Containers and Cargoes Lost Overboard

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Ever since man first put to sea, cargoes have been lost overboard. One of the first documented ship disasters occurred in the year 60 A.D. No sea adventure of ancient times has been more fully, excitingly or accurately told than St. Paul's shipwreck on the island of Malta during his voyage to Rome. As set down in Chapter 27 of the Acts of the Apostles, it is undoubtedly the most dramatic piece of writing in the literature of the age. Countless generations of seamen, including Admiral Horatio Nelson have appreciated it both for its vividness and technical accuracy. St. Luke, who wrote it, was not only aboard the ship with St. Paul, but had considerable experience of the sea as a doctor to seafaring men.

No man in those days went to sea with a light heart, for even the land-locked Mediterranean was considered to be a perilous place. This was because the ship-building art had not yet developed sufficiently to provide vessels that could be guaranteed not to break up in a storm. Neither were there any aids to navigation, such as compasses and sextants, so that when the heavens were obscured, mariners were as good as lost if out of sight of land. There were no accurate charts to give forewarning of submerged sandbanks, reefs and rocks which could tear the bottom out of a ship in full sail on an apparently friendly sea. St. Paul's voyage to Rome graphically portrays all of these perils.

The account of the disaster encompasses most of all the hazards which have resulted in lost cargoes up to the age of the container, beginning in the 1950's. For the first twenty years, the industry handled containers with a bit more care and respect than is presently the case. The companies which engaged in the sea transport of containers were generally the well run traditional steamship companies. Due to the design of the ships at that time, containers carried on deck were only stacked two or three tiers high.

Captain Hewlett Bishop, then President of the National Cargo Bureau, in 1962 authored a paper on behalf of the Maritime Administration of the United States addressing the design of containerships. The main focus of the paper was to implore naval architects to design ships that protected their cargoes. He based the need on a fact which is still relevant. A freight container is a fragile piece of equipment that even today is not intended to fend off a boarding sea. A recommended solution to this problem was locating the deckhouse at the forward end of the ship. This would not only assist navigational control, but also protect the most forward containers from boarding seas. Thus, many first generation containerships were built with the deckhouse located forward.

As time passed, and the competition became keener, the ships got bigger, faster and more costly. Due to arrangement and cost considerations, a design with a forward deckhouse was replaced with one utilizing a substantial breakwater or just omitted.

During the 1970's ship operators realizing that if containers could be stowed two or

three high safely–why not four or five high. Now, six high on deck is common and in some cases, seven high is being considered. The reason for stacking containers this high on deck is to carry more containers and thereby increase revenue.

With respect to taxes, most port dues are based on gross tonnage, which is defined in the Load Line Convention as a measurement of a ship's internal capacity. Thus, containers stacked many tiers high on deck are not counted in the tonnage measurement. Naval architects are invariably under pressure to both minimize gross tons and increase the number of containers that can be carried.

Current designs, particularly in the coastal feeder ship market, are seeing vessels with up to three-quarters of their cargo of containers carried on deck. One design for a 300 TEU coastal feeder ship has 228 containers on deck and only 72 below, a full 76% of the cargo on deck. The vessel has such a small freeboard that the deck edge immerses at only 11 degrees of heel. The figures for larger container ships are not so high, but, often, over half of the containers are carried on deck. Many feeder ships have less than one meter of freeboard, and many feeder vessels are open deck barges, where the entire cargo is stowed on deck..

The practical effects of such high deck loadings:

- Reduce the stability to occasionally dangerous levels;
- Interfere with visibility from the bridge;
- Expose very high stacks to potential damage from heavy seas and bad weather;
- Reduce the effectiveness of lashing arrangements;
- Reduce freeboard to such an extent that deck edge immersion and even capsize becomes a real possibility;
- Render ships almost unmanueverable at slow speeds due to excessive windage.

A number of the more significant cases of ships losing containers are listed below. Unfortunately, accurate information regarding losses of this nature is difficult to obtain for a number of obvious reasons.

1989, December 12	*MERCEDES DEL MAR*	5 Containers	Bay of Biscay
1992 , January 3	*SANTA CLARA I*	21 Containers	off New Jersey
January 24	*HYDERABAD*	2 Containers	off U.S. east coast
February 11	*AZILAL*	15 Containers	off French coast
September 23	*JANS*	22 Containers	at LaGuardia
October 23	*UNI-HUMANITY*	13 Containers	off Hong Kong
October 27	*STELLA I*	9 Containers	off Hong Kong
December 14	*CLYDEBANK*	4 Containers	North Atlantic
1994, February 14	*MARINE TRADER*	21 Containers	off Dutch coast
April	*KAMINA*	3 Containers	
April 14	*MING FORTUNE*	8 Containers	English Channel
December	*HYUNDAI SEATTLE*	30+ Containers	in North Pacific
1995, June 30	*ALEXANDRIA III*	111 Containers	off South Korea
1996, January	*MSC CLAUDIA*	21 Containers	off Boston
February 27	*MARITIME LEE*	3 Containers	in North Sea
September 11	*PONCE TRADER*	27 Containers	off New Orleans
December 20	*IBN SINA*	A number of containers	off N.Y.
1997, February 13	*TOKYO EXPRESS*	62 Containers	off U.K.
February 17	*RENNE*	28 Containers	North Sea
March 8	*DISARFELL*	A number of containers	
March 26	*CITA*	100 Containers	off U.K.
March 31	*POL AMERICA*	23 Containers	off Nantucket
April 14	*JANG YUNG LOTUS*	30 Containers	off Korea
August 7	*VISHA NANDINI*	14 Containers	off India
November 24	*MSC CARLA*	hundreds lost as ship split	
November	*KATE MAERSK*	26 Containers	off Coruna, Spain
December 17	*MSC RITA*	15 Containers	off Nantucket
1998, January 20	*SEALAND PACIFIC*	26 Containers	in Pacific
February	*ARCTIC OCEAN*	An unknown number of containers	
April 21	*KOON HONG 211*	17	off Hong Kong
September 19	*LEERORT*	94 Containers	Indian Ocean
October	*APL CHINA*	233 Containers	in mid-Pacific&450+damaged
October	*PRESIDENT ADAMS*	22 ”	“ ” “ +15damaged
October	*EVER UNION*	23 ”	“ ” “ +54 shifted.
November 11	*SEABARGE TRADER*	200 Containers	
December 20	*EVER GIVEN*	19 Containers	in mid-Pacific
1999, Unknown	*MSC BOSTON*	A number of containers	in mid-Pacific
April 26	*UNION ROTOITI*	12 Containers	off New Zealand
October 22	*EVER DIVINE*	80 Containers	at Pusan
December	*GUAYAMA*	9 Containers	off Puerto Rico
December	*HUMACAO*	51 Containers	off Puerto Rico
2000, January 26	*OOCL AMERICA*	300 Containers	in mid-Pacific
	ASTORIA BRIDGE	17 Containers	“ ”
	SEA LAND HAWAII	21 Containers	“ ”
	SEA LAND PACIFIC	26 Containers	“ ”
February 4	*CHOYANG HONOUR*	A number of containers	in mid-Pacific
April	*MING OCEAN*	“ ”	“ ” North Atlantic

When a container or containers are lost overboard, usually there is no news release and seldom is the fact publicized. The loss is only revealed to those in a need-to-know situation, i.e., the shipowner, shipper, receiver and insurer. Thus, the above mentioned case of the *SANTA CLARA I* is quite interesting as well as important. The incident has probably been the best researched and documented case of all cargo losses. The reason for this was that many of the lost containers were loaded with arsenic trioxide, an extremely hazardous commodity, and they were lost on the U.S. continental shelf in a prime fishing zone. As a result, the incident was well-covered by the media in the U.S. and in Europe.

The 9,600 tons gross (grt), 1974-built *SANTA CLARA I* was on a regular U.S. East Coast - South America West Coast service carrying containers, vehicles and breakbulk cargo. The Panamanian- flag vessel had arrived at Port Elizabeth, New Jersey on January 2, 1992 where containers were discharged from the Nos 2 and 3 hatch tops after which containers and general cargo were loaded into No 3 hold and on deck on top of Nos 1, 2 and 3 hatches.

She departed Port Elizabeth for Baltimore at 1517 hours on January 3, the master having declined the services of a shoreside lashing gang in favour of his crew. This was the master's first voyage for his new company although he had 25 years' sea experience, 18 of these in command. Following departure, the crew, under the bosun's supervision, lashed and secured the new cargo. Deck cargo on top of No 2 hatch comprised 15 loaded containers, 10 empty boxes and a "calciner", a 19-ton piece of mining equipment which was mounted on a steel frame, secured to a wooden skid. This 15-meter long device was stowed in between two rows of containers.

Late that night the vessel encountered severe weather – 50 knot gusts and 9-meter high waves – as she ran down the New Jersey shore. The vessel rolled heavily in the swells, pounding, surfing and taking water on deck. The master was reluctant to reduce speed, however, claiming that when he dropped below 11 knots, the ship lost steering control. At a point some 30 miles off Cape May, New Jersey *SANTA CLARA I* lost 21 containers and the calciner overboard. Due to the foul weather and thick fog at the time, the lost cargo went unnoticed. It was only when the Delaware pilot boarded the ship the next morning and remarked that a container was hanging over the side.

When the ship berthed at Baltimore later that day, it was discovered that the lost cargo comprised 17 general cargo containers and four 20-foot boxes that had each been loaded with 55 US gallon (210-liter) drums of arsenic trioxide, a very toxic substance which is also harmful to aquatic life, even in low concentrations. In addition, two other containers packed with this same cargo had been damaged and remained aboard the vessel. One of these containers, manufactured of fibreglass-reinforced plastic/plywood, had been ripped apart and had lost nine drums overboard.

The six containers were part of a consignment of 25 such boxes loaded at Coquimbo, Chile. The 19 other arsenic trioxide containers were stowed in No 2 hold and were undamaged. The drums had been positioned on pallets before stowage in the containers where they were braced with dunnage. Of the entire 450-ton arsenic trioxide shipment, some 414 drums, each containing 170 kg of the Class 6 substance, often used as a insecticide, rat poison or wood preservative, i.e. 70 tons, had been lost overboard.

SANTA CLARA I was not the only vessel buffeted by this particular storm. Two other ships and a barge also reported losing containers overboard off the New Jersey coast on the night of January 3, 1992.

The toxic nature of the missing cargo prompted a large-scale search of the area where the cargo was thought most likely to have gone overboard. The authorities were keen to find and retrieve the arsenic trioxide in order to prevent damage to the marine environment. Because of the extensive fishing carried out off New Jersey, initially, there were fears that the chemical might also get absorbed into the food chain and be ingested by humans.

Search operations over 100 square miles of ocean, including the use of U.S. Navy helicopters towing a side-scanning sonar system, yielded dividends when the first of the sunken containers and drums was discovered on January 12, 1992. Over the next two weeks a large field of debris was mapped out. However, winter weather and a dispute over who should bear responsibility for the cleanup delayed the start of recovery operations until April 6.

The salvage work, which took six weeks to complete, centered around a 100-meter barge equipped with two remote-operated vehicles (ROVs). The search was terminated by the shipowners on May 6, 1992 after 320 of the 414 missing drums had been found and recovered. The owners had maintained that only three arsenic trioxide containers had been lost overboard, although the cargo manifest indicated that it was four. Thus, the official records list 94 drums unaccounted for. Of particular interest in this incident was that this was the first time a port state forced a shipowner to retrieve a lost cargo from the floor of the ocean. The cost to the shipowner exceeded 5 million dollars.

The U.S. Coast Guard with the help of other agencies conducted a thorough investigation and the following conclusions were made. They are important in that most all cases of lost cargo today have a combination of the same root causes as *SANTA CLARA I*. They are as follows:

1. <u>The proximate cause</u> of the cargo loss was the failure to adequately secure containers and cargo on deck.

1. <u>Mechanical weaknesses</u> in the cargo securing system which may have contributed directly to the loss of deck cargo include:

a. inadequate number of wire lashings to overcome static and dynamic loads on the containers stow;

a. mismatched/improvised lashing gear, especially the use of an incorrect type of turnbuckle for the wire lashing and the unconventional use of penguin hooks with wire rope lashings;

a. improper (inverted) installation of wire lashings, putting an unreinforced eye over the penguin hooks;

a. pairing of penguin hooks with wire lashings, possibly weakening the connection to the corner fitting of the container;

a. use of already-damaged lashing gear;

a. improper stowage configuration of outboard 20-foot containers in a 40-foot space, leaving one end of each container stack unsecured.

a. deficient lashing configuration for the machinery on deck, minimizing the restraint against transverse sliding;

a. insufficient number of clips on the machinery lashing; and

i. unsecured hatch covers, permitting small lateral movements of the entire stow and slackening of the securing system.

3. Operational weaknesses which may have contributed to the casualty include:

a. failure to follow recommended international standards for providing stowing/securing instructions (a Cargo Securing Manual) aboard ship;

a. lashing under time constraint when underway into heavy weather, thus reducing the standard of care by the crew, and reducing the extent of actual lashing and securing;

a. maintaining an inventory of too many varieties of securing gear onboard, complicating the job for lashing gangs or crew;

a. excessive stability, causing increased dynamic forces acting on the cargo, greater likelihood of synchronized rolling in the seas, and therefore greater likelihood of large roll angles and green water on deck. The Master's unfamiliarity with the ship may have misled him in evaluating the stability conditions;

a. failure to properly assess the storm, its movement and relative winds;

a. failure to take early action in deteriorating weather to avoid putting the ship in a dangerous situation with limited safe alternatives remaining. The

Master should have navigated to put the ship in a position where he could effectively reduce speed, better control his heading in relation to the weather, and avoid heavy rolling and green water on deck. His unfamiliarity with the ship may have caused him to overestimate the capabilities of the ship in heavy weather; and

a. failure to effectively counteract synchronous rolling, pounding and the attendant violent motions of the ship, by reducing speed and/or changing course.

4. Other factors which may have contributed to the loss of cargo:

a. An apparent structural weakness inherent in the material of fiberglass-reinforced plastic containers, strained with the carriage of heavy, dense cargo; and compounded by stowage of this container below another heavy container.

a. Inadequate blocking and bracing of the cargo inside the containers, a condition which was exacerbated by palletizing the drums for container shipment.

- Regulatory controls and oversight programs leave significant gaps in safety for the carriage of containerized dangerous cargo in U.S. waters. The recommendations, guidelines and rules of the International Maritime Organization (IMO) and Classification Societies systematically outline the development of a good cargo securing system; however, neither the U.S. nor Panama has implemented the IMO guidelines by regulation. If the vessel operator had carefully applied these guidelines, the casualty may have been prevented.

- Stowage of marine pollutants such as Arsenic Trioxide on deck in lieu of under deck may present an unacceptable risk. In some conditions, such as the introduction of green water on deck, the forces may be of such magnitude that damages to deck-stowed cargo is unavoidable.
- Failure by the ship's crew and owner representatives to report and mitigate a known spillage of Magnesium Phosphide (and other hazardous cargoes) in Baltimore resulted in exposure of the crew and shoreside personnel to a substantial health threat, and left unchecked a safety hazard affecting the ports of Baltimore and Charleston.

It was this incident in addition to a loss of a deck cargo of containerized blasting caps in the English Channel which washed up on French shores that got the attention of the IMO. And interestingly it was only the concern for the hazardous cargoes and environmental concerns, in both instances regulated by the International Maritime Dangerous Goods code, that was responsible for the commencement of IMO actions. Insurance or commercial loss due to non-delivery of cargo was of no concern.

At the time, the IMO was in the process of implementing the Code of Safe Practice for Cargo Stowage and Securing (or CSS Code). This code set recommendation for methods

of securing cargoes on and under deck and basically was established under the following general principles:

- Stowage instructions, specific for the ship, must be furnished in the form of a Cargo Securing Manual which is approved by the flag administration.

- All cargoes should be stowed and secured in such a was that the ship and persons on board are not put at risk.

- The safe stowage and securing of cargoes depend on proper planning, execution and supervision.

- Personnel commissioned to tasks of cargo stowage and securing should be properly qualified and experienced.

- Personnel planning and supervising the stowage and securing of cargo should have a sound practical knowledge of the application and content of the Cargo Securing Manual, if provided.

- In all cases, improper stowage and securing of cargo will be potentially hazardous to the securing of other cargoes and to the ship itself.

- Decisions taken for measures of stowage and securing cargo should be based on the most severe weather conditions which may be expected by experience for the intended voyage.

- Ship-handling decisions taken by the master, especially in bad weather conditions, should take into account the type and stowage position of the cargo and the securing arrangements.

The Code applies to cargoes carried on board ships (other than solid and liquid bulk cargoes and timber stowed on deck) and, in particular, to those cargoes whose stowage and securing have proved in practice to create difficulties.

As the loss of containers overboard continued unabated, the IMO took the strongest action possible and that was the requirement for cargo securing manuals to be included in the Safety of Life at Sea Conventions.

Thus, effective December 31, 1997, every cargo ship on an international voyage, except for bulk carriers and tankers, will be required to have on board and utilize a Cargo Securing Manual which is approved by, or on behalf of, their national administration. The manual will list and describe all the securing materials and/or systems on board, provide instructions for use, and provide a method for performing securing calculations for use in special cases where calculations are needed.

This new requirement was initiated by the IMO and included in the 1994 amendments

to the SOLAS Convention and is, therefore, implemented in the national regulations for every ship, it does not prescribe a standard which must be met but, instead, requires that information be furnished to the master and then leave it to him to use it properly.

The U.S. Coast Guard is a firm supporter of securing manuals and is currently considering a rulemaking (USCG 1998-4951) which will add regulations requiring cargo securing manuals for U.S. or foreign vessels of 500 gross tons or more when on international voyages, consistent with Chapter VI/5 and VII/6 of SOLAS, which became effective December 31, 1997. This rulemaking will also address U.S. flag ships and barges when operating in U.S. coastal waters.

The actual effectiveness of Cargo Securing Manual and the CSS Code are difficult to quantify as losses of cargoes and containers overboard continue to this day. However, these IMO instruments are having an impact in another but less obvious manner.

1. Ship and cargo brokers are quite frequently inserting a clause in a charter party which states, “Throughout the period of this charter the vessel will adhere to all applicable codes and recommendations of the IMO.”

1. Occasionally, I hear the insurance industry is also adapting this or similar verbiage in their coverage of ships and cargoes.

In both of the above cases, commercial interests are forcing ship owners (or ship operators) to take better care of their cargoes, as courts, arbitrators and subrogation claims view losses a bit differently if it can be proven that the ship went to sea, and was not in adherence to recognized guidelines set forth by the IMO.

Incidentally, the publications of the IMO are economically priced and are available here in London at the IMO headquarters at Albert Embankment.

As a parting thought and perhaps a topic for next year’s conference, consider the ULCS, or ultra-large containership. Details of the concept for a 12,500 TEU containership have recently been released by Lloyd’s Register. Germanischer Lloyd is studying the economics of a 15,000 TEU ship, while a group in The Netherlands is planning an 18,000 TEU ship.

The fact that a very large number of containers will be positioned on deck and possibly stacked seven units high in each of the above three designs will surely cause some interesting stowage, securing, and firefighting, considerations.