# SEMAPHORE

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## THE CHEMICAL, BIOLOGICAL, RADIOLOGICAL AND NUCLEAR THREAT

The terrorist attacks of 11 September 2001 and the subsequent United States (US) anthrax letter attacks in October 2001 have resulted in a heightened awareness of the vulnerability of civilian communities to such attacks. This has had a flow on effect to military forces, which now operate at increased alert levels. The anthrax letter attacks also served to increase the perceived risk of chemical, biological, radiological and nuclear (CBRN)[1] weapons use, by both state and non-state aggressors.

Concern over the proliferation of CBRN weapons and potential support of terrorist operations influenced the US-led coalition forces to invade Iraq in March 2003. Royal Australian Navy (RAN) ships that deployed to the Middle East Area of Operations were fitted with chemical warfare agent detectors and personnel were given vaccinations against biological warfare agents. It was subsequently discovered that Iraq, at the time of the 2003 war, had no chemical or biological weapons capability.[2] However, Operation FALCONER raised several important questions for the RAN, including: what is the nature of the threat to our fleet, if any, and, if attacked, could it adequately protect its ships and people?

Conventional weapons (bombs, missiles and firearms) will always constitute the bulk of any nation's arsenal, as chemical and biological (CB) warfare agents are difficult to both manufacture and disseminate. In addition, the use of CB weapons is stigmatised in western society. The development and acquisition of nuclear weapons by nation states is even more difficult and expensive although, theoretically, nuclear weapons are easier to use than CB weapons.

CB weapons are difficult to disseminate effectively. Chemical agents are easily consumed or degraded by blasts and heat, and therefore require specifically engineered bombs and missiles. Biological agents are most effective when dispersed as an aerosol at dusk or early evening. A typical scenario includes an aerosol line-dispersal from a fixed wing aircraft, helicopter or even an uninhabited aerial vehicle, where the agent is then carried as a downwind plume toward the target.[3]

Improvised Radiological Devices are much easier to make and use, as radioisotopes cannot be destroyed in a blast. An explosion from a conventional bomb containing radioactive material would spread isotopes over a large area, potentially contaminating strategic sites and preventing their use. Most injuries, however, would occur from the actual explosion and not from the radioactive material, as it would be too finely dispersed. Of course, a dirty bomb is just one way of disseminating radioisotopes. Enemy forces can also use deliberate placement, such as a high radiation source hidden in a strategic location and placed to cause radiation sickness to personnel working in the vicinity. Such placement may be relatively easy for enemies to carry out and difficult for military forces to detect.

A nuclear explosion produces blast, shock, intense heat, intense light and radioactivity. The effect of a nuclear weapon on a ship depends on the type and size of the weapon, whether the blast occurs in the air, on the surface or underwater, and its distance from the ship. There is no practical defence against a nuclear explosion.

| Threat System | Potential Fatalities |
|---|---|
| *Nuclear* | |
| 1 megaton nuclear bomb | 500,000 - 2,000,000 |
| *Chemical* | |
| 1000 kg sarin nerve agent (line source with agent drifting on wind) | Clear day: 300 - 700<br>Overcast: 400 - 800<br>Clear night: 3000 - 8000 |
| *Biological* | |
| 100 kg weaponised anthrax spores (line source with agent drifting on wind) | Clear day: 130,000 - 460,000<br>Overcast: 420,000 - 1,400,000<br>Clear night: 1-3 million |

*Potential fatalities from typical CBRN weapon systems, under various environmental conditions*[4]

Most literature on CBRN acknowledges that the threat to land forces is real and constant. This influences the structure and functions of many armies, such as Australia's, which is tasked with the lead role in developing and maintaining CBRN doctrine and research. But how relevant is CBRN defence to the RAN?

RAN ships operate in two environments, the littoral and blue water, and both provide unique conditions under which ships may be attacked. When a ship is operating close to land, or is alongside, it is most vulnerable to attack from land forces which can deploy a variety of CB munitions including: missiles, artillery, mortars, mines and rocket launchers, as well as aerosol release. In the littoral a ship may be limited in its ability to manoeuvre away from CB plumes. In blue water, where the ship is beyond engagement by land forces, the main threat is from direct aerosol release, as there are no known naval munitions able to carry CBR agents. In blue water, ships are better able to manoeuvre to avoid CB plumes; and therefore, an attack is less likely to be effective, even if the ship is without CBR countermeasures.


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The requirement for the RAN to have effective CBRN countermeasures is therefore dependent on the nature of each operation and the threat. Certainly the RAN has been involved, and will continue to be involved, in both littoral and blue water operations. The more important question, then, is whether there is a reasonable threat?

Currently, 170 countries are signatories to the 1994 *Chemical Warfare Convention* (CWC).[5] The Democratic People's Republic of Korea is one of only ten countries in the world that has not acceded to this Convention. The CWC is enforced through the Geneva-based Organisation for the Prohibition of Chemical Weapons, which deploys inspectors throughout the world who are empowered to conduct site examinations to monitor the development and manufacture of chemical weapons.

As of December 2004, there were 169 signatories to the 1972 *Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and their Destruction* (BWC),[6] including: Indonesia, China, the Republic of Korea, the Philippines, Malaysia and Japan. The BWC is also supported by other states such as: Russia, the US, Pakistan, India, Afghanistan, Iran and Iraq. However, the BWC does not have enforceable rules and there are no real penalties for countries that breach the conventions. Therefore, some experts believe that a few countries that are signatories to the convention still develop biological agents. Australia is a signatory to both the CWC and the BWC; as such, Australia does not produce or stockpile CBRN weapons, but does retain the right to conduct research in CBRN defence.

To defend against CBRN attack there are two types of protection available: individual protective equipment (IPE) and collective protection (COLPRO). IPE includes the use of protective clothing: overalls, masks, butyl-rubber gloves and overboots; as well as vaccines, anti-dotes and prophylactics. COLPRO is a means of protecting personnel, equipment and stores from CBR exposure by securing the unit (whether it is a ship, building, vehicle or aircraft) within a filtered air environment. For navy ships COLPRO usually comprises a citadel system; a term applied to the main group, or groups, of interconnecting compartments with unbroken gas-tight boundaries and which can be provided with filtered or re-circulated air. A citadel normally embraces the bridge superstructure and any other superstructure that can reasonably be included. COLPRO can also include a pre-wetting system that can spray every part of the upper decks and superstructures with water, before, during or after an attack to prevent and remove contamination.

While IPE is relatively inexpensive compared to other protective measures, and personnel can be effectively trained in its use in a single day, it places a physical burden on personnel. Respirators and masks reduce visibility, making verbal communication and breathing at a normal rate more difficult, while thick rubber gloves reduce dexterity. Chemical overboots and additional clothing can lead to increased perspiration, causing dehydration and shock, and limiting the length of time and types of duties that personnel can perform while wearing IPE.

The benefits of COLPRO over IPE are that it provides a place where personnel can work unencumbered, where personnel are able to remove and change IPE, and a place of respite. However, COLPRO is difficult to construct and maintain. Because of this very few current RAN ships are fitted with citadel systems.

*Royal Australian Navy personnel conducting decontamination drills prior to Operation FALCONER (2003 Iraq War)*

Between the 1950s and 1970s the RAN fleet comprised mainly Royal Navy (RN) design or ex-RN ships which incorporated extensive citadel systems. From the 1970s, however, the RAN moved to Australian built ships based mainly on United States Navy designs. During the following two decades it was determined that the CBRN threat was small, and citadel systems were not necessary.

During the 1990-91 Gulf War, RAN ships were faced with a serious CBRN threat, highlighting the need for the RAN to strengthen CBRN protection for its ships. This war saw a move to a reliance on IPE over COLPRO, which remained the protective philosophy up to and including the 2003 Iraq War. With no evidence of CBRN proliferation, the RAN is now reassessing the perceived threat and its response.

A structured assessment of the impact of CBRN on RAN operations has commenced in order to provide an objective basis for future debate on the relevance of the CBRN threat to the RAN. This study will assist in the design of the next generation of ships (like the air warfare destroyers and amphibious ships) and their supporting doctrine.

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1 Previously these were referred to as Nuclear, Biological and Chemical (NBC) weapons, but the classifications have changed in recent years to reflect the differences between nuclear (atomic) weapons and improvised radiological devices (ie. dirty bombs).

2 C. Duelfer, *Comprehensive Report of the Special Advisor to the Director of Central Intelligence on Iraq's Weapons of Mass Destruction*, 30 September 2004. Internet <cia.gov/cia/reports/iraq_wmd_2004/>.

3 A.A. Stebins, *Can Naval Surface Forces Operate Under Chemical Weapons Conditions?* Thesis, Naval Postgraduate School, Monterey, California, June 2002, p. 10.

4 D.G.E. Caldicott and N.A. Edwards, 'The Tools of the Trade: Weapons of Mass Destruction', *Emergency Medicine*, 2002, 14, pp. 240-8.

5 Organisation for the Prohibition of Chemical Weapons website, <opcw.org> (29 July 2005).

6 Biological and Toxin Weapons Convention website, <opbw.org> (29 July 2005).

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