

# **Emergency Response Arrangements for the Pacific Nuclear Transport Fleet**

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**Abstract.** Whilst the likelihood of an incident occurring during the transportation of radioactive material is very small and the safety arrangements are extensive, any organisation involved should ensure that comprehensive emergency management arrangements are in place. Details of the particular emergency response arrangements adopted for the Pacific Nuclear Transport Limited (PNTL) Fleet are covered by this paper.

## **1. Introduction**

PNTL, the nuclear transport company owned by British Nuclear Fuels Limited (BNFL), Compagnie Generale des Matieres Nucleaires (COGEMA) and a consortium of Japanese Utilities, operate five purpose built marine vessels from the BNFL Marine Terminal at the Port of Barrow in the United Kingdom (UK). The PNTL fleet is responsible for transport of nuclear material between Europe and Japan. With over four and a half million miles covered without a single incident resulting in the release of radioactivity, the company has a safety record second to none [1]. However, in the unlikely event that an incident should occur during a transport movement then the PNTL vessel involved would call upon the dedicated emergency response arrangements prepared and maintained by BNFL International Transport.

## **2. Emergency Response Section**

The Emergency Response Section is an integral part of BNFL International Transport, with the single aim to ensure that the company responds to any International Transport related incident in a swift combined and co-ordinated manner [2]. In order to meet this aim, the section is required to ensure that their emergency management arrangements comply with stringent safety measures, quality standards regulations and guidance including:

- IMDG Code – International Maritime Dangerous Goods Code [3].
- INF Code – The Code for the Safe Carriage of Irradiated Nuclear Fuel, Plutonium and High-Level Radioactive Wastes in Flasks on Board Ships [4].
- Regulations for the Safe Transport of Radioactive Material (RM) [5].
- Planning & Preparing for Emergency Response to Transport Accidents Involving RM [6].

## **3. Incident Prevention**

Whilst the BNFL emergency arrangements focus on the response to an incident, it is important to recognise the particular measures adopted which could seek to prevent an incident occurring or reduce the severity should one occur. These measures constitute a vital part of the emergency planning process [7].

For the PNTL Fleet, which are all purpose built vessels, certified to INF3 classification [3] such prevention measure include the following:

- Double Hulls - the vessels are constructed with a double hull around the cargo holds in order to withstand a severe collision with a much larger vessel without penetrating the inner hull.
- Enhanced Buoyancy - the ships have enhanced buoyancy, enabling them to remain afloat even in extreme circumstances.
- Dual Systems - each vessel has two sets of navigation, communications, cargo monitoring, electrical and cooling systems, so there is always a back up in the unlikely event that the main system should fail or become damaged.
- Fire Fighting - every part of the ship is covered by a fire detection system and each vessel is equipped with sophisticated fire fighting equipment. In a worst case scenario all of the cargo holds could be flooded and the vessel would still remain afloat.
- Satellite Navigation and Tracking - The most modern satellite navigation and tracking equipment enables the ships position to be transmitted back to the UK and whilst at sea each vessel maintains communications with the 24-hour report centre at Barrow.
- Experienced Crew – the crew that operates each PNTL vessel is approximately twice as large as those found on chemical tankers of a similar size. All navigation and engineering officers hold qualifications of their next higher-ranking officer [8].

Additional preventative measures include the design, maintenance and licensing of the transport packages and the environmental, health, safety and quality management systems, which cover all aspects of BNFL International Transport business activities.

#### **4. Pre-Planning**

All activities associated with the transport of radioactive material are covered by the BNFL 'International Transport and PNTL Management System'. This set of documents defines the various interfaces, responsibilities, requirements, control and records each of which have been certified by Lloyd's Register Quality Assurance (LRQA) as compliant with ISO 9001:2000.

The specific management procedures relating to emergency response start with the 'Shipboard Marine Emergency Plans' (SMEPs) [9] carried on each of the PNTL vessels. The SMEPs, are approved by the UK Maritime and Coastguard Agency (MCA) and detail the action to be taken by the ship's Master in the event of an incident.

The second plan, used to support the PNTL Master is the 'Emergency Response Procedures (ERP) for the BNFL / PNTL Fleet'. The ERP dovetail with the SMEPs and operate in conjunction with a 24 hour rota for emergency call out. Together, they provide detailed instructions on the actions personnel should take to ensure that BNFL are able to respond to any part of the world, where shipments are in transit.

Whilst the deployment of personnel is covered later in this paper, the plan used at the scene of an incident to provide specialist technical information and advice on package design, monitoring and remedial action, is known as the 'Flask Emergency Handbook'.

The final two plans in this well-established and comprehensive emergency response system are the Sea Transport Contingency Manual (STCM) and the Coastal Landing Sites Manual (CLSM). The STCM covers background reading and advice on all aspects of sea transport including salvage and the CLSM provides data on the nearest helicopter landing sites for the deployment of personnel to the PNTL vessel involved.

## **5. Personnel and Resources**

BNFL personnel are retained on a 24-hour, 365-day rota system providing cover on all aspects of emergency response including management, operational engineers, health physics and package licensing.

A Transport Operations Centre is located at BNFL Headquarters in Risley, Cheshire, UK. The centre is equipped with telephone, fax and computer communication systems together with technical information, maps and ship position monitoring systems. The centre provides a focal point for the technical information and advice to those deployed to the scene of an incident. In addition, an 'Emergency Control Centre' is located at Barrow, however this facility is staffed 24-hours a day, 365 days of the year to receive and log the two-hour position reports that are received from the ships. In the event of an incident at sea the centre would also co-ordinate the sea response including any marine and salvage operation, should these become necessary.

An Emergency Response Team of personnel from flask engineering, marine engineering, health physics and public / media relations disciplines are specially trained and available to respond to any off site transport incident on a world-wide and 24-hour basis.

Emergency equipment resources are held at various locations including onboard all PNTL vessels, at the BNFL Sellafield site, and at various locations within mainland Europe and Japan. The equipment will enable the emergency response teams to effectively contain any foreseeable incident and also to carry out appropriate remedial action to enable the package to be returned to a licensed site.

Each ship is fitted with a Sunken Vessel Location and Information System comprising of a number of transponders and data acquisition units linked to various sensors and monitors throughout the vessel. The system allows for the information gained by the sensors to be read at the surface when interrogated by a programmable acoustic navigator. Initially the system can be used to locate a sunken vessel and can then provide accurate information such as the condition of the ship, including the attitude of the vessel (roll, pitch), radiation levels in the holds and hatch cover status. The system has a maximum operating range of around 10,000 metres.

Communications from ship to ship and ship to shore can be achieved using a variety of on board systems, for example the use of Digital Selective Calling and various satellite systems. Any combination of these systems permits the transfer of data, voice and facsimile transmissions. In addition, all PNTL vessels are equipped with HF, MF and VHF radio.

## **6. Emergency Response Contracts**

BNFL have a contract in place with the UK's largest onshore operator of helicopter transport. The contract provides for the 24-hour call out of helicopter services in order to transport emergency response teams and associated equipment. An agreement for long haul air transport is also in place with one of the UK's leading airlines.

A "Salvage Resource / Equipment Database" is located at Risley, which comprises of a map-based computer system that can be used to identify salvage resources and associated equipment / services adjacent to any incident world-wide. It provides information regarding the resource, its current location, and contact details. The system is automatically updated on a weekly basis.

In relation to salvage and recovery, the services of one of the world's best known salvage companies have been available to BNFL for many years. Smit Salvage of Rotterdam, are world leaders in the salvage business and have vast experience and resources available to them world-wide. They have produced, on BNFL / PNTL's behalf a damage stability software programme for use by their salvage masters in the event of a maritime incident. The program can simulate a damaged vessel and is designed to assist a salvage master in determining the best course of action during a recovery. Under advice from Smit, all vessels within the PNTL Fleet are fitted with special additional bollards for use in righting operations, along with additional towing brackets fore and aft to enable quick and effective towing connections to be made. Although the Smit contract is in place, this is in no way exclusive or restrictive, and should the need arise, all or any salvage resources available may be used.

A further long established contract in place is with Nuclear Services Company (NSC), Japan. The contracts relates to the provision of Radiological Protection and Safety Assistance and ensures that similar emergency response arrangements, communications, control centres and response team are all available to PNTL on a 24 hour basis.

## **7. Training, Exercising and Review**

As with all emergency management arrangements, the above procedures are enhanced with by regular training, exercising and review. All BNFL, PNTL and NSC emergency response personnel receive regular training. The plans and arrangements are tested and exercised in accordance with an annual emergency exercise programme [2] with the findings being reported to the BNFL SAFTRAN Committee. All lessons learnt and recommendations from this committee are then incorporated into a review action list to ensure that the arrangements are updated or amended.

## **8. Audit**

Internally, the emergency response arrangements for the PNTL Fleet are under constant audit through the International Transport and PNTL Management System 'self verification procedure'. Externally the plans and procedures have been inspected and audited by a number of independent national and international bodies such as the MCA, DfT, International Atomic Energy Authority (IAEA), International Maritime Organisation (IMO) and the International Civil Aviation Organisation in the form of the Transport Safety Appraisal Service (TranSAS). The TranSAS appraisal conducted in June, 2002 concluded that 'PNTL activities involving INF Code material are handled in a very commendable fashion' [10].

## **9. Conclusions**

With over 20 year's experience, PNTL has transported more than 4,000 flasks in over 160 shipments without a single incident resulting in the release of radioactivity [1]. During this time their emergency response arrangements have evolved to meet the needs of the transport business. Further development through the emergency planning cycle [11] will ensure that in the unlikely event of an incident occurring, BNFL / PNTL will be able to respond in a swift combined and co-ordinated manner.

## 7. References

- [1] BRITISH NUCLEAR FUELS LIMITED, MOX Fuel Voyage – 2002, Information File, BNFL, Risley (2002).
- [2] BRITISH NUCLEAR FUELS LIMITED, International Transport, Emergency Response Section Business Plan – 2003, BNFL, Risley (2003).
- [3] INTERNATIONAL MARITIME ORGANISATION, International Maritime Dangerous Goods Code, IMDG Code, 2000 edition, IMO, London (2000).
- [4] INTERNATIONAL MARITIME ORGANISATION, The Code for the Safe Carriage of Irradiated Nuclear Fuel, Plutonium and High-Level Radioactive Wastes in Flasks on Board Ships, IMDG Code Supplement, IMO, London (2000).
- [5] INTERNATIONAL ATOMIC ENERGY AGENCY, Regulations for the Safe Transport of Radioactive Material (ST-1, 1996 edition, revised), Safety Standards Series No. TS-R-1, IAEA, Vienna (2000).
- [6] INTERNATIONAL ATOMIC ENERGY AGENCY, Planning and Preparing for Emergency Response to Transport Accidents Involving Radioactive Material, Safety Guide, Safety Series No. TS-G-1.2 (ST-3), IAEA, Vienna (2002).
- [7] UNITED KINGDOM HOME OFFICE, Dealing with Disaster, Third Edition, Home Office, London (1997).
- [8] BRITISH NUCLEAR FUELS LIMITED, Safety In Depth, The Reliable Transportation of MOX Fuel to Japan, BNFL, Risley (1998).
- [9] INTERNATIONAL MARITIME ORGANISATION, Guidelines for Developing Shipboard Emergency Plans for Ships Carrying Materials Subject to the INF Code, Resolution A.854(20), IMDG Code Supplement, IMO, London (1997).
- [10] INTERNATIONAL ATOMIC ENERGY AGENCY, Transport Safety Appraisal Service, United Kingdom Appraisal, IAEA, TranSAS, UK (2002).
- [11] UNITED KINGDOM HOME OFFICE, Exercise Planners Guide, Home Office, London (1998).