in the various committees of the IMO, should propose an amendment and/or measures for the above mentioned existing tracks.

The recommendation has been discussed between the administrations of the Netherlands, Germany and Denmark. The conclusion thereof is that so far there is insufficient basis for a mandatory routeing measure or amendment of the existing tracks.

In the meantime the Netherlands has chosen to focus on the improvement of the information position of the crew on board. In this respect the following measures have been implemented in the Netherlands:

- *Since 31 October 2019 the coastguard provides advice to large containerships in certain weather circumstances for the risk of bottom contact with the seabed. In the meantime the coastguard of Germany also provides advice to large containerships in the western direction;*
- *Since October 2020 specific information on wave direction and period is broadcast by the coastguard to ships during storm conditions;*
- *On the basis of the results of the MARIN research the advice by the coastguard has been extended to smaller containerships (i.e. larger than 100 metres in length) and to the risk of loss of containers in general above specified wave heights as per November 2020.*

The BMDV established a nationwide working group – Federal Government/Federal States – with the responsible public authorities, affected associations and further experts, in order to ensure the co-ordination of further activities as well as expert support and the appraisal of the investigations. Further studies required for the investigation of the effects are currently carried out by the MARIN Institute on the part of the Netherlands and the BSH on the part of Germany. The discussions focus on the possibility of various routings, also through the IMO. Alerts, which are largely agreed upon with the Netherlands, are in force since the beginning of the gale season and are spread by the usual channels.

Together with its international partners, the BMDV is striving for a continuation of the warning message already sent out and is actively working on submitting a proposal to the IMO to amend the TSS concerned and to discuss it there as early as 2022.

To **the shipowning company MSC:**

3.1 In the construction and operation of ships, reduce high acceleration forces, which can cause damage to crew, passengers and cargo, by installing eg. bilge keels or anti-roll tanks or stabilizers or setting operational stability limits eg by limiting the operational GM.

3.2 Raise awareness and develop guidelines to the Masters and Navigational Officers on sailing with a high stability and the hydrodynamic phenomena that may be encountered in the sailing routes north of the Wadden Sea.

On the day following the incident, the shipowning company MSC ordered the re-routing of its vessels sailing from the English Channel into German ports. As a general precautionary measure, the vessels were ordered to no longer proceed via the TSS Terschelling – German Bight, but to use the northern deep-water route instead. The TSS Terschelling – German Bight has been qualified as a "no entry area" and all the MSC vessels take only the northern route.

Limiting the operational GM for these kind of vessels in the considered sailing area is very difficult. MSC's focus has therefore been on alternative solutions as follows:

1. *Awareness/Training*
   The lessons learned are implemented in the training matrix for masters and officers. In particular the options and tools to predict and avoid critical accelerations are included as training subjects in these training modules.

2. *Upgrade of the lashing software*
   The actual GM value of the vessel is the basis for the calculation of the limiting factors of stability and containers stowage. Consequently, the forces acting on the lashing equipment will be calculated based on the actual loading condition of the vessel, including the actual GM value.

3. *Passage plan monitoring*
   Passage plans are provide and monitored by the operations team in Geneva 24/7, to ensure the vessels strictly comply in terms of speed and routing.

4. *Seakeeping*
   The bridge teams are provided with a more accurate tool to predict and avoid critical movements and accelerations of the vessels under different stability and weather conditions.

5. *Harmonization of Cargo loading software*
   MSC has implemented a software harmonization project with the goal to use the same version of the cargo loading software throughout the fleet. The project is expected to be completed within 2021.

6. *Company Policy for Maximum acceptable rolling*
   MSC has developed a policy of maximum acceptable rolling. Posters for awareness have been ordered and displayed on each vessel's bridges.

7. *Participation to the development of an application in collaboration with DNVGL*
   DNVGL has launched a research on an application designed at helping prevent parametric and synchronous resonance on containerships. Due to the considerable amount of expert analysis and data available for the MSC ZOE incident, this casualty is being used for the development of this application.

8. *Retrofitting of the lashing bridges*
   A retrofitting program has been introduced to increase the height of the current lashing bridges on several of the MSC vessels. MSC entertains regular interaction with classification societies, yards and lashing-gear designers/manufactures to implement new measures regarding lashing bridges.

9. *Study on modifications of certain class of vessels (over 8000 TEUs)*
   MSC has launched a study at reducing the occurrence of high GM especially in low draft conditions, which involves studies for increasing the stack weight capacity of the hatch covers. A system is tested on several MSC vessels – including MSC ZOE – and if found sufficient, the system will be implemented on other vessels during their dry docking periods.

10. *Digital inclinometers*
    MSC has tested two models of digital inclinometers and purchased a model to be installed on the MSC vessels.

11. *Cameras*
    Cameras, many of them infrared, are now installed on most of the MSC vessels which adds a further possibility to compensate for restricted visibility on deck especially at night and during storm when no crew can be sent out to check on the stow.

12. *Bilge keels*
    MSC agrees that constructional changes (larger bilge keels, stabilizers, anti-rolling tanks) could reduce the rolling effects. However MSC also highlights the drawbacks, notably in respect of the operability of the vessels, in particular ecological aspects, as increased fuel consumption. Irrespective of the difficulties, the technical departments of MSC are in the process of evaluating the effect of various solutions.

To the **World Shipping Council** and **the International Chamber of Shipping**:

4.1. Communicate actively the lessons from this safety investigation;

4.2. Propagate industry standards and principles that will increase the safety of container transport;

4.3. Start an initiative for innovation in ship design, to work towards hull and/or lashing system designs that are better suited for the conditions as described in this report.

The World Shipping Council (WSC) communicated a link, accompanied by appropriate background and introduction to the international investigation report, to all WSC Member companies. The report was also referenced during the inaugural meeting of the WSC Safety and Security Council (SSC) on January 19, 2021. The SSC also established a working group which is exclusively focusing on issues regarding containers lost at sea.

The WSC and its members companies have been, and continue to be, actively involved in efforts to further increase the safety of container transport. WSC having the observer status at IMO, lead to co-sponsoring of several submissions regarding reduced container stacking strength, containership fires and mandatory reporting systems for containers lost at sea.

WSC and its Member companies agree that the risks of future incidents of containers lost at sea, could be addressed via a comprehensive approach, encompassing a multitude of issues and concerns. They also agree that ship and lashing designs should form an integral part of such a comprehensive approach, preferably undertaken jointly by key parties such as shipyards, technology developers and manufacturers, equipment manufacturers and service providers, classification societies etc. WSC has indicated its interest to the Dutch-based MARIN research institute in participating, initially as an observer, in the follow-up joint industry research project that is being developed entitled "TopTier".

The International Chamber of Shipping (ICS) has issued a circular to all members raising awareness of the investigation report and its conclusions. It should be noted that the

members are not only active in the container shipping sector, but also in all other sectors, altogether representing over 80% of the world's shipowners and operators. Therefore, the communication was aimed at achieving broader awareness, in the interest of helping enhance safety through information.

ICS articulates and advocates shipowner positions to international regulators including the International Maritime Organization (IMO), promulgating the continuous enhancement of the high standards of quality, safety of shipping and environmental protection.

At the same time, ICS holds regular meetings of internal Committees, Sub-Committees and Panels, including a dedicated Container and Dangerous Goods Panel, in order to discuss issues facing industry and identify solutions aimed at advancing the abovementioned goals.

Among other initiatives ICS has taken following actions towards enhancing industry standards and principles, increasing the safety of container transport:

- *ICS has been promoting a proposal at IMO to introduce SOLAS amendments for the mandatory carriage of electronic inclinometers on containerships and bulk carriers. This technology will help enrich the base of accident investigations through relevant data availability, but also support the decision-making process onboard by providing accurate roll motion information of the ship to avoid dangerous situations.*

- *Since 2019, ICS has actively participated and contributed with proposals in the Stakeholders' Workshop on Lost Containers organized by the European Commission. The first meeting took place in July 2019, following the MSC ZOE incident, and was aimed at answering how to prevent the loss of containers and mitigate the environmental impact.*

- *ICS has been promoting an IMO review of container stacking strength requirements in the 1972 Convention for Safe Containers (CSC), as amended. This proposal is aimed at updating the CSC as appropriate in order to reduce the incidence of collapsed container stacks and resulting losses at sea, in the interest of safety of crew, ships and environmental protection.*

Innovation in ship design, hull and lashing equipment designs are of extreme importance for the safety of the container sector. Ship owners and operators, as customers of designers and manufacturers of ships, hull and lashing systems, look to those parties to provide them with vessels and equipment that are safe, fit for purpose and compliant with the applicable requirements. Such compliance is certified by classification societies, as appropriate, for shipowners to be able to use those vessels and equipment, and as such the recommended action is not within the role for ICS.

ICS has however added industry's voice to proposals made at IMO with regard to ship and equipment design aimed at enhancing the safety of shipping, and continues to support appropriate initiatives taken by those organizations within whose remit the above areas fall.

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