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*Table 1.1
SOLAS contents list*

Aim of SOLAS

To promote safety of life at sea by establishing a common agreement for uniform principles and rules.

Case Study: 'RMS Titanic'

The loss of the Royal Mail Ship (RMS) 'Titanic' on 14th April 1912 was the catalyst for the initiation of the International Convention for the Safety of Life at Sea (SOLAS). At the time of her build, the RMS 'Titanic' was the largest passenger vessel in the world and was widely regarded as unsinkable.

The circumstances surrounding the sinking of the vessel and the reasons for such a large loss of life are well known, so only a basic summary will be provided here. However, the importance of the RMS 'Titanic' in the development of SOLAS and all other legislation since cannot be underestimated.

Incident Summary

Four days into her maiden voyage from Southampton to New York, the RMS 'Titanic' struck an iceberg off the coast of Newfoundland. The damage to the vessel's hull led to rapid and sequential flooding of the transverse compartments and the ship sank within a matter of hours.

The vessel had over 2,200 passengers on board, but a total lifeboat capacity for only 1,178. Over 1,500 died.

As a result of the disaster, minimum standards for the provision of lifeboats and other life-saving appliances were put in place through SOLAS. This was the first step toward ensuring minimum standards in all areas of onboard safety and fire protection.



*Figure 1.6
SOLAS requires specific lifeboat capacities and capabilities*

Case Study: ‘Scandinavian Star’

Another incident that was a catalyst for the adoption of more onerous requirements as part of SOLAS, was the major fire on board the ‘Scandinavian Star’ on 7th April 1990. While the loss of the RMS ‘Titanic’ had a major impact on the development of minimum life-saving appliance standards and requirements, the fire on the ‘Scandinavian Star’ (and previous incidents) had a major impact on fire protection standards and requirements.

Basic fire safety requirements have always been part of SOLAS and subsequent versions have improved upon the initial requirements. The ‘Scandinavian Star’ incident provides a good example of how such incidents have affected amendments to the Convention.

The ‘Scandinavian Star’ was built in 1971 and was originally named the ‘Massalia’. During service, the vessel was owned by a number of companies and changed its name several times.

The vessel had been operating as a casino cruise ship between the United States and Mexico but, shortly before the incident, changed operation to a standard passenger ferry sailing between Norway and Denmark.

Incident Summary

While on passage between Oslo in Norway and Fredrikshavn in Denmark, two fires broke out in the passenger accommodation. Fire spread quickly and was accelerated by the extremely flammable laminate covering that was prevalent in the passenger accommodation bulkheads. Subsequent investigation also revealed that the laminate produced hydrogen cyanide and carbon monoxide when burned and this may have contributed to the loss of life.

Attempts were made to contain the fire by automatically closing the fire doors on the deck (deck 3) that was affected by the initial fires. These attempts

Passenger Vessels (International Voyages)	<i>Partially or totally enclosed lifeboats on each side, of such aggregate capacity as will accommodate not less than 50% of the total number of persons on board. Launching appliances shall be equally distributed on each side of the ship.</i>
Passenger Vessels (Short International Voyages)	<i>Partially or totally enclosed lifeboats of such aggregate capacity as will accommodate at least 30% of the total number of persons on board. The lifeboats shall, as far as practicable, be equally distributed on each side of the ship.</i>
Cargo Ships	<i>One or more totally enclosed lifeboats such that the aggregate capacity on each side of the vessel will accommodate the total number of persons on board or one or more free-fall lifeboats, capable of being free launched over the stern of the vessel, of such aggregate capacity as will accommodate the total number of persons on board.</i>

Table 1.2
Summary of SOLAS requirements

failed as the doors could not be closed automatically and the situation was further compounded when the air conditioning system was shut down. It was thought that this action would cut off the supply of oxygen to the fire, but it increased the smoke in the passenger cabins, trapping many of the passengers.



Figure 1.7

'Scandinavian Star' in dock in Lysekil – fire-fighting continues a day after the fire broke out

The situation was confused and the Master instructed the crew and passengers to abandon ship. The subsequent investigation found that the crew abandoned ship prior to the evacuation of all the passengers.

Many of the passengers remaining on board did not hear the alarm and were quickly overcome by the fumes from the laminate furnishings. Those who did escape their cabins were faced with thick noxious smoke that hampered their attempts to locate the emergency exits. 159 people died as a result of the fires, which were believed to have been started deliberately.

The investigation raised a number of issues relating to onboard competence and methods of evacuation. Many of the crew did not speak English or

Norwegian, although the majority of the passengers were Norwegian. They were unfamiliar with the vessel and had not participated in a fire drill on board.

As a result of the incident, some major changes were made to the fire protection requirements in SOLAS for both new and existing passenger vessels. The amendments focused on requirements to install automatic sprinkler and smoke detection systems, non-combustible bulkhead materials and improvements to escape and evacuation systems. These included the need for low level lighting to assist escape in smoke-filled areas.

1.7.2 MARPOL

The original purpose of the IMO was to focus on safety at sea and to protect the lives of those working and travelling on board ships. However, the IMO took up a new challenge in the 1950s and 1960s – pollution.

The design and construction of new supertankers had resulted in much larger quantities of oil being transported by sea. These new supertankers had carrying capacities far in excess of any previous cargo vessel and the loss of the *'Torrey Canyon'*, in 1967, highlighted the problem in a spectacular manner.



*Figure 1.8
MARPOL applies to all ships, including tankers*

As a result of the disaster, the IMO introduced minimum requirements for all ships to prevent oil pollution and protect the environment. These are contained in the International Convention for the Prevention of Pollution from Ships, commonly referred to as MARPOL.

The main body of the Regulations details the measures to be in place to prevent pollution from all ship-related sources. Table 1.3 lists the main annexes to the Convention.

I	<i>Regulations for the Prevention of Pollution by Oil</i>
II	<i>Regulations for the Control of Pollution by Noxious Liquid Substances</i>
III	<i>Regulations for the Prevention of Pollution by Harmful Substances Carried by Sea in Packaged Forms</i>
IV	<i>Regulations for the Prevention of Pollution by Sewage from Ships</i>
V	<i>Regulations for the Prevention of Pollution by Garbage from Ships</i>
VI	<i>Regulations for the Prevention of Air Pollution from Ships</i>

*Table 1.3
Main annexes to MARPOL*

Case Study: ‘Torrey Canyon’

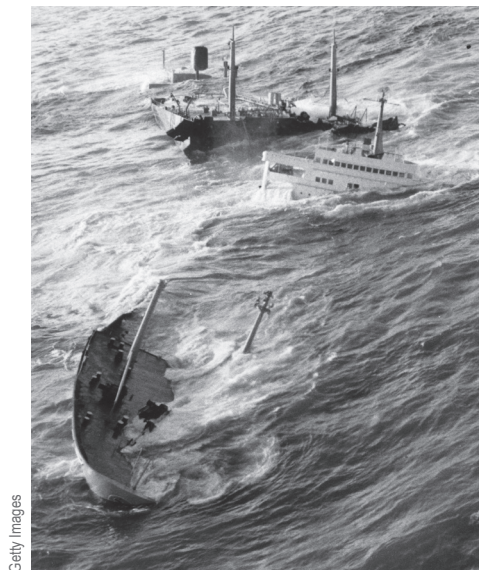
The oil tanker ‘Torrey Canyon’ was built in 1959. It originally had a cargo capacity of 60,000 tonnes, but was subsequently enlarged to a carrying capacity of 120,000 tonnes. The vessel was 297 m in length with a beam of 38 m and a draught of over 20 m.

On 18th March 1967, the vessel ran aground off the southwest coast of England with a full cargo of crude oil.

At the time of the incident, she was owned by the Barracuda Tanker Corporation and was on charter to British Petroleum.

Incident Summary

The ‘Torrey Canyon’ was on passage from Mina Al-Ahmadi, Kuwait, to Milford Haven, UK when she struck Pollard’s Rock, off Land’s End, causing a major oil spill. The coastlines of both England and France were severely affected.



Getty Images

*Figure 1.9
The wrecked tanker ‘Torrey Canyon’*

Efforts were made to salvage the vessel and to disperse the oil, but as this was the first major oil spill of its kind, the response was limited and ill prepared. Some of the measures taken to disperse the oil using detergents caused as much damage as the initial oil spill.

The vessel broke up and sank within a few days, but the damage to the marine environment had already been done.

The incident investigation found that the vessel had been using small scale navigation charts, which did not have sufficient detail to adequately portray all the hazards to navigation in the area. The vessel was using the Loran electronic positioning system as its primary navigation tool and this was not the most accurate system available. Added to these failings, prior to the grounding, the vessel was trying to negotiate an area of high traffic density, which consisted mainly of fishing vessels. Confusion between the bridge team as to what method of steering was being used complicated matters further.

As a result of the grounding and the significant environmental damage, the IMO introduced a number of preventative measures aimed at reducing the likelihood of future oil tanker incidents and, where incidents do occur, providing effective emergency response.

The introduction of MARPOL was the most far reaching of these measures. Over the years, MARPOL has been updated to incorporate measures not only to prevent oil pollution, but also pollution by chemicals, sewage, garbage and emissions.

1.7.3 ISM Code

The International Management Code for the Safe Operation of Ships and for Pollution Prevention (International Safety Management (ISM) Code) was adopted by the IMO as a direct result of the capsizing of the RoRo passenger ferry *'Herald of Free Enterprise'* in 1987.

The loss of the *'Herald of Free Enterprise'* highlighted numerous failures in the management system on board the vessel, in the management of the company's fleet and in the link between the onboard and onshore management teams. These failures all contributed to the large loss of life and resulted in the introduction of the most important new legislation since SOLAS.

Aim of the ISM Code

To provide an international standard for the safe management and operation of ships and for pollution prevention.

The purpose of the ISM Code was to ensure that the failures that were evident in the case of the *'Herald of Free Enterprise'*, and others, were not repeated. The Code was, therefore, established to provide a recognised international standard for safe operation. The ISM Code mandates the creation of a Safety Management System (SMS), which in the context of the Code is a structured and documented system clearly stating, and providing guidance on the implementation of, a company's safety and environmental protection policies.

The Code requires all shipping companies to:

- Identify all risks that personnel may be exposed to in the safe operation of the vessel. Providing suitable safeguards and mitigation to such risks is essential to comply with the Code
- identify critical operations on board all company vessels and to provide suitable guidance and procedures to ensure the safety of all those involved in performing them. Critical operations will vary from ship to ship, depending on the type of ship and the tasks that have to be conducted. Some tasks, such as entry into enclosed spaces, mooring and working at height, can be considered universal, but the SMS must consider the particular equipment, systems and requirements of each individual ship
- ensure that all foreseeable emergency contingencies are identified and ensure suitable plans are in place to respond. This includes conducting drills and providing training for the vessel's crew
- ensure a Designated Person Ashore (DPA) is identified within the shore-based management. The DPA is to be the primary safety contact for all personnel on board the vessel(s) and has a key role within the shipping company to ensure effective communication between the ship-based and shore-based management. The DPA must have direct access to the highest

level of management within the shipping company

- ensure that any additional support (technical, manning, safety, emergency) is provided to the vessel(s) within the shipping company
- provide a framework for continuous improvement in all aspects of the vessel's safety performance on board and ashore
- ensure compliance with all mandatory legislation and international and national rules and regulations.

These requirements and the full contents of the Code were introduced and implemented in stages between 1998 and 2002.

To remain compliant with the ISM Code, all shipping companies must provide evidence that the requirements of Part A of the Code are implemented and enforced on board all company vessels and within the onshore management structure.

1	<i>Objectives and Application</i>
2	<i>Safety and Environmental Protection Policy</i>
3	<i>Company Responsibilities and Authority</i>
4	<i>Designated Person(s)</i>
5	<i>Master's Responsibility and Authority</i>
6	<i>Resources and Personnel</i>
7	<i>Development of Plans for Shipboard Operations</i>