

# HAZRUNOFF

PROJECT

## Challenges of the response on chemical incidents

**CEDRE**

Florence PONCET  
Stéphane LE FLOCH



Funded by  
European Union  
Civil Protection  
and Humanitarian Aid

# Comparison with on shore accident

Always difficult to define the response on chemical accident but, on shore, we have

- Industrial sites - plants: knowledge of the product and regular training on emergency response
- Site access and exclusion zones well defined
- Only limited quantities are carried by trucks, trains, river barges and plane
- Many feedback post incidents



HAZRUNOFF  
PROJECT



Funded by  
European Union  
Civil Protection  
and Humanitarian Aid

# Off shore response specificities

---

Depending on the exact nature of the product, the location and the environmental conditions of the accident

- Difficulty to have access to the zone (remote access)
- Difficulty to achieve risk assessment
- Limited response crew
- Monitoring heavy to organise
- Adverse environment



HAZRUNOFF  
PROJECT



Funded by  
European Union  
Civil Protection  
and Humanitarian Aid

For example

---

## Difficulties related to past incidents involving chemical tankers in French waters



HAZRUNOFF  
PROJECT



Funded by  
European Union  
Civil Protection  
and Humanitarian Aid

# A vessel in trouble



## The hazards related to the towing

- Reactivity of the cargoes
- Toxicity of the cargoes
- Weather conditions
- ....



HAZRUNOFF  
PROJECT



Funded by  
European Union  
Civil Protection  
and Humanitarian Aid

# YM URANUS (8 October 2010)

<b>Type of ship</b>	Tanker double-hulled (120 meters long, 6 meters draught)
<b>Nature of accident</b>	Collision with a bulk carrier. The collision caused a crack 8 m long by 5 m high in the rear portside but the cargo tanks and bunker tanks remained intact
<b>Localisation</b>	Offshore (30 nautical miles from French Island)
<b>Nature/quantity of the chemicals transported</b>	Pygas ( <b>pyrolysis gasoline</b> ), 6,500 tons. Pygas evaporates easily and is highly flammable
<b>Quantity spilled</b>	No spill
<b>Strategy of the emergency response</b>	Transshipment of the load
<b>Comment</b>	Determination of spill simulations, determination of mass balance and exclusion zones Transshipment



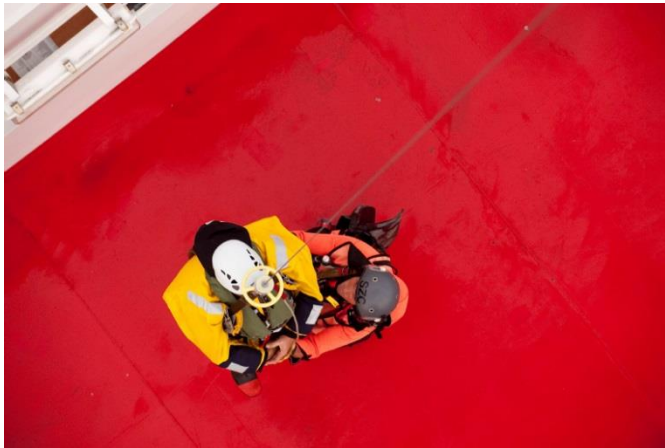
HAZRUNOFF  
PROJECT



Funded by  
European Union  
Civil Protection  
and Humanitarian Aid



# YM URANUS (8 October 2010)



HAZRUNOFF  
PROJECT



Funded by  
European Union  
Civil Protection  
and Humanitarian Aid

# Containers & Chemicals

## Wide variety of products and scenario that involve

- Large spectrum of reactivities
- Risk of leakage of toxic product
- Different exposure routes
- Different volume / quantities of product (from the drum -200L to the big bag -1000L)
- ....



HAZRUNOFF  
PROJECT



Funded by  
European Union  
Civil Protection  
and Humanitarian Aid



# MSC NAPOLI (18 January 2007)

<b>Type of ship</b>	Container ship (276 meters long, 13.5 meters draught)
<b>Nature of accident</b>	Bad weather, crack in the hull
<b>Localisation</b>	Offshore (50 nautical miles from the shore) 70 meters deep
<b>Nature/quantity of the chemicals transported</b>	<ul style="list-style-type: none"><li>• Various goods: 2,200 containers (TEU = twenty-foot equivalent unit), 170 with dangerous goods</li><li>• Bunker fuel oil</li></ul>
<b>Quantity spilled</b>	103 containers lost (various goods), 3,500 tonnes of Heavy Fuel Oil and around 600 tonnes of marine diesel oil and engine lubes
<b>Strategy of the emergency response</b>	<ul style="list-style-type: none"><li>• Airlifted the 26 crew members</li><li>• Ship stranded, recovery of containers (1351 on the deck) and then dismantled</li><li>• Oil recovery (containment + pumping)</li></ul>
<b>Comment</b>	924 days were needed...



HAZRUNOFF  
PROJECT



Funded by  
European Union  
Civil Protection  
and Humanitarian Aid

# MSC NAPOLI (18 January 2007)



© Marine nationale



HAZRUNOFF  
PROJECT



Funded by  
European Union  
Civil Protection  
and Humanitarian Aid

# MSC NAPOLI (18 January 2007)



The vessel posed three main threats to the environment

- **Oil Pollution** – the vessel was carrying 3,500 tonnes of Heavy Fuel Oil and around 600 tonnes of Diesel and engine lubes
- **Inert Pollution** – the vessel was carrying over 2,200 containers with a variety of products onboard. Of the 103 lost, 56 washed ashore and 47 are unaccounted for, presumed sunk
- **Chemical Pollution** – there were a variety of dangerous goods being carried within the containers



HAZRUNOFF  
PROJECT



Funded by  
European Union  
Civil Protection  
and Humanitarian Aid



# MSC NAPOLI (18 January 2007) – Public disorder issues



EUROPEAN UNION  
PROJECT



European Union  
Civil Protection  
and Humanitarian Aid



# Far from civilisation



## Additional difficulties due to the environment

- Difficult to project the rescue team and equipment
- Weather condition and vessel stability
- Sensitivity of the environment
- ....



HAZRUNOFF  
PROJECT



Funded by  
European Union  
Civil Protection  
and Humanitarian Aid



# SICHEM OSPREY (10 February 2010)

<b>Type of ship</b>	Tanker (170 meters long, 10 meters draught)
<b>Nature of accident</b>	Accidental stranding (different factors: natural, material, human and other)
<b>Localisation</b>	Offshore (700 nautical miles from Mexico shore)
<b>Nature/quantity of the chemicals transported</b>	Vegetable 6,000 tons, 6,000 tons animal fats, 10,500 tons xylene
<b>Quantity spilled</b>	No spill
<b>Strategy of the emergency response</b>	Transhipment of the load
<b>Comment</b>	Recommendations: systematically put into practice the assessment-training of the crews on the board vessel they manage.

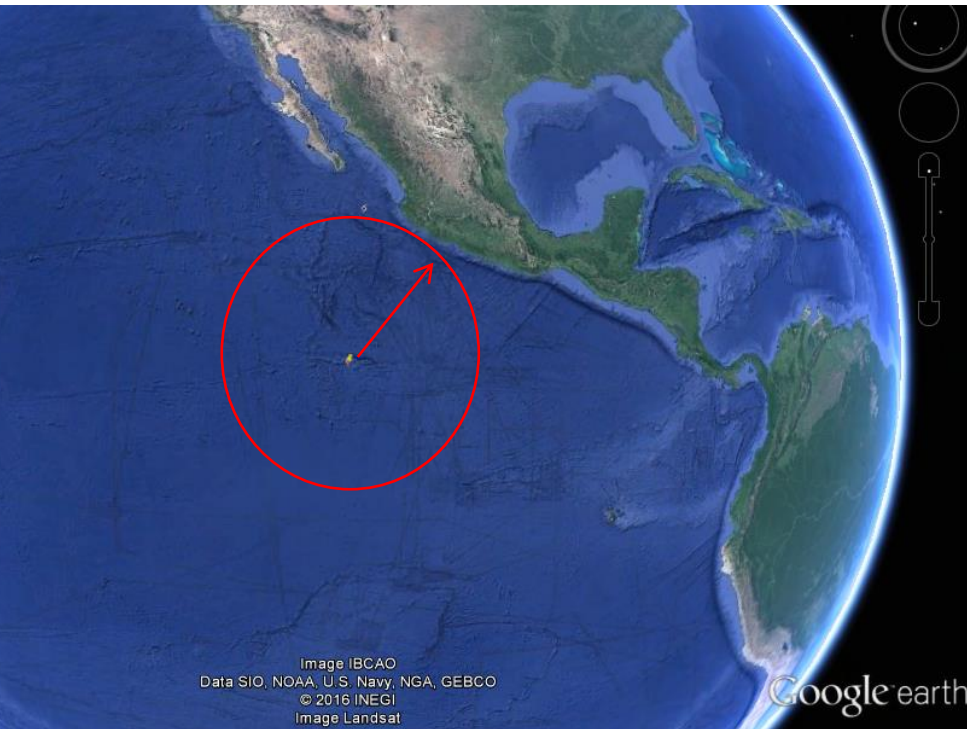


HAZRUNOFF  
PROJECT



Funded by  
European Union  
Civil Protection  
and Humanitarian Aid

# SICHEM OSPREY (10 February 2010)



*Sichem Osprey* stranded on Clipperton island.  
Photo © Marine nationale



No shore within a radius of 700  
nautical miles



HAZRUNOFF  
PROJECT

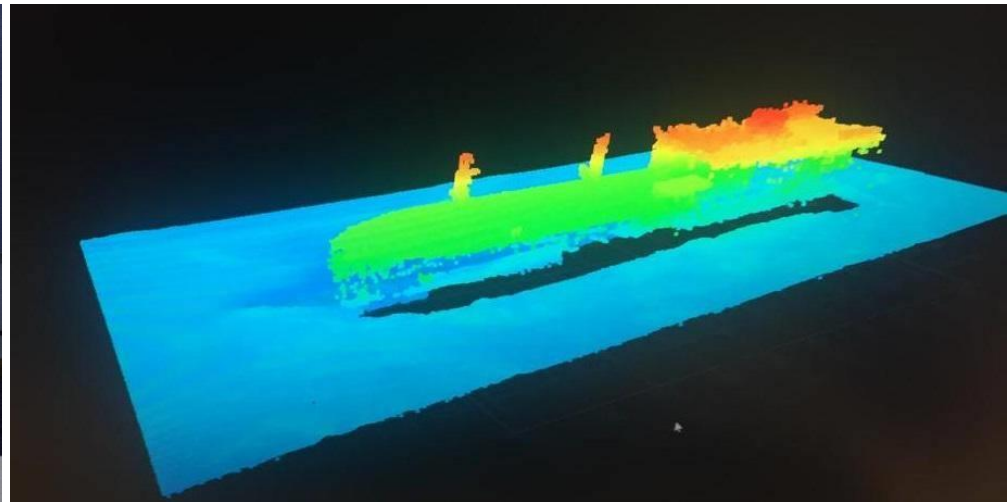


Funded by  
European Union  
Civil Protection  
and Humanitarian Aid

# A wreck on the seafloor with still its cargoes on board



America Grande, 2018



## Not possible to do nothing

- Pump the cargo directly from the wreck
- Cargoes released under control in the water column (dissolution)
- Release the cargoes and containment and recovery at the sea surface
- ....



# IEVOLI SUN (30 October 2000)

<b>Type of ship</b>	Tanker (115 meters long, 6.3 meters draught)
<b>Nature of accident</b>	Leak at the bottom of the ship
<b>Localisation</b>	Offshore (45 nautical miles from the shore) 70 meters deep
<b>Nature/quantity of the chemicals transported</b>	4,000 tons styrene 1'000 tons methylethylcetone 1'000 ton isopropyl alcohol
<b>Quantity spilled</b>	Totality
<b>Strategy of the emergency response</b>	Recovery of styrene, controlled release of the other chemicals
<b>Comment</b>	Ship has sunk during towing (9 nautical miles from shore)



HAZRUNOFF  
PROJECT



Funded by  
European Union  
Civil Protection  
and Humanitarian Aid

# IEVOLI SUN (30 October 2000)



## Several issues have emerged

- Dissolution of the cargo in the water column
- Volume of contaminated water
- Impact on organisms



# ECE (31 January 2006)

<b>Type of ship</b>	Tanker (126 meters long)
<b>Nature of accident</b>	Collision (with General Grot Rowecki , transporting 26'000 tons of phosphates)
<b>Localisation</b>	Offshore (50 nautical miles from the shore) 70 meters deep
<b>Nature/quantity of the chemicals transported</b>	10'000 tons phosphoric acid
<b>Quantity spilled</b>	Totality
<b>Strategy of the emergency response</b>	Recovery of hydrocarbons onboard wreck, controlled release of the phosphoric acid
<b>Comment</b>	Ship has sunk during towing (50 nautical miles from shore)

And even more...



HAZRUNOFF  
PROJECT



Funded by  
European Union  
Civil Protection  
and Humanitarian Aid

# Main findings

## Large variety of chemicals

- Liquid bulk, Liquid gases (LNG, LPG, CVM,...) but also solid bulk
- Corrosive gases (Ammonia, chloride) and corrosive liquids (Acids and alkalines: may produce corrosive sprays)
- Several reactive chemicals
  - Heat reactives: monomers
  - Fire reactives: ammonium nitrate
  - Water reactive: DRI pellets
  - Air reactive: alkyl aluminium compounds

# Main findings

## Behaviour and chemical properties

- 5 main behaviour (G, E, F, D, S)
- Liquid evaporators (totally or partially)
  - Toxicity levels in air: CVM, benzene,...
  - Flammability: VOC
  - Explosive: H<sub>2</sub>, GPL
  - Toxicity levels for particulates and sprays
- **Care**: some chemicals present an issue even if not identified as evaporators (chloroform is a sinker, dissolver)



HAZRUNOFF  
PROJECT



Funded by  
European Union  
Civil Protection  
and Humanitarian Aid

# Main lessons learnt

---

- Researching valuable information on cargoes takes time (wide variety of chemicals)
- 5 main behaviours depending on the physical and chemical properties of substances but not only...
- Need to define normal procedures but experts have to work on simple scenarios
- Important to assess the risk for responders and the environment before responding: need of visual observation and measurements before dropping the evaluation crew on board
- **Need training and identifying individual capacities to act in a proper way in a stress situation**



HAZRUNOFF

Challenges of the response on chemical incidents  
PROJECT



Funded by  
European Union  
Civil Protection  
and Humanitarian Aid



# Conclusion

---

- First response actions will face to unexpected situation. In this respect, the training of responders is essential.
- There is no basic response able to face all situations: do not be trapped by contingency planning or by cloudy procedures
- Offshore operations always present risks that are multiplied in case of response to a chemical incident



HAZRUNOFF

PROJECT

Challenges of the response on chemical incidents



Funded by  
European Union  
Civil Protection  
and Humanitarian Aid



# HAZRUNOFF

PROJECT



**Funded by European  
Union Civil  
Protection and  
Humanitarian Aid**



<http://www.hazrunoff.eu/>



@hazrunoff

