Terrorism and the Maritime Shipment of Nuclear Material

Executive Summary

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This report is concerned with the security of maritime shipments of nuclear material, especially those carried on vessels built for the purpose[2]. The focus is particularly on the supposed threat to this activity posed by terrorist organisations that might wish to assault the ships and perhaps take the cargo, with the intention of making a nuclear-based device, or devices. The methodology is to consider the full spectrum of possible intentions in the light of what is known of the conditions under which these cargoes are carried. Of course, there is much about the security arrangements that surround these cargoes that is not in the public domain but it is the conclusion of the report's author that there is enough that can be said to amply support an overall finding that the risk is very much smaller than critics imagine.

There is a range of possible cargoes that may be carried. At one end, there is plutonium oxide, either from nuclear weapon stockpiles, or from reprocessed civilian material. In principle, plutonium oxide (from whatever source) may be the basis for the fabrication of a nuclear explosive device. In practice, though, material from civilian sources will contain much higher proportions of contaminating isotopes of plutonium (i.e. isotopes other than Plutonium-239) and is thus much less suitable for the purpose[3]. Mixed oxide (MOX) fuel rods also contain plutonium in a diluted form (diluted with uranium oxide) and thus (again, in principle) could constitute a starting point for weapon fabrication. Historically, the genesis of much of this transportation has been the decision of Japan to reprocess in Europe the spent fuel from its (now) fifty-five nuclear reactors. This means that another common cargo material is spent fuel rod assemblies. This cargo also contains plutonium (extracting it is the point of reprocessing) and thus it is also (once again, in principle) a source of material for making a nuclear explosive device. However, in this case, there is an additional formidable problem and that is the presence in the spent fuel of the intensively radioactive products of fission.

There are a number of possible cargoes from which a nuclear explosive device cannot be made (not even 'in principle'). The most obvious of these is vitrified high

[2] Such as those operated by Pacific Nuclear Transport Limited (PNTL) for the trade between Europe and Japan. PNTL ships were also used to take material between the United States and France in 2004 and 2005.

[3] In the opinion of some, 'high burn-up' civilian plutonium is completely unsuitable for weapon manufacture.

level waste (HLW). This is the physically immobilised concentration of fission products which arise from spent fuel reprocessing. Another possible cargo is the general mixture of low-activity materials that arises from nuclear activities (Operational Waste). Both Operational and High Level wastes could form the basis of some sort of radiological attack but, as is made clear in the report, neither is very promising for the purpose and the intense radiation associated with HLW would make it impossible to deal with without specialist facilities.

All these scenarios involve seizing the ship and removing its cargo before any of the possibilities (however promising, or unpromising) can be realised. A major part of the report is concerned with the difficulties of doing this. In the first place, it is noted that when the ships are carrying cargoes involving plutonium (except spent fuel), there are two ships (one escorting the other) and both are armed. They have (each) three 30mm rapid fire naval guns and they carry members of the UK Civil Nuclear Constabulary, who have access to a range of weapons. They also have continuing contact with their home base and with appropriate security agencies, in the event of any emergency. Potential attackers would need to find their quarry, which would be no easy matter once they were away from the coast. They would then need to approach without being observed. This will be a very difficult operation since the ships are equipped with state-of-the-art monitoring and surveillance capability. Once they are observed, they will be at great risk from the guns and, as they get closer, from small arms on the ship. They are going to need armoured attack craft and must expect to take serious losses. Of course, they might improve the odds here by also using a helicopter, or helicopters. The ships have defences against this. It also needs to be noted at this point, that the assault group would need a substantial mother ship (from which to fly the helicopters and support the attack vessels) and that we are now really talking of a mid-ocean military operation which is arguably beyond the capabilities of a non-state party.

Notwithstanding this, the report goes on to consider at some length what the terrorists might be able to do, if they have somehow taken the ships (or, at least, taken a ship with its cargo and somehow neutralised the escort). The first thing to note here, is that cargoes between Japan and Britain or France are carried in shipping flasks which weigh of the order of 100 tons and that the PNTL ships, themselves, do not have the capability to lift this kind of weight. Indeed, when the cargoes contain plutonium, they do not even have the capability to remove the very substantial hatch

covers. This suggests that the terrorists would need to deploy (as well as everything else) a floating crane, or, otherwise, they would need to go to a port which had the appropriate facilities; this could hardly occur without detection and with all the complications that that would entail. The conditions of transportation are different where cargoes are never far from land (as in the case of shipments around Europe or around the coast of Japan). In these cases, the crucial factor is that the ships are always close to a source of serious security support in the event of any kind of threat.

Finally, the report considers a range of threat scenarios that do not entail taking the ship. Included in this are the possibility that a ship carrying a nuclear cargo is rammed by a fast attack vessel packed with explosives, after the fashion of the attacks on the USS *Cole* and the French tanker, *Limburg*. It is noted that, in these latter cases, the ships in question were stationary and without protection at the time of the attack, whereas the nuclear ships tend to be in secured harbours or protected by floating barriers. An attack of this kind on the high seas is a different matter. Assuming that an explosion could be contrived alongside the ship, the main factors that would limit the consequences of this are the double-hull construction of the vessel and the extremely robust construction of the transportation flasks. This, particularly, would make it extremely unlikely that an incident of this kind would result in any nuclear contamination of the environment. A similar conclusion is arrived at in relation to air or subsurface assault.

Overall, the report details some of the extensive and formidable security arrangements that are maintained by the various companies involved in shipping nuclear materials on dedicated ships and concludes that the actual risk that terrorists might take material and make a bomb or radiological device (or otherwise contrive the dispersal of nuclear material into the environment) is extremely small and that there is little prospect of an attack having any serious consequences beyond the psychological. This is not a reason for complacency; indeed, it is important that defensive provisions keep pace with developments in the relevant technologies, and in the intentions and capabilities of possible threat organisations, as far as these may be determined. But it is a reason for recognising when enough is palpably enough.