

# **Dangerous Goods Requirements. Problems. Solutions A shipowner's perspective**

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# Grain cargo



## Log cargo



# Steel cargo



What is the actual cargo here ?



What was the actual cargo here ?



# Problem - identification of cargo ?

- The Master of a container vessel cannot SEE the cargo !

And further complicated by :

- Container cargoes could be 'dangerous goods'
- Onboard cargo stowage plan is made by a shore planner.

# A question for the audience?

What percentage of the total containers on a west bound (Europe/Medi) container ship from the Far East (HK, China, Singapore) would be containers packed with dangerous goods ?

- A - 0.5%
- B - 1%
- C - 2.5%
- D - 5%



# The correct answer

What percentage of the total containers on a west bound (Europe/Medi) container ship from the Far East (HK, China, Singapore) would be containers packed with dangerous goods ?

- A - 0.5%
- B - 1%
- C - 2.5% Correct answer**
- D - 5%

# But exactly how many containers is that?

So, 2.5% of the containers would be 'declared' Dangerous Goods containers.

To put that into some context :

6000 TEU vessel = 150 containers

18,000 TEU vessel = 450 containers

# Presentation overview

- Requirements
- Problems
- Solutions

# Requirements

# ‘Dangerous goods’ definition

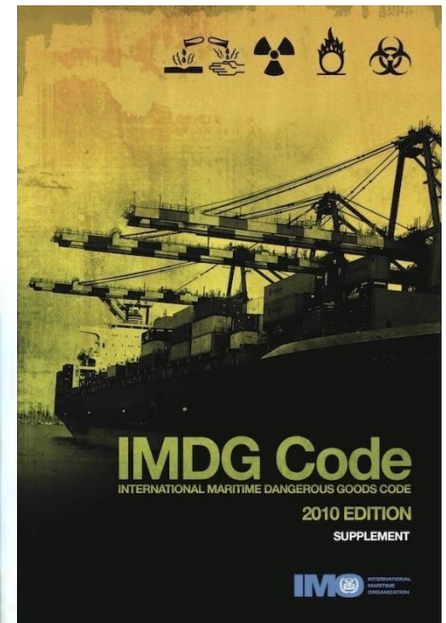
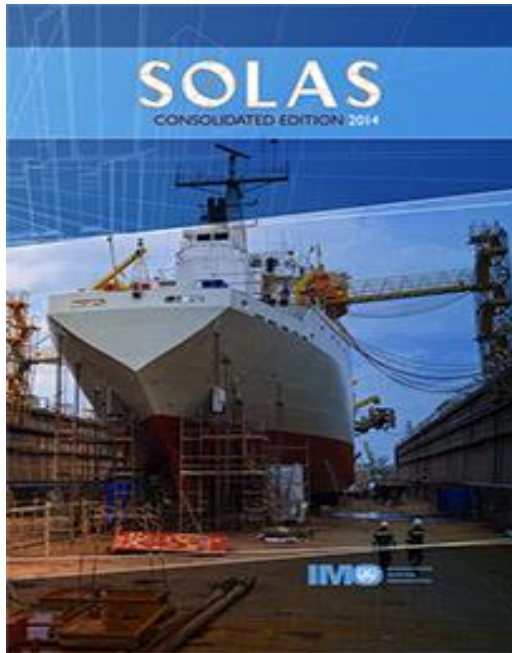
‘The substances, materials and articles covered by the IMDG Code’.

Ref. SOLAS, Ch.VII,PartA, Reg. 1

# SOLAS requirements for the carriage of dangerous goods

‘The carriage of dangerous goods in packaged form shall be in compliance with the relevant provisions of the IMDG Code’.

Ref. SOLAS, Ch.VII, Part A, Reg. 3



# The IMDG Code

‘The provisions contained in this Code are applicable to all ships to which the International Convention for Safety of Life at Sea, 1974 (SOLAS 74), as amended, applies and which are carrying dangerous goods as defined in regulation 1 of part A of chapter VII of that Convention’.

Ref. IMDG Code, 2012 Edition, Vol. 1, Ch.1.1, Section 1.1.1.1



# The IMDG Code



## Volume 1

- General provisions, definitions, training
- Classification
- Packing and tank provisions
- Consignment procedures (marking, labelling, documentation)
- Construction and testing of packagings, IBCs, large packagings, portable tanks, multiple element gas containers and road tank vehicles
- Transport operations



# The IMDG Code



## Volume 2

- Dangerous goods list, special provisions and exceptions (including limited quantities exceptions)
- Appendix A – list of generic and N.O.S Proper Shipping Names
- Appendix B – Glossary of terms
- Index



# The IMDG Code



**The Supplement** contains the following :

- EMS Guide
- Medical First Aid Guide
- Reporting Procedures
- Packing Cargo Transport Units
- Safe Use of Pesticides
- INF Code



# Categories of hazard : Classes



- Class 1 - Explosives
- Class 2 - Gases
- Class 3 - Flammable liquids
- Class 4 - Flammable solids
- Class 5 - Oxidising substances and organic peroxides
- Class 6 - Toxic and infectious substances
- Class 7 - Radioactive material
- Class 8 – Corrosive substances
- Class 9 – Miscellaneous dangerous substances and articles





# Marine pollutants



- If the substance does not fall under Classes 1 to 8, or a specific entry in Class 9, then it is transported as :

Environmentally hazardous substance, solid, N.O.S,  
UN No. 3077

Environmentally hazardous substance, liquid, N.O.S,  
UN No. 3082



# Marine pollutant mark



# DG procedures (all Codes)



- Classify the goods. Identify Proper Shipping Name.
- Check if any prohibitions or special conditions apply.
- Check if any packaging segregation requirements.
- Packaging (Packing Instruction, Class, Packing Group)
- Apply warning marks, labels to goods (Subsidiary risks?)
- Compile DG Transportation Document.
- Pack the goods into a Cargo Transport Unit (Segregate?)
- Compile Container Packing Certificate. Label CTU.





# Burden on 'cargo interests'

The majority of the International **Maritime** Dangerous Goods Code applies to tasks done ashore by 'cargo interests' not onboard the ship!

# Shipboard transport operations



Those onboard the vessel must consider the following :

- Stowage – on deck, under deck.
- Segregation – vertical, horizontal.
- Provisions in event of an accident / fire precautions.
- External condition of CTU. Labels.
- Empty containers - residues of DG cargo ?
- Ventilation, condensation, heat protection, temp control.
- Tracking and monitoring equipment.
- Documentation.
- Emergency Response Procedures (Check Supplement)



# Training requirements



Since 1<sup>st</sup> January 2010, in accordance with IMDG Code requirements:

‘Shore based personnel engaged in the transport of dangerous goods intended to be transported by sea shall receive training in the contents of dangerous goods provisions commensurate with their responsibilities.’

- The training should cover general awareness / familiarization training and function specific training
- Safety training remains recommendatory, not compulsory.



# Problems

# Minimizing risk



If the IMDG Code is complied with :

- Risks associated with carriage of Dangerous Goods can be recognized, assessed, and minimized to acceptable levels.

BUT

- This assumes the Code is followed by 'cargo interests' and port and ship are suitably equipped and personnel adequately trained.



# Common dangerous goods by Class



- 1 Explosives – ammunition, fireworks, flares, toy caps
- 2.1 Flammable gases–lighter gas, acetylene, ethylene.
- 2.2 Non flammable non toxic gases – carbon dioxide, oxygen  
(Aerosols Class 2.1 or 2.2 depending on properties)
- 2.3 Toxic gases–methyl bromide, ethylene oxide.
- 3 Flammable liquids – petrol, car lacquers, varnish

# Common dangerous goods by Class



4.1 Flammable solids – fire lighters, matches, sulphur

4.2 Substances liable to spontaneous combustion –  
phosphorous, copra, un-stabilized fish meal.

4.3 Dangerous when wet – sodium and potassium metals,  
calcium carbide

5.1 Oxidising substances – calcium hypochlorite, bleach,  
hydrogen peroxide, ammonium nitrate.

5.2 Organic peroxides–hardener, manufacturing goods



# Common dangerous goods by Class

6.1 Toxic substances – pesticides, degreasers.

6.2 Infectious substances – blood samples, syringes.

7 Radioactive material – used in measuring devices

8 Corrosive substances – car batteries, caustic soda

9 Miscellaneous dangerous - asbestos, ion batteries



# Most common dangerous goods exported from Asia



Class 3.1 **Flammable** liquids - paint, laquers, varnish,  
cosmetics, perfume.

Class 6.1 Toxic substances – pesticides, degreasers.

Class 8 Corrosive substances – dye chemicals  
(textile trade)



# Lack of compliance

## Most common deficiencies

- Labelling, marking, placarding
- Stowage within the CTU
- Documentation (including mis-declaration, non-declaration)
- Packaging

## Other problem factors

- Shore planner container loading software not same as shipboard software.
- Shore planning load plan can require manual checking by shore planner.
- Charterparty may have a DG Clause – shore planner needs to be aware of restrictions.
- Some Carriers have ‘in house’ policies which may differ from or add to IMDG requirements.
- Shipboard staff may not have time to properly check DG containers ashore before loading.

# Case study 1



40' high cube container, Hong Kong, June 2007

- Packed with various dangerous goods, and non-hazardous goods, loaded on deck for a voyage from the UK to Hong Kong
- Leakage of liquid noted from container during voyage
- Survey of container arranged for when vessel arrived in Hong Kong, June 2007



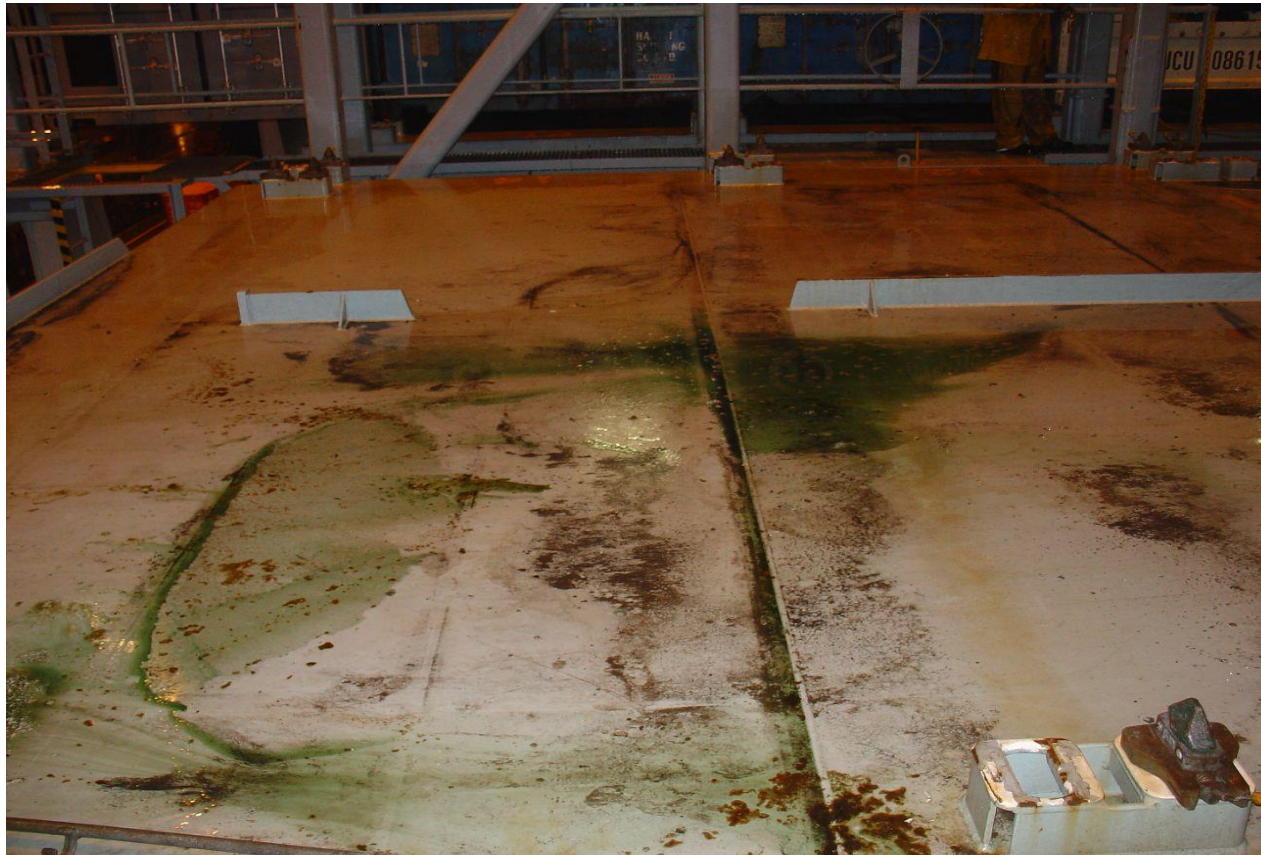
# Liquid chemical leaking from the door of the container



# Blistering of paint coating – this liquid is corrosive!



# Cargo spillage on hatch cover following removal of the container





## Dangerous goods in container

- 400 x 5 litre cartons Hycolin disinfectant. UN No. 3082. Class 9 : Environmentally Hazardous Substance.
- 50 x 25 litres Cresolox disinfectant. Un No.1760. Class 8. Corrosive substance
- 15 cartons wax polish. 20 x 25 litre steel kegs of paint. UN No.1263. Class 3 : Flammable liquid.
- 168 cartons Diazinon. UN No.1263. Class 3 : Flammable liquid

# Pallet found with cartons leaking



## 2 steel drums damaged and leaking



# Cartons crushed at bottom tier of pallet



# Wooden floor of container damaged by corrosive liquid



## Poor packing of the container resulted in :

- Damages to the vessel
- Damages to the container
- Damages & loss to the cargo

## Case study 2



40' high cube container, Singapore, 2009

- Non hazardous cargo & dangerous goods. (Groupage)  
Loaded in UK, bound Korea, via Columbo & Singapore
- Smoke sighted coming from container whilst vessel at sea.  
Sea water discharged into container by vessel's crew.
- Flames from container when vessel in Colombo - foam  
discharged into container by local fire services. Fire  
extinguished. Container surveyed in Singapore.



## Burn marks on side panel





## Major damage to cargo and container



## Drums poorly secured



# Combustion residue near heat damaged drums



# Gathering evidence of stowage and cargo condition prior to devanning



# Collection of samples of combustion residues for analysis



# Dangerous goods in container

- 4 pallets STC 16 x 180 kg net steel drums, ATMER 163. UN No. 2735, **Class 8 : Corrosive Substance**, Packing Group II. (Stow separated from acids)
- 4 x 200 litres Amtrol Virucidal Disinfectant, contains Chloroxylenol. UN No.2927, **Class 6.1 : Toxic substance, Subsidiary risk Class 8**. Packing Group II. (not an acid)
- 120 x 25 kgs Cokocide (Potassium Peroxymonsulphate). UN No.1759 **Class 8 : Corrosive Substance**. Packing Group II. (not an acid)

# Mis-declared DG cargo



- Laboratory analysis of the cargo residue samples obtained at the survey in Singapore was conducted. On the basis of those results, the carriers stated :

*'the categorization and carriage of this cargo was inappropriate'*

- Carriers held Shippers responsible for shipping a mis-declared cargo.



## Case study 3



20' container, Singapore, 2014

- Cargo of 'Mixed sulphide'. **Class 9.**  
**Miscellaneous dangerous substance.**  
UN 3077. Moisture content 14.06%.
- Packaging : in bulk in lined container





# Mixed sulphide in lined container



Plastic liner had been ineffective.



## Case study 4



Container shipped from UK to Vietnam, 2013

- 270kg drums of 'Cereclor' (Chlorinated paraffin) UN No. 3082. **Class 9 Miscellaneous dangerous substance.**
- Found leaking. Survey at Singapore.



# Labels on container



# Labelling on drums



## Leakage evident on floor of container



# Holes on drums resulted in leakage



# 'MSC FLAMINIA' 2011





# 'MSC FLAMINIA'



Fire and explosion occurred in No. 4 hold on German flagged vessel on 15<sup>th</sup> July 2011, in Atlantic Ocean, enroute to Europe from USA. Report by Germany's Federal Bureau for Maritime Investigation (BSU) found :

- Establishing cause difficult due to destruction in No. 4 hold and number of different Dangerous Goods in the hold.
- 3 tank containers of divinylbenzene (DVB) 'more likely than any other substance' to be the initiating cause of the fire.
- Safety information in manufacturer's MSDS for packaging, stowage and temp monitoring not provided to the vessel.

# 'MSC FLAMINIA'



In addition, other findings of the BSU included :

- 10.21% of laden containers in area of No. 4 hold '*exhibited shortcomings or negligence in the declaration*'.
- IMDG Code classification of divinylbenzene inappropriate.
- On discovering chemical odour, the correct EMS procedures were not followed by the vessel's crew.
- Closing down hatch cover (for release of extinguishing CO<sub>2</sub> gas) could result in increase of explosive gas concentrations.
- Incorrect installation and instructions of fixed CO<sub>2</sub> system.
- Unfamiliarity with CO<sub>2</sub> system, lack of onboard training.

# 'MSC FLAMINIA'



BSU report safety recommendations :

- IMO to enhance DG regulations to include more details of chemical properties and transport restrictions. Shipper to be required to provide this information.
- IMO to enhance SOLAS to require fixed water extinguishing system in cargo holds carrying Dangerous Goods.
- IMO legislation and German Shipowners' Association to require first aid equipment be promptly available on board large ships after an incident.
- Operators of 'MSC Flaminia' to improve fire fighting organisation, drills, equipment and CO2 system training.



# Solutions

# Research and legislation



- Can more research be conducted into the safe carriage of dangerous goods, in particular, the effects of heating?
- Can the research results be promulgated and changes in transportation codes be made promptly and then enforced?
- Can IMDG Code be made available in more languages than English, French, Spanish?
- Can legislation be enacted and enforced so shore based training in the knowledge of DG transportation is more widespread, to a better standard, and more effective?



# Communications



- Can Charterers ensure that any Charterparty requirements for Dangerous Goods are made well known to the carriers and to the container load planners?
- Can terminal operators better communicate and plan with vessel's personnel so that checks of all DG cargo can be made ashore before loading on board the vessel?
- Can carriers and charterers better communicate with 'cargo interests' to assist them to comply with the Codes?



## Balancing act

Further enforcement of DG requirements.

- Will it just result in more cargo shippers taking the easy option and not declaring a DG cargo?

# Penalties

- Can national authorities clamp down more severely on 'cargo interests' who contravene dangerous goods regulations and who do not properly equip or train their staff?
- Are stiffer financial penalties a way to make companies act accordingly?
- Can contravening parties be blacklisted, licenses revoked, or additional training enforced?



# Ship, equipment & container design



- Can container ships be equipped with fixed water spray equipment more suited to combat fires in holds without securing hatch covers which blocks venting of explosive gas?
- Powerful high pressure lances are available to introduce water mist into a container without opening the doors.
- Readily available 1<sup>st</sup> aid equipment could reduce casualties
- Purpose built Dangerous Goods containers are available.

# Training



- Can improvements be made to training methods?
- Internet based training courses :  
Are they to an acceptable standard?  
Are national authorities monitoring and approving the courses?



# Summary



- Container ships are getting bigger
- More exposure to claims due to a DG container incident on a vessel.
- Only needs 1 container to heat up, catch fire, explode. Knock on effect ?
- More lobbying of governments and IMO by the insurance industry?



THANK YOU