Responding to Containership incidents

Colleen O'Hagan & Andrew Tucker (Senior Technical Advisers, ITOPF)

ITOPF Ltd, 1 Oliver's Yard, 55 City Road, London, UK, EC1Y 1HQ

Submission date: 15th February 2012

ABSTRACT

Throughout its history, ITOPF has been involved with many containership incidents of varying degrees of severity. Recently attended high profile incidents, such as the MSC NAPOLI (UK, 2007), MSC CHITRA (India, 2010) and RENA (New Zealand, 2011), have resulted in long, complex responses, both in terms of the salvage operations that followed, as well as the recovery of spilled oil and cargo. The cargoes have included a wide range of substances and materials, some of which were considered to be hazardous. One of ITOPF's primary objectives on site is to understand the impact that substances lost from a ship may have on the marine environment, in order to assess the most effective and efficient response techniques applicable. When responding to containership incidents the added complication of numerous substances other than oil also being lost often presents an additional set of considerations. The aim of this paper is to highlight the common challenges that have arisen following serious containership incidents, focusing largely on the MSC CHITRA incident response in India, in order to encourage preparedness and planning for other such events.

INTRODUCTION

On 7th August 2010, container vessel MSC CHITRA (built 1980, 33,113 GT) and bulk carrier KHALIJIA III (built 1985, 25,525 GT) collided near Prong Reefs within the approaches to the main ports in Mumbai, India. This resulted in the loss of both oil and cargo and necessitated a complex incident response lasting over seven months, also involving a complicated salvage operation for the vessel itself. Initial reports following the collision and subsequent grounding estimated a loss of over 600 MT of bunker fuel, and 250 containers from the MSC CHITRA, which was reported to have been carrying around 2,600 MT of bunker fuel and 1,219 containers at the time of the incident. The seasonal monsoon weather hampered at-sea response operations, and within a number of days, oil, containers and their contents began stranding along shorelines within Mumbai Harbour area and along the coast, south of the city. Many of the challenges faced during the response to the MSC CHITRA, are also common to other containership incidents and thus worthy of review.

INITIAL RESPONSE ACTIONS

The identification and prioritisation of the risk posed by oil and cargo lost at the time of the incident and which might be lost during the subsequent salvage operation was a lengthy process given the large and varied quantity of cargo on board. An initial assessment of the MSC CHITRA's dangerous goods (DG) and general cargo manifests, helped to broadly identify what was carried in the various containers. This included 31 containers classified as corrosive, poisonous, toxic or flammable. The general format with which cargo manifests are compiled and displayed, together with the casualty's heavy list to port after grounding complicated modelling the three dimensional arrangement of the containers on board the ship, making it difficult to ascertain exactly which containers had actually been lost.

While the fate and behaviour of spilled oil is generally well understood, the fate and behaviour of lost containers/cargo either intact or saturated with oil/seawater is not. There are many more variables and complexities that need to be evaluated. The commercially relevant information provided in a ship's manifest can sometimes be vague from a responder's point of view and may not be sufficient to enable a detailed understanding of how the contents of a particular container are packaged. They may also lack sufficient detail as to the physical properties of the substances carried in a particular container. For additional information the shipper (Consignor), cargo owner, charterer, receiver (Consignee) or manufacturer may be able to assist. An understanding of the integrity of the container and the packaged contents inside may provide an indication of whether the container and contents are likely to remain intact, float or sink if lost overboard. Following the MSC CHITRA incident, a number of containers sank, while some floated before stranding on the shoreline. The ID number on stranded containers enabled identification of their contents; stranded cargo also helped provide an indication of the likely source container in order to account for and identify the status of as many lost or damaged containers as possible.

Some container cargoes have greater potential for environmental impact than oil, in addition to more complex health and safety concerns. Therefore, it was a priority to identify the fate of the DG containers containing cargo classified as hazardous and noxious substances (HNS). HNS is defined under the OPRC-HNS Protocol[1] as a

[1] Protocol on Preparedness, Response and Cooperation to Pollution Incidents by Hazardous and Noxious Substances, 2000 (see www.imo.org)

substance *other than oil* which, if introduced into the marine environment is likely to create hazards to human health, to harm living resources and marine life, to damage amenities or to interfere with other legitimate uses of the sea. Various tools were used to assist with assessing potential impact, such as the relevant Material Safety Data Sheet (MSDS; ideally from the manufacturer) as well as reference literature such as GESAMP[2], NIOSH[3], CAMEO Chemicals[4]. This enabled identification of some of the likely hazards posed by these substances and a better understanding of how they would behave in both seawater and the atmosphere[5] (evaporate, dissolve, float or sink). These references also provided information on the toxicity of each substance and the risk this might pose to human health and the marine environment. Fate models such as ALOHA[6] and ChemSIS[7] were utilised to predict the likely behaviour and movement of the substance through the atmosphere and/or water column to assist with determining safe working distances for any substance of concern.

During the MSC CHITRA incident a number of DG containers were identified as being of significant concern. These mainly contained pesticides with one particular container carrying canisters of Aluminium Phosphate (AIP), identified as being of highest priority. When in contact with water, AIP can react to produce the highly toxic phosphine gas (PH_3). A number of days into the response, the salvors notified the authorities that a container carrying 2,800 x 1.5kg canisters of AIP had fallen from the deck during their operations and the contents spilled inside the vessel. Reports

---

[2] GESAMP: Joint group of Experts on the Scientific Aspects of Marine Environment Protection.
[3] NIOSH: Pocket Guide to Chemical Hazards, US Dept. of Health and Human Services.
[4] CAMEO Chemicals: NOAA *www.cameochemicals.noaa.gov/*
[5] ITOPF Technical Information Paper on Response to Marine Chemical Incidents *www.itopf.com*
[6] ALOHA: NOAA Areal Locations of Hazardous Atmospheres http://response.restoration.noaa.gov/aloha
[7] ChemSIS: Chemical spill dispersion model developed by the National Chemical Emergency Centre (NCEC) and BMT.

followed that canisters which appeared similar to those containing AIP had also begun to strand ashore.

Where information on a specific cargo of concern is insufficient in terms of response planning, as with the AIP cargo in this incident, it may be useful to contact the cargo manufacturers to gain a better understanding of the nature of the material. They should be able to provide specific information regarding health and safety measures employed for handling the material under normal conditions, and the availability of appropriate detection devices used to identify the hazard. ITOPF contacted the manufacturer of the AIP to gain the additional information described above, as well as assistance in correctly identifying the AIP canisters (given that many of the markings had washed off before stranding and some were oiled). It was also important to understand the physical strength of the canisters and their robustness against rupture. The manufacturer subsequently arranged a technical team to travel to the incident site to assess the situation, and assist in mitigating the risk caused by the AIP canisters to both the public and shoreline response teams. They did this by removing all suspected canisters, as well as carrying out regular PH_3 gas monitoring to detect whether PH_3 had been produced by a leaking canister. They were also able to provide an emergency contact point should additional canisters be uncovered.

Although DG cargo is often a primary concern, general cargo should also be evaluated for potential issues, for example rotting/decomposing materials. The rate of decay will depend on environmental factors present at that time, such as temperature and humidity. The result may be unpleasant odours or infestation by vermin and is generally unpleasant for responders. In more serious cases decay can result in the generation of hydrogen sulphide gas (H_2S) which is a particular hazard when allowed to accumulate in confined spaces as it is highly toxic and flammable.

Inhalation of significantly high concentrations of the gas can be fatal. If there is a risk of H_2S being produced implementation of an air monitoring plan may be required.

Due to the additional risks and hazards associated with containership incidents (as a result of the varied cargo onboard), health and safety has to be the main priority. Even though obtaining the necessary information and expert advice to aid the development of risk assessments may cause a time lag between the incident occurring and a physical recovery operation, it must be acknowledged as an integral part of the response. In order to assess the hazard posed by AIP canisters stranded on the shoreline both ITOPF and Oil Spill Response Ltd (OSR) (who supervised the shoreline response effort undertaken by Seaworthy Shipping Services, a locally based clean-up contractor) undertook a risk assessment study to identify and mitigate potential hazards to responders. Atmospheric modelling was carried out through the National Chemical Emergency Centre's (NCEC, based in UK) Marechem (24 hour advice) service to simulate the typical gas concentrations likely under a number of scenarios and conditions, which helped to indicate safe distance limits, and protocols to be adhered to should PH_3 gas or other hazard be detected. Additional specialist technical advice was also offered by the bareboat charterer of the vessel.

RESPONDING TO SPILLED CONTAINERS/CARGO

At sea, the response actions, as with oil, would depend on the specific properties and characteristics of the material/substance in question. Floating solids, such as containers or cargo spilled from damaged containers, can be corralled from boats using nets or poles with hooks, which can be recovered using grabs or shovels.

Sunken materials may require dive surveys, dredges or crane grabs, where recovery is considered necessary. However, responding to spills of containers and cargo can also raise issues that differ from those typically encountered with spills of oil. Cargo stranding ashore can result in security issues at stranding sites, where the general public may take unnecessary risks to retrieve stranded goods. In order to reduce safety concerns, sections of shoreline may need to be secured and access restricted. It is difficult to ascertain what substances may have mixed together prior to stranding on the shore. Therefore, during the MSC CHITRA incident advisory notices were posted at key sites to notify the public on the potential hazards and risks that might be present on the shore. During the RENA and MSC NAPOLI, temporary closure notices were issued for sections of shorelines in an attempt to restrict public access so that identified hazards could be removed. Jurisdiction and ownership over the foreshore to enforce access restrictions can be a complicated legal issue and varies across local, regional and international boundaries and therefore should be considered as much as possible in the contingency planning process to avoid confusion during an emergency situation.

Cargoes comprised of absorbent materials such as paper or cardboard can dramatically gain weight when saturated with water or oil. This additional weight and subsequent expansion can lead to rupture of packages and result in shipping containers becoming structurally compromised and failing, for example the floor of the containers can fall out as they are being moved. This is a health and safety issue in addition to the risk of more cargo being released. Temperature changes to cargo, due to air temperature or loss of refrigeration, can cause rapid physical changes, such as melting or vaporisation, of some substances. Different substances may therefore require different response protocols and safety measures to be in place before recovery can take place.

During the MSC CHITRA incident, some of the cargo stranding ashore was contaminated by oil. Oiling made the impact of certain cargoes more serious, identification of hazardous materials amongst other cargo more difficult, and the classification of recovered material for waste disposal more complex. For example, large quantities of oil-soaked plastics stranded along shorelines, wrapping around mangroves and other vegetation, or becoming partially buried in the sediment. As plastic will not readily degrade naturally, much of it was removed manually, with great care taken to minimise any physical damage to the soft sedimentary shores and the complex root systems of the trees. In mangrove areas that were contaminated with oil alone, the risks posed by entering the area was considered and the decision was made that no clean up should be undertaken and natural recovery monitored, in order to minimise potential damage and physical disturbance that could result from actions of clean-up workers.

Environmental authorities often have legislation in place governing the classification and disposal of waste. Depending on the degree of oil contamination, otherwise inert cargo such as glass, plastics or paper may be classified as hazardous. Hazardous waste should be segregated once recovered as options for its disposal are often limited due to regulatory restrictions. It is possible that large quantities of hazardous waste cannot be immediately processed and may require temporary storage while a backlog is being cleared. This was an issue during the MSC CHITRA when the majority of the oiled cargo was classified as hazardous material.

During the MSC CHITRA response, both the oil spill and lost containers caused unprecedented disruption to maritime activities. A temporary suspension for marine traffic in the Mumbai Harbour area was issued due to the navigational hazard posed by both floating and sunken containers; this affected port calls to both the Port of Mumbai and JNPT Container terminals, as well as passenger ferries transiting between the various islands and jetties around Mumbai. Vessel-based sonar surveys were undertaken by the Indian Navy and salvage teams to inspect the main shipping lanes for lost containers. Due to their relatively shallow draft, passenger ferries were able to resume normal operations within a few days, however commercial traffic was restricted to transiting in and out of the ports by convoy along routes that had been declared sufficiently clear by the surveys. These convoys continued for a number of weeks until most containers that were posing a risk to shipping were identified, assessed and moved or recovered where necessary.

Containership incidents can result in protracted salvage operations if containers have to be removed before refloating or scrapping the vessel. The container removal from the MSC CHITRA took almost six months and that for the MSC NAPOLI took four months. At the time of writing, operations are on-going on the RENA, four months after the incident. During this time a vessel is often subject to changing weather seasons and environmental conditions, the subsequent effects of which have to be considered when preparing for and mitigating possible further losses from the vessel. It is possible that cargo and containers may strand for some time after the initial response operation has concluded. Depending on the distance from shore where a particular container is lost and the local tidal and current systems, stranding of cargo could occur over a wide area of coastline. It may therefore be useful to establish a central contact point where any observed cargo by the general public may be reported and subsequently dealt with. If there is a risk of hazardous goods stranding ashore, then it is also important to educate the public on the potential hazard, what it might look like and actions to be taken.

Suitable temporary storage areas for recovered containers will be required and during the MSC CHITRA incident these were difficult to find and secure. Pre-identification of such sites ideally would be considered within a port or regional contingency plan. Processing damaged/undamaged containers requires a large area with good transport links and access for heavy machinery. Once recovered, either from the casualty or the seabed, containers have typically suffered some degree of damage and some of their contents may be waterlogged. In order to expedite both the salvage operation and a return to normal marine activity, often these containers will need to be offloaded and processed on land before repair or disposal. Suitable sites for landing damaged containers and storing them temporarily would ideally have a hard impermeable surface. Bunded areas with contained drainage need to be established for initial investigation of the containers. Unlike the high stacks of containers loaded on a container ship, damaged containers often cannot be re-stacked so the surface area required to store recovered containers is often many times greater than that of the ship's deck.

Containers, and their cargo recovered from a vessel will often require investigation by cargo or customs surveyors before a decision can be made on the appropriate and legal fate of the cargo. Considering the potential number of cargo owners involved, if not properly managed, this has the potential to cause further delays to the response, especially if sufficient surveying capacity has not been addressed in planning the operation.

SALVAGE OPERATIONS

Often salvors and those working in and around the vessel will face elevated risk from exposure to the contents of containers, in particular, as spilled cargo can collect within the spaces and the holds of the vessel where their impact can be concentrated. Salvors typically conduct their own risk assessment on the health and safety implications of the work they are about to undertake. This is due to the unique nature of their job, which brings a unique set of hazards not faced in a typical work environment. Salvors are often best placed to report on changes that may occur on the vessel that may have implications for other response organisations (such as further losses of containers, oil or cargo). It is therefore essential that good communication exists between the salvors and the authorities and other organisations involved in the incident response so that developing issues and new hazards are reported as soon as practicable to enable others to assess the safety of their own actions. Regular joint meetings with government authorities, salvage liaison personnel and response organisations throughout an incident encourage such cooperation. This was the case for all three of the incidents described in this paper.

CONCLUSION

Incidents involving containerships can result in the loss of a wide variety of materials and substances other than oil adding to the complexities involved with responding to such incidents. Many of the issues highlighted in this paper can be addressed beforehand as a part of the contingency planning process. In the past, preparedness activities have largely concentrated on oil spill response, with contacts and links to expert groups and response organisations well established in this field. When responding to potentially hazardous and noxious substances (HNS), gathering of key information on the cargo is integral to the response and advice from expert groups is essential given the potential implications for health and safety. Therefore organisations and information resources which can be called upon to assist, either on-site or remotely, during a HNS incident should be explored, and ideally, formal cooperative agreements established as part of the contingency planning process.

Undoubtedly, the necessity to remove containers from the casualty will directly affect the duration of the salvage operation, and response strategies will need to adapt accordingly, particularly as weather conditions change and cargo degrades. Long, complicated response operations can cause disruption to a wide variety of shoreline and maritime activities that can continue for some time. Contingency planning should aim to incorporate efforts that minimise such disruption. Pre-identification of storage areas, waste disposal routes, development of mechanisms to easily illustrate the arrangement of containers and their contents on a vessel, as well as the specific expertise that may be required to deal with a range of different cargos and waste materials, will also assist in mitigating the overall impact of an incident.

When preparing for containership incidents it is worth noting that the incidents discussed above involved relatively small containerships in terms of size and capacity, carrying between 1,200 – 2,300 containers, and around 2,000 tonnes of fuel oil on board directly prior to grounding. New builds of container ships are regularly increasing in size with vessels trading now with capacities of over 15,000TEU (twenty foot equivalent unit containers) and up to 17,000 tonnes of fuel oil. This trend for bigger and larger vessels emphasises the need for robust and effective response structures to be established that can quickly scale up as required, be sustained over an extended period of time, effectively assess the risks posed by the cargo, and address critical issues regarding the health and safety of responders and the general public.