

A photograph of a large fire on a ship at sea. A massive plume of white smoke rises from the fire, which is reflected in the dark water. The fire is bright orange and yellow, and the ship's structure is visible in the background.

**Centre for
Security Studies**
Occasional Paper

It is with great pleasure that we introduce a new series of papers published here at the University of Hull in our Centre for Security Studies.

The topic under investigation is that of IEDs, perhaps one of the most important security issues for the beginning of the Twenty First century. IEDs pose a threat not just on the battlefield but to civilians in warzones and civilians in societies under threat from extremist groups. These papers examine the many dimensions, historical, political and technical of the IED phenomenon.

Over the course of this project workshops have taken place within the United Kingdom, the Republic of Ireland and Spain. I would like to thank the University of Cranfield, the University of Hull, the University of St Andrews and University College, Cork for hosting seminars. We remain grateful for the ONR United States for funding this work.

Caroline Kennedy-Pipe

Director, Centre for Security Studies

Chris Martin

Deputy Director, Centre for Security Studies

Acknowledgments

This research was funded under an award from the Office of Naval Research, Contract # N00014081-0481, and we would like to acknowledge them for their support. We would like to thank our collaborators at Penn State (Kevin Murphy, John Horgan, and Frank Ritter) and at Georgia Tech (Lora Weiss, Elizabeth Whitaker, Erica Briscoe, and Ethan Trehitt) for providing guidance and insight into some of the behaviors and processes associated with the perpetration of IEDs.

THE HISTORICAL USE OF MARITIME IMPROVISED EXPLOSIVE DEVICES

The experience of coalition troops in Iraq and Afghanistan has brought to the fore of public consciousness the issue of Improvised Explosive Devices (IEDs). Of course those who experienced Northern Ireland as well as countless other counter-terror/insurgency campaigns will testify to the fact that the IED was not invented by the opposition in either Iraq or Afghanistan. Notwithstanding this notoriety, the subject of the Maritime Improvised Explosive Device (MIED)¹ is rather less well known, particularly among the public and indeed, many practitioners in the field have often overlooked just how much has been done with MIEDs thus far. This paper seeks to place in the public domain a basic history and appraisal of the use of MIEDs in the recent past.

Maritime terrorism is closely linked to the matter of MIEDs; but the incidence of terrorism at sea represents only 2% of all terror attacks in the past 30 years.² However, that should not make us complacent, “Because of the requirement to capture headlines, terrorists are under constant pressure to do something new.”³ There are a number of reasons why terrorists do not generally use the maritime environment. These include the following:

¹ Alternatively referred to as Water Borne Improvised Explosive Devices (WBIED) in some circles, particularly in the United States.

² Peter Chalk, *The Maritime Dimension of International Security: Terrorism, Piracy and Challenges for the United States*, (RAND Project Air Force, Santa Monica CA, 2008), p. 19. Akiva J. Lorenz, *Al Qaeda’s Maritime Threat*, Maritime Terrorism Research Center, 15 April 2007, p. 4, <http://www.maritimeterrorism.com>

³ Richard Farrell, “Maritime Terrorism: Focusing on the Probable”, *Naval War College Review*, Summer 2007, Vol. 60, No. 3, p. 47.

- Terrorists are generally conservative in their method. They tend to keep to what they know works.⁴
- The maritime domain, as those of us who work on maritime subjects know well, is out of sight, out of mind. Although maritime spectaculars are possible, they do not have the same publicity value as major land targets.⁵
- Ignorance of the maritime domain is another factor;⁶ you need to know the sea to effectively operate in it.
- Lack of maritime skills to operate in a maritime environment.⁷ For example, when Al Qaeda attempted an attack off the coast of Yemen in January 2000 against the USS *The Sullivans*, their explosive laden speed boat sank because it was overloaded. A simple and amusing error. Of course, as we shall see, terrorists are resourceful and intelligent: they learn and they are in it for the long haul.⁸
- Lack of explosive/engineering skills to make improvised weapons work in a salt water marine environment in particular: the corrosive and harsh environment makes engineering weapons difficult (fresh water environments are less hazardous but pose many problems also).⁹

Notwithstanding these problems, over the past few years attacks using improvised explosive devices at sea have increased and, as this paper will demonstrate, concerted effort has been made by Al Qaeda and affiliate groups to learn and overcome the difficulties of operating in this environment.

⁴ Chalk, *Maritime Dimension*, p. 19.

⁵ Ibid.

⁶ Lorenz, *Al Qaeda's*, p. 5.

⁷ Ibid.

⁸ Captain James Pelkofski, "Al Qaeda's Maritime Campaign", *Proceedings*, 27 December 2005, www.military.com/forums/0,15240,83909,00.html

⁹ Ibid.

However, what are we really discussing here? Clarity is important. Therefore, within this paper the subject will be limited strictly to MIEDs. So, for example, one of the most important incidents of terrorism at sea in the past decade, and one of the most devastating as regards loss of life will not qualify; namely the attack on the Philippines ferry, *Super Ferry 14* in 2004, which claimed the lives of 116 people that we know of. The attack, conducted by an operative from the Abu Sayef Group with support from the Rajah Soliahman Movement and Jemiah Islamiah was an example of maritime terrorism, but it was not an attack utilising a Maritime IED. In this case the device was 20 sticks of dynamite smuggled on board in a hollowed out TV set.¹⁰ Similarly, recent intelligence intercepts which identified a possible stand-off attack from shore against western cruise shipping off Morocco utilising rockets, does not fall under the umbrella of this paper.¹¹



Superferry14: the effect of a bomb onboard.

Copyright Philippines Navy.
www.navy.mil.ph

¹⁰ Chalk, *Maritime Terrorism*, Table A.1, p. 51.

¹¹ *Extremist Discussions about Stand-Off Attacks on Western Shipping Visiting North African Ports, 18 January 2010*, Special Report, HMS Maritime Intelligence Report, 28 January 2010, (Swindon, 2010); see www.hms-online.org

Therefore, when referring to a MIED, just what are we discussing? The following are offered as examples:

1. Small boats laden with explosives, piloted directly (suicide) or remotely, and initiated by contact with or in proximity of a target. These boats can be launched from the shore or from a mother ship;
2. Home-made submersibles;
3. Improvised self contained explosive devices; free floating, semi-submerged or fully submerged; initiated by contact with the target, proximity or influence, radio frequency or otherwise;
4. Free swimmers, with or without scuba equipment, laden with explosives and initiated by the diver (i.e. suicide); or, Underwater manned (suicide) vessels such as underwater tugs;
5. Large maritime vessels, conveying dangerous cargo, high jacked and detonated for the purpose of the attack;
6. Improvised explosive devices attached covertly to civil or military vessels.

Despite the difficulties of operating in a maritime environment, a diverse number of terror groups have developed a maritime capability to a greater or lesser degree, some of whom are:

- The IRA;
- Chechen rebels;
- Popular Front for the Liberation of Palestine;
- Democratic Front for the Liberation of Palestine;
- Palestine Liberation Front;
- Palestinian Islamic Jihad;

- Hezbollah;
- Fatah;
- Hamas;
- Movement for the Emancipation of the Niger Delta (MEND);
- South East Asian Tigers of Tamil Eelam (LTTE): to date the most expert practitioners of operations in a maritime environment to date;
- Al Qaeda and its affiliates.¹²

It is worth noting that the Abu Sayyaf Group—which is a close affiliate of Al Qaeda—is a noteworthy exception to the issue of lack of maritime expertise. Most members belong to families with strong seafaring traditions and have ample skill. This is why S. E. Asia is an area of concern for maritime terrorism and the use of MIEDs.¹³

Following the attacks of September 2001, considerable attention was focused upon the possibility of terror groups smuggling a nuclear or other WMD into a western port and detonating it. Because of this perceived threat, initiatives such as the Customs-Trade Partnership Against Terrorism (C-TPAT) and the Container Security Initiative (CSI) were introduced by the United States government. In any event, the likelihood of a ship borne WMD Trojan horse attack is discounted by many analysts and, like the *Superferry 14* incident this paper will not be considering the use of ships as conveyors of WMD here.¹⁴ What is very surprising is just how little focus was given over until very recently of the possible threat from far more mundane weapons, such as the improvised devices discussed before.¹⁵ Only in 2008, did the United States

¹² Michael D Greenberg (et al.), *Maritime Terrorism: Risk and Liability*, (RAND Center for Terrorism Risk Management Policy, Santa Monica CA, 2006), pp. 19-26.

¹³ Farrell, "Maritime Terrorism", p. 49.

¹⁴ Michael Richardson, *A Time Bomb for Global Trade: Maritime-related Terrorism in an age of Weapons of Mass Destruction*, (Institute of South East Asian Studies, Singapore, 2004), p. 1, <http://www.iseas.edu.sg>

¹⁵ Farrell, "Maritime Terrorism".

Naval Postgraduate School (Systems Engineering Analysis Program) undertake research that recognised the threat.¹⁶ It was a matter taken up by the US Department of Homeland Security in May 2009, which categorised it as an area of Critical Research and Innovation, because of the fact that clear “capability gaps” had been identified in US security.¹⁷ Consider also, it was only in March 2010 that Lord West, then a Home Office Minister, announced the creation of the National Maritime Information Centre to address matters such as piracy, smuggling and terrorism because our grip of affairs around our own coast was, in his words “pretty ropey”.¹⁸

Although some potential targets for MIEDs are out at sea, such as oil and gas platforms, vessels of various types and choke points to disrupt, they are limited compared to the available targets on land and this is partly why they are less attractive as targets for terror groups. However, the main threat comes at the most vulnerable border point of all states which have coastlines: ports. Additionally, it is important to recognise that the more advanced the economy, and the more dependent upon maritime trade, the more vulnerable to MIEDs, and this is why this matter is important to us.

Consider what is located at many of the world’s major ports: military vessels and bases; cruise ships; ferries; container ships and container facilities; oil tankers and oil terminals; Liquid Natural Gas tankers and gas terminals; petrochemical plants; refineries; factories; dams and locks; flood defences and the world’s major cities.

These are the hub of the global maritime economy which operates on a ‘just enough-

¹⁶ Kellie Arakawa, *Systems Engineering Students Confront Maritime IED Threat*, Friday 09/01/2009, <http://www.nps.edu/About/news/Systems-Engineering-Students-Confront-Maritime-IED-Threat/html>

¹⁷ Ruth Doherty, *Critical Research/Innovation Focus Area Document: Detect and Defeat Waterborne Improvised Explosive Devices (WBIEDs)*, US Dept of Homeland Security, Science and Technology Directorate, May 4, 2009.

¹⁸ Jack Doyle, “National Maritime Information Centre will monitor threat from sea”, <http://www.independent.co.uk/news/crime/national-maritime-information-centre-will-monitor-threat-from-the-sea-1925293.html> (accessed 22/04/10).

just in time' basis, disruption to which, wherever effected, could have global consequences. Consider also, that in the modern world, these ports are designed, not for ease of defence, but specifically for ease of access. The problem becomes obviously worrying.¹⁹

THE EXPLOSIVE LADEN SPEED BOAT.

The explosive laden speed boat is, perhaps the most used and most effective maritime IED. Of all known practitioners, it is without doubt the LTTE (or Sea Tigers) who have had most success with such devices. The type of craft has varied, ranging from sophisticated 'stealth' speedboats specifically designed to reduce the radar profile, 'standard' boats fitted out as suicide craft, to crude home-made vessels.



LTTE 'stealth' fast attack craft captured by Sri-Lankan forces.

www.defence.lk

Swarming tactics were commonly used so that the suicide vessel had maximum chance of hitting the target even when under intense fire. Not only were the types of boats different, so were the relative sophistication in the arrangement of the explosives. The improvised boat shown here has a system whereby explosives are

¹⁹ Paul R. Parformak (et al.), *CRS Report for Congress, Maritime Security: Potential Terrorist Attacks and Protection Priorities*, (Congressional Research Service, Washington DC, 14 May 2007), p.5. Lorenz, "Al Qaeda's Maritime Threat", pp. 13-14.

initiated by contact horn-type initiators at the vessel's bow which detonate when the target was struck.



LTTE Improvised fast attack craft captured by Sri Lankan forces. The initiator horns are clearly visible. The centre hull of the trimaran contains the explosives which are, in this case, up to 100kg of C4 explosive in a shaped charge for maximum effect.

www.defence.lk

The horns do no more than close the electrical circuit to detonate the explosives as the boat penetrated the ship's hull. As the boat is semi-submerged, it makes maximum use of the shaped charge as well as the bubble-pulse effect of the detonation. In another variant shown below, improvised directional land mines were attached to the sides of these boats which again would detonate on contact. The boat would also have explosive packed into the bow of the vessel. In other versions, the explosives were detonated by the operative when in sufficient proximity to the target. This method is generally regarded as less satisfactory, as error on the part of the operative might leave a large air gap between the explosive and the target thereby dissipating much of the explosive force.²⁰

²⁰ HMS Ltd, Triton Quick Look Report, *Suicide WBIED Attack off Jafna, Sri Lanka, 22 October 2008*, (HMS Ltd, Swindon, 2008), p. 7.



LTTE suicide attack boats captured by Sri Lankan forces.

www.defence.lk

Despite the considerable success of the LTTE in this field, relatively little is known to the general public in the west. Far better known are Al Qaeda's efforts primarily because of the nature of the targets. Much of what we know of Al Qaeda's attempts to attack at sea using MIEDs have come from interrogations of the Al Qaeda mastermind behind these attacks undertaken at Guantanamo Bay: Abd al-Rahim al-Nashiri, also known as 'The Prince of the Sea'. Al-Nashiri was Al Qaeda's operations chief in the Arabian Peninsula until his capture in 2002. At the time of his capture, he is reported to have been carrying a 180 page dossier detailing numerous

maritime targets of opportunity.²¹ Four main pillars of attack were in Al-Nashiri's inventory: small zodiac type speedboats laden with explosives to attack surface targets; medium sized ships that could be blown up next to other vessels; crashing small explosive laden planes into ships; and finally, underwater demolition teams.²² An examination of Al Qaeda's efforts and of its associates is worth consideration.

In January 2000, Al Qaida operatives in Yemen attempted an attack on a US Navy warship, the USS *The Sullivans*: The attempt failed because the boat was overloaded with explosive and it sank on being launched. Undeterred, the team consulted with knowledgeable comrades in Indonesia and in October 2002 executed the now infamous attack on the USS *Cole*. On this occasion, the same small modified dinghy (it was salvaged by the operatives) laden with what is thought to be about 500 pounds of C-4 explosives rammed the vessel and detonated. The result was severe damage to the ship: a 40 foot hole; 17 sailors killed and 40 wounded. It took over 14 months and over \$250 million to repair.²³

In 2001 and 2002, Al Qaida operatives pursued a number of failed plots to attack Israeli shipping and US warships in the narrow channel north of Singapore. Their intention was to use fast attack boats laden with explosives.²⁴ The plans were long standing, sophisticated and involved comprehensive intelligence gathering.²⁵ This failed plot is interesting from the point of the difficulty of conducting maritime operations. Having said before that Abbu Sayyef possessed ample expertise, here

²¹ Ashley Moore, "Needed: Revisions to Maritime Response Standard", T.I.P.S. (Total Integrated Preparedness Solutions), Vol. 1, Issue 7, 6 April 2005, p.1.

²² Lorenz, *Al Qaeda's Maritime Threat*, p. 9. Richardson, *A Time Bomb for Global Trade*, p. 17.

²³ Richardson, *A Time Bomb for Global Trade*, pp.13-14.

²⁴ Farrell, "Maritime Terrorism", p. 48. Michael Richardson, "Maritime Terrorism: A Threat Magnified by Arms Proliferation", p. 13, *Security and Terrorism Research Bulletin*, Issue No. 8, May 2008, *Maritime Security in the Gulf*, (Gulf Research Center, Dubai, UAE, 2008), www.gre.ae.

²⁵ Richardson, *A Time Bomb*", p.19.

they found the task too difficult and called off the effort after 9/11 when they realised they were under surveillance.

On 6 October 2002, in an attack that mirrored that on the USS *Cole*, the MV *Limburg*, a 299,000 ton VLCC, (Very Large Crude Carrier) was attacked 400 nautical miles off Yemen. The MIED was a small fibreglass boat, packed with 100-200kg of explosives which was driven into the side of the ship by 2 suicide operatives, although some reports suggest it was a remotely controlled attack.²⁶ 1 sailor died, 25 were injured and 90,000 tons of crude oil spilled into the sea.²⁷ Although it is believed that the intended target was another US warship and that the *Limburg* was an unfortunate target of opportunity²⁸, Al Qaeda did not waste the propaganda value, claiming: "The operation of attacking the French oil tanker is not merely an attack against a tanker—it is an attack against international oil transport lines and all its various connotations."²⁹ It is noteworthy the extent to which Al Qaeda stressed the economic aspect as well as citing the proximity of the Band al-Mandab to the attack.

In Iraq, April 2004, operatives under the order of the late Abu Musab Al-Zarqawi intended to use several small fast boats packed with explosive targeted at laden VLCCs and oil loading and storage facilities. Although the proposed attacks were foiled, the vulnerability of such targets should not be ignored³⁰

Another failed plot was that undertaken in Turkey in August 2005. The so-called *Tufan* plot failed due to premature detonation of the bomb as it was under construction. The operative, Louai Sakka, intended to ram his explosive laden yacht

²⁶ Richardson, *A Time Bomb*, p. 16.

²⁷ Lorenz, *Al-Qaeda's Maritime Threat*, p. 13.

²⁸ Farrell, "Maritime Terrorism", p.48.

²⁹ Statement of the Political Bureau of the Organisation of Al-Qaeda al-Jihad, 13 October 2002, Quoted in *Al Qaeda Threat to Oil Industry and US Allies*, v1.0-16 October 2002, (IntelCenter/Tempest Publishing, LCC, 2002, <http://www.intelcenter.com>)

³⁰ Richardson, "Maritime Terrorism: Arms Proliferation", p. 12.

the *Tufan* into an Israeli tourist ship, which was assumed to be packed with Israeli and US citizens as it approached Antalya in southern Turkey.³¹

In Morocco and Gibraltar in 2002, there were further failed plots to attack US and RN warships in Gibraltar straits with explosive laden boats.³²

In 2002, according to Al-Nashiri, Al Qaida purchased a 'mother ship' and several speed boats. The plot, which was abandoned, was to deploy the attack boats from the mother-ship in open water. The use of a mother ship would extend considerably the range of the attack boats into deep water. The intention was to sink US warships, tankers and allied warships in the narrow Hormuz Strait. The attack craft had shaped explosive charges at the bow, which would detonate on contact. The shaped charge would maximise effectiveness against the targeted ship.³³

Although these incidents are relatively 'old', at the time of writing this paper details relating to an incident that occurred in the Strait of Hormuz on Wednesday 28 July 2010 were released. The Japanese owned (Marshal Islands registered) VLCC MV *M-Star* was damaged leaving a dent in the tanker's hull. The tanker, as is required of modern vessels of its type, was double-hulled and there was no breach of the outer skin. The tanker is 160,292 gross tonnes, and was carrying 270,204 tonnes of crude oil (or 2 million barrels). Initially, the cause of the damage was unknown and theories ranged from a freak wave to a collision with a USN submarine. However, on Friday 6 August, the government of the United Arab Emirates, whose personnel had carried out tests on the damage, announced that it had been caused by a home made explosive, traces of which were found on the ship's hull. The report stated that: "UAE

³¹ Ibid.

³² Ibid.

³³ Ibid. Also, www.dni.gov/announcements/content/DetaineeBiographies.htm

experts who collected and examined samples found a dent on the starboard side above the water line and remains of home-made explosives on the hull". Additionally, the report stated: "Probably the tanker had encountered a terrorist attack from a boat loaded with explosives." This matches with claims made by an obscure Al Qaida affiliated group known as "The Brigades of Abdullah Azzam" which had claimed on 4 August that one of its operatives, Ayyub al-Taishan had carried out the attack in revenge for "the plunder of Muslim wealth".³⁴

What is significant here is that the attack, if that is what it was, was clearly directed at a very vulnerable and vital system of oil transport. Something in the order of 40% of the world's oil transits the Strait of Hormuz. Although it will have little effect, if any, if it remains an isolated attack, should this become a focal point for Al Qaida and its affiliates the effects on oil prices could be significant.

What of countermeasures? We should ignore the multiple failures that are detailed here. Failure simply demonstrates effort, persistence and a willingness to learn. Al Qaida is in for the long haul and this should not be forgotten. These fast attack boats are very difficult to deal with. In short, the large slow unarmed merchant vessel has no defence. Thankfully, although VLCCs are the most vulnerable and tempting because of size and cargo, all oil tankers in the west must now be double-hulled, a requirement with will soon be global. This offers some protection as demonstrated by the MV *M-Star*. The Sri Lankan Navy (SLN) did have considerable success against the boats of the LTTE. However, we must remember that the SLN was on a constant

³⁴ Shipbuilders and Shiprepairers Association, "Militants attack supertanker in Middle East", <http://www.ssa.org.uk/story/show/545> (accessed 12/08/10); Maritime Industry News, "Crude oil tanker was damaged in an explosion", <http://www.infomarine.gr/maritime-industry-news/crude-oil-tanker-was-damaged-in-an-explosion-html?tmpl=component&print=1&layout=default&page=> (accessed 12/08/10); BBC News, "Japan tanker was damaged in a terror attack, UAE says", <http://www.bbc.co.uk/news/world-asia-pacific-10890098> (accessed 09/08/10); Global Jihad, "Explosion on M. Star-Terror Attack", http://www.globaljihad.net/view_news.asp?id=1596 (accessed 09/08/10).

war footing ready for instant action at all times. The vulnerability of even the most expensive, sophisticated but unprepared warship, as shown by the USS *Cole* needs no elaboration. Of greatest concern must be our own ports where thousands of small pleasure craft routinely sail. Booms and floating barriers can defend and protect fixed installations. However, shipping is far more vulnerable. Vigilance, intelligence and defeating the threat at source appears the most efficient means of dealing with the threat, unless we are to have all our ports areas patrolled like war zones.

THE HOME MADE SUBMERSIBLE.

The idea of an improvised submersible at first thought might appear somewhat far-fetched. However, once again, we have to only look to the LTTE for the example. These submersibles of various types were captured by Sri Lankan forces.



Views (external and internal) of a captured LTTE submersible.

www.defence.lk

Although basic by modern standards, the relative sophistication which has gone into conceiving and building these vessels is obvious. Data is not available as to the capability of these submersibles. It appears that they were suicide craft: which suggests great dedication on the part of the builders to put so much effort into what is a one-way vessel with presumably a very short life span. It would be likely that vessels such as these would have been intended for use against very high value targets. No other terror group has demonstrated such a capability or intention. However, in the context of the LTTE, we have to remember that they were able to take advantage of several factors: a long period to develop such capability; a well financed organisation; relatively secure territory.

It seems most unlikely that such a device would be developed by terror groups elsewhere. The degree of sophistication and effort would be unlikely to be replicated.

THE IMPROVISED MINE.

Thousands of commercially made naval mines are available for just a few thousand pounds. They do not concern us here. Like the fast attack craft, it is surprising how neglected the threat has been. The US Coastguard, for example, which is tasked with the immediate security of US home waters, makes no mention of them in its 2007 strategy paper, referring only once to a USS Cole type attack.³⁵ The same is true of the U. S. Department of Defence, which by 2007 had no Mine Counter

³⁵ *The U. S. Coast Guard Strategy for Maritime Safety, Security, and Stewardship*, Washington DC, 20593-0001, 2007), pp. 21-22.

Measures (MCM) in preparation.³⁶ Again, we must begin with the LTTE, who are known to have developed improvised mines.

In March 2008, an SLN *Dvora* was sunk. According to analysis, an improvised sea mine was most likely the cause. Improvised sea mines had been used in the area previously, and a previous attack had revealed debris comprising: small bits of plastic, burned polythene and a fibreglass shell float. This supports the notion of an improvised mine and it is known that the LTTE had some success with improvised mines. Additionally, the recovered pieces have similarities with improvised mines used off Iraq in 2003.³⁷



An improvised LTTE mine (2nd left on structure).

www.defence.lk

³⁶ Scott C. Truver, "Mines and Underwater IEDs in U. S. Ports and Waterways", *Naval War College Review*, Winter 2008, Vol. 61, No.1, p. 115.

³⁷ HMS Ltd, *Suicide WBIED Attack*, pp. 10-11.

Even discounting off the shelf commercially made mines, MIED varieties are a major concern. They would be small and hard to detect. They can easily be hidden among the mass of dumped material lying at the bottom of ports and estuaries, or left to float among the flotsam and jetsam, looking exactly like discarded rubbish.³⁸ Importantly, traditional MCM might not be appropriate. Nor indeed does the presence of the mine have to be real. Psychologically the alleged presence of such weapons is often all that matters. Consider the 'Patriotic Scuba Diver' of 1980. In this case someone claimed, under the aforementioned sobriquet, to have placed an improvised mine in the Sacramento River. It took 4 days to confirm the channel was safe, costing \$100,000s in lost trade. The potential cost to extensive port closures can be demonstrated by the fact that a strike at US west coast ports in 2002 cost the US economy \$2 billion per day. This stark figure is related to the fact that the economic effect is not localised. Consider a closure of the River Humber, for example. This would not just have an effect on the estuary, but would also affect: Yorkshire, Lincolnshire, Lancashire, Ireland (as a destination for through traffic from Europe to Ireland), the East Midlands and parts of the North East.

Consider the deployment of an MIED (mine) in Lake Pontchartrain, Louisiana, in April 2004. It was described initially as a suspicious floating bag. Upon examination it was found to be an improvised MIED: 2-3 pounds of explosive in plastic pipes for waterproofing; a timer also waterproofed with the whole device wrapped in plastic bags to keep it afloat. In this instance the countermeasure was to break it up with water cannon. The problem is that a device of this kind can be manufactured quite easily from everyday materials, and we can expect the expert terrorist to develop more sophisticated devices than this. Note the improvised LTTE mine here. [picture]

³⁸ CRS Report for Congress, p. 6.

Improvised mines are the terrorists' perfect weapon. Cheap, easy to construct and with maximum effect irrespective of whether they detonate or not. Consider a type built and used by the IRA. In this instance, a buoyant tethered mine just below the surface of the water. An old oil drum or any watertight container would suffice. The method of employment by way of command wire to an operative who would detonate the bomb when the target was in sufficient proximity to the mine. Of course, a command wire does not have to be the method, a contact or proximity fuse would also do the job. The command wire is simplest, however. The anchor points for the mine and command wire are all below the surface so there is no visible presence to betray the mine's presence. As far as the target is concerned there is nothing noteworthy until it is too late. Notwithstanding the fact that the U. S. intelligence services consider the likelihood of a mine attack as low,³⁹ the threat is a known and real one. It has been used in the past and we need to consider seriously the threat it poses today.

Traditional MCM (Mine Countermeasures) might not be effective because we do not know what we are looking for. The old oil drum on the port bottom might be an old oil drum or equally it could be a mine. Effective countermeasures require a lot of work and involve the following:

- We need to know what is already on the sea floor;
- We need to know if something is new;
- We need to know the local environmental and oceanographic conditions;
- We need to know what to protect;

³⁹ Arakawa, "Systems Engineering Students Confront Maritime IED Threat".

- We need to know what we could do in a crisis.⁴⁰

An obvious issue is keeping the port open. Identifiable Q routes for emergency evacuation are required. To ensure this, is complicated and requires of our main ports up to date information on:

- Port geography and infrastructure;
- Climatic and oceanographic knowledge and seasonal variations;
- Very detailed sonar and bottom surveys. Floor mapping is vital. However, it is costly and time consuming. For example, a survey of just 11 nautical miles of key points and related areas at San Diego, California, required no less than 350 hours of survey time with 230 hours for analysis. The survey found over 600 contacts which might be interpreted as mines.⁴¹

Once surveyed, the floor is best wiped clean. Such 'wipe clean' areas still then require constant survey to spot and identify new contacts that appear. This is again time consuming and potentially costly: in effect, a never ceasing task.

Disposal of a suspicious object is problematical. Because of the nature of the problem, analysts have suggested that non-human disposal is the best option, utilising vessels such as the Talisman Underwater Vehicle.⁴² However, the vast differences in working environments means that both human and non-human disposal will be required. The problems of working in such possible environments do not need elaboration.

⁴⁰ Truver, "Mines and Underwater IEDs", p. 118. Grace V. Jean, *Improvised Explosive Devices, Could they Threaten US Ports?* National Defence, (NDIA, Jan 2008), www.nationaldefencemagazine.org/archive/2008/January/Pages/Improvised238...

⁴¹ Truver, "Mines and Underwater IEDs", pp. 118-120.

⁴² Arakawa, "Systems Engineering Students Confront Maritime IED Threat".

THE DIVER OR SWIMMER DELIVERY VEHICLE (SDV).

As mentioned, it is known that Al Qaeda planned to use underwater swimmers as attack vehicles. We know this from Al-Nashiri's interrogation.⁴³ There are a number of possible operations for swimmers: high jacking ships; placing limpets on ships; placing mines and suicide attacks. I shall focus on the latter. Again, the LTTE had some success with such methods. An attack in May 2008 which sank a naval cargo ship MV *Invincible*, was thought to be the consequence of suicide attack. Part of a body with diving equipment attached was discovered after the attack.⁴⁴ In 2002, suspicions were aroused by the number of young Muslims undertaking diver training at Eindhoven in the Netherlands. This gave rise to the so called 'Al Qaeda Diving Team': the proximity to Rotterdam, Europe's largest entrepôt, and Antwerp is noteworthy.⁴⁵ As regards Al Qaeda's interest, most evidence has come from South East Asia through the Abu Sayyef connection after the capture in 2003 of the Al Qaeda chief of operations, in the region, Omar al-Faruq.⁴⁶ In 2000 a diving instructor was abducted to train operatives, he was released in 2003. Additionally, at the same time, the owner of a diving school in Malaysia reported that, rather like trainee pilots who had no interest in learning to land, he had student divers who had no interest in learning to decompress.⁴⁷ However, it was the capture of two Abu Sayyef operatives in 2005, Angelo Gamal Baharan and Trinidad Khalil, which confirmed Al Qaeda's intentions.⁴⁸ Although no specific knowledge of targets are known, interrogation of

⁴³ www.dni.gov/annoncements/content/DetaineeBiographies.htm

⁴⁴ Doherty, *Detect and Defeat*, p. 4. Lorenz, *Al Qaeda's Maritime Threat*, p. 12.

⁴⁵ Lorenz, *Al Qaeda's Maritime Threat*, p. 13. Richardson, *A Time Bomb*, p. 16.

⁴⁶ Richardson, *A Time Bomb*, p. 16.

⁴⁷ *Ibid.* p. 17.

⁴⁸ Lorenz, *Al Qaeda's Maritime Threat*, p. 13; Ayaz Nanji, "Terror's New Frontier", <http://cbsnews.com/stories/2005/03/18/terror/main681524.shtml>; Greenberg (et al.) *Maritime Terrorism, Risk and Liability*, p. 13.

the prisoners revealed extensive training for attacking underwater targets, such as ships, oil & gas platforms and port facilities.⁴⁹

In June 2010, Israeli counter-terror units attacked and killed several Palestinians of Gaza who were, according to the Israelis preparing for a terror attack. The Al-Aqsa Martyrs' Brigade confirmed that the men were part of its 'marine unit' on a training mission. Although attacks of this type have been rare in Israel, the event confirms why we need to be aware of the threat such activity poses.⁵⁰

As regards operational employment the traditional suicide vest is not ideal as a shaped charge or very large charge is needed to punch through a ship's hull. Accordingly, the swimmer needs to place or hold an explosive device against the ship. It is known, that LTTE operatives used to cling onto the ship to do this. Here are examples of LTTE scuba equipment captured by Sri Lankan forces, as well as MIEDs by use by swimmers. Interesting is also the 'man powered' suicide MIED 'scooter' shown here also.



Suicide diver breathing apparatus and manually propelled 'scooter' captured by Sri Lankan forces from LTTE, www.defence.lk

⁴⁹ Nanji, "Terror's New Frontier".

⁵⁰ "Israeli Troops Kill Palestinian 'terror attack' divers", <http://www.telegraph.co.uk/news/worldnews/middleeast/israeli-troops-kill-palestinian-terror-attack-divers.html>

However, to operate underwater in port areas is difficult. Even highly trained military divers have difficulty. For the terrorist, the main problems are: getting training and equipment to the right standard, noise, darkness, disorientation, tidal conditions and ship traffic. None of this is easy to deal with⁵¹

THE SHIP AS A MIED

Many analysts believe that this is an overrated threat. Firstly, many acknowledge that to pilot a ship requires considerable maritime skill.⁵² Much has been made of the possibility of terrorist using Liquid Natural Gas (LNG) carriers as a giant MIED.

However, the threat is probably overrated. Firstly, LNG is cooled to -161.5° C and is not under pressure. It does not explode in this state. It will only ignite if the gas is released into the atmosphere and the mixture is between 5-15% gas as a proportion to air at the point of ignition. In the history of LNG carriers there have been engine fires, collisions and fuel spillages: there have been no fuel fires or explosions. During the Iran-Iraq War a LNG carrier was hit by an *Exocet* anti-ship missile; it did not explode. In reality, the real threat is to storage and loading/unloading facilities. This is because compared to the open environment of the sea, which allows for the quick dispersal of released LNG, storage and off loading facilities can allow escaped gas to collect. The intense heat caused by a LNG fire is intense and would have major consequences.⁵³

The bulk carrier, with the terrorist's chemical of choice as cargo, ammonium nitrate, is a different proposition. Ammonium nitrate is dangerous, when mixed with fuel oil or alone with a source of fire. It is readily available globally and easy to use. In 1947, as

⁵¹ HMS Ltd, *WBIED Attack*, pp. 10-11.

⁵² Pelkofski, *Al Qaeda's Maritime Campaign*, p. 2; Lorenz, *Al Qaeda's Maritime Threat*, p. 5.

⁵³ Richardson, *A Time Bomb*, pp. 38-39.

an example of the damage that such a cargo can cause, at Texas City, a bulk carrier, the *Grandchamp* detonated. It carried 2,300 tons of ammonium nitrate. A fire had been caused by a discarded cigarette. Barely one hour after the fire started, the ship disintegrated in a huge explosion. The blast was heard over 150 miles away. A tidal wave 15 feet high swept through the harbour. 568 were killed, 3,500 were injured, one-third of all of Texas City's housing was demolished.⁵⁴

In June 2003, the MV *Baltic Sky* wandered aimlessly around the Mediterranean for six weeks. It carried 680 tons of ammonium nitrate based explosive and 8,000 detonators. It was owned by a company in Khartoum that did not exist, and was flagged as a Comoros Islands vessel and before that as a Cambodian vessel: both flags of major international concern. When eventually stopped and arrested by the Greek navy it flew no flag at all.⁵⁵

This type of attack is difficult to achieve but not impossible. In such cases, intelligence is the obvious defence, defeating the threat at source and at distance.

CONCLUSION

Of the possible weapons available as MIEDs, the most potent and most dangerous is the small fast explosive laden boat. It is easily created and can be hidden among the mass of small pleasure craft which populate our ports. In foreign waters, it has been demonstrated already that it can be launched from isolated or terror friendly areas and can have devastating effects. In the absence of active armed defence, there is little that can defend against it as far as shipping is concerned. Because the

⁵⁴ Ibid. pp. 40-42.

⁵⁵ Ibid. pp. 41-42.

other threats discussed in this paper are less likely, should not make us conclude that they are not a viable threat. They have been used and can be again.

The IED working group has considered the issue of MIEDs. It is clear, that what needs to be focussed upon is not simply the MIED itself but the broader concept of the threat to maritime related facilities and shipping. This is because although the maritime environment has been largely neglected to date by terror groups, particularly in the UK home environment, it would be foolish not be vigilant and take such countermeasures as we can.

Firstly, the maritime environment has been used and can be again; the precedent has been set. Secondly, as terror groups are squeezed out of their more traditional areas such as aircraft by increasingly competent security measures, they will look to other soft targets. The maritime environment offers such soft targets; whether they are passenger vessels or large industrial facilities. Thirdly, The possibility of a 'spectacular' at sea: a ferry or passenger liner providing a target of mass casualties will be too tempting for the terrorist to ignore. Finally, the maritime environment: ports, estuaries, rivers, all provide the access to vulnerable inland targets such as they have done throughout history. Rivers have often been used as acces to interior targets. For example, the London Olympics of 2012 is a target vulnerable to *maritime based* terrorism because of the access provided to the main sites by the River Thames. In reality, it is only a matter of time before a major incident occurs in the maritime environment; either here or overseas.

For these reasons, the working group argues that we must address the matter of the threat and consequences of a successful attack on our maritime facilities. This means going beyond the MIED as discussed here. It means addressing all threats to

our maritime based facilities and interests; whether they are ships or ports and whether the threat originates from a MIED, a shore based attack or an attack from the air. All these possibilities have been considered by Al Qaida, we should be foolish to ignore the possibility.

Dr Christopher Martin

Deputy Director, Centre for Security Studies,

Department of Politics and International Studies

University of Hull

1 August 2010.

