

BNFL



Pacific Nuclear Transport Ltd's nuclear fuel carriers have been armed against possible terrorist attack

SAFETY IN NUMBERS

Half a tonne of plutonium under the hatch covers must qualify as the ultimate hazardous cargo. Alex Horton looks at the debate over the latest nuclear transport by sea

Take two purpose-built 5,000 dwt vessels, arm with 30mm cannons (one forward, two aft), add thirteen armed personnel to each crew, load 25,000 rounds of ammunition, bunker with 1,100 tonnes of fuel, load with a cargo containing 450 kilograms of weapons-usable plutonium and send on a 42-day, 20,000 kilometre voyage. This is Pacific Nuclear Transport Ltd (PNTL's) recipe for the first commercial shipment of mixed oxide (MOX) fuel from Europe to Japan. Opponents of the scheme call it a recipe for disaster.

A bilateral agreement between Japan and the US (the US having originally supplied the uranium) requires a naval escort vessel for such shipments. However, this has been waived in favour of the two vessels – the *Pacific Pintail* and *Pacific Teal* – being lightly armed and travelling in tandem for mutual pro-

tection. The fuel itself is bound for use in the reactors of two Japanese nuclear power stations.

British Nuclear Fuels Ltd (BNFL – a partner in PNTL) is satisfied that it has complied with all possible practical and political requirements for the shipment. "All three governments – Britain, France and Japan – have pronounced that they are happy with this arrangement and it has also been overseen by the US government," said Bill Anderton, a spokesman for BNFL.

However, criticism from environmental groups and governments of states such as Ireland, Korea and the Caribbean islands, who do not welcome what they see as a 'floating Chernobyl' passing their national waters, has been severe. The main fears are of a disastrous maritime accident or of the cargo

being hijacked by terrorists trying to procure plutonium for nuclear weapons. En route states are additionally incensed at not being consulted about routing and emergency plans and there are grave concerns that the development of the plutonium industry will undermine attempts to limit nuclear proliferation. The MOX cargo contains more plutonium than in the entire Indian and Pakistani nuclear weapons programme. If this first shipment is a success, it will open the door to as many as eighty such shipments over the next ten years.

Despite the controversial security arrangements, the vessels themselves are impressive. They are already fully compliant with the IMO's INF3 code, the highest rating for carriage of a nuclear cargo. The safety features include double hulls, duplicate safety systems, satellite tracking, a double bottom and reinforced collision bulkheads.

The two vessels of the five-strong fleet have been undergoing a refit in BNFL's yard at Barrow-in-Furness, reportedly at the cost of £8 million. The accommodation has been upgraded, armaments fitted and a new satellite communications system installed. The extended accommodation will house the extra crew on each ship: thirteen specially-trained personnel from the UK Atomic Energy Authority, who normally patrol the UK's nuclear installations. They will be armed with assault rifles, shotguns and hand-weapons. It is not clear how many have a maritime background or experience of long sea voyages.

The fuel assemblies themselves are transported inside huge, sealed steel casks approximately 6 metres long, 2.5 metres in diameter and made of 0.3 metre thick steel. They weigh 110 tonne each, the fuel assembly itself containing around 5 tonnes of solid MOX fuel. Asked about the threat of attack by terrorists or agents of a rogue state wishing to get their hands on enough plutonium to manufacture sixty nuclear bombs, Mr Anderton said, "I think there are far easier and far more attractive targets than our ships to terrorists".

Even if pirates were able to get at the fuel inside the flasks, they would need to reprocess it to get at the plutonium, according to Mr Anderton. However, independent experts state that it would be relatively easy to do this with unirradiated fuel. The International Atomic Energy Agency estimates it would take just one to three weeks to convert into nuclear bombs.

As for the normal maritime risks that every vessel runs - fire, loss of propulsion, collision - PNTL are confident of the vessels' capabilities. Both have twin engines and the capacity to carry out repairs at sea. A double hull and enhanced buoyancy should ensure that the vessel remains seaworthy even in extreme circumstances. The casks are tested in fires of 800° centigrade for thirty minutes, although critics argue that most fires burn hotter and longer. According to the IMO, on average, shipboard fires burn for twenty-three hours. The US Department of Energy states that petroleum fire temperatures can exceed 1000° C.

At the time of writing, the route itself is still unknown and will probably only be announced once the vessels are underway. Mr Anderton admits the Panama Canal is "the shorter and easiest route" but does not rule out the other two possible routes via the Capes.

Governments of some en route states are particularly concerned about passage through narrow straits, for example in the Caribbean and Korean waters. The consequences of an accident resulting in the release of the fuel into the environment would be disastrous. One speck of plutonium is enough to cause fatal diseases and it has a radioactive half-life of 24,000 years. It would not be possible to contain the contamination in a marine environment and the impact on the health and economy of the affected region would be huge.

PNTL are prepared for emergencies. The vessels have a twenty-four-hour reporting system with their base in Barrow-in-Furness and a special response team would be able to move 'very quickly' in the event of an incident. They have arranged



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The Pacific Pintail and Pacific Teal in their home port of Barrow

contracts with helicopter and airline companies to transport the team and have an agreement with Smit for any salvage operations.

While the vessels themselves are compliant with current regulations and the probability of radioactive leakage in an accident situation is low, the larger question of the risks of the trade in plutonium, of which these ships are an integral part, remains.

IMO nuclear code compliance to be compulsory

On January 1, 2001 the INF Code will be mandatory for all non-military vessels, and even they will be expected to comply with the terms of the code. The International Code for the Safe Carriage of Packaged Irradiated Nuclear Fuel, Plutonium and High Level Radioactive Wastes on Board Ships was formally adopted by the IMO at the 71st meeting of the Maritime Safety Committee. The code was introduced as a series of amendments to the 1974 SOLAS convention, particularly Chapter VII of the convention, which deals with the transport of dangerous goods.

It was on November 4, 1993 that the IMO agreed the INF code as a series of recommendations for ship specifications and standards. On November 27, 1997 amendments were made adding requirements for emergency plans and incident reporting measures. The IMO began to redraft the code in the summer of 1997 to turn it into a series of mandatory regulations under the SOLAS convention.

The INF code covers vessels carrying nuclear fuel components containing uranium, plutonium or thorium, the transport of reprocessed plutonium and also high level liquid radioactive waste. The code can apply to any ship, regardless of age and size, except military and government non-commercial vessels, although the IMO expects countries to ensure that even exempt vessels meet the terms of the code.

Ships carrying INF materials will be placed in classes from one to three, depending on the nature and radioactivity of the materials carried. Higher classes have to meet more stringent standards than lower.

Ships involved in the transport of nuclear materials will have to meet standards of damage stability, fire protection, cargo temperature control, structural integrity and design, cargo stability, electrical supply, radiological protection equipment and management, training and emergency planning.