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1

Historical Precedents?

War is defined as a state of hostility, conflict, antagonism or struggle between two opposing forces for a particular end. When chemical weapons are added to an existing arsenal, the nature of the conflict is changed in two significant ways. First, the number of deaths and injuries are potentially increased. Secondly, if one country has chemical weapons this causes other countries to devote vast resources to develop a matching arsenal. Since the invention of these weapons, warfare and the threat of warfare has never been the same. The twentieth century saw the development of progressively more deadly chemical weapons. It saw their use, with significant effect, in a world war, in a regional conflict and the first instance of their use by terrorists.

Today, the so-called weapons of mass destruction (WMD), which is an umbrella term to include chemical, biological and nuclear weapons, have become one of the most prominent topics in the news since the events of September 11, 2001. Not a day passes without much being said about them in the media, by politicians and other commentators. The world's leaders continually warn us of the dangers of WMD. The Secretary-General of the United Nations, Kofi Annan, called the possible terrorist use of chemical, nuclear and biological weapons, 'The gravest threat the world faces.'¹ Western leaders, especially George W. Bush and Tony Blair, have told us that international terrorists and the states that support them are today's greatest threats to national and global security. War, they argue, is necessary and justified to remove these threats because unless the regimes in the accused countries are changed, WMD may be used with devastating effects. Should we believe these prophecies of doom or are they exaggerated nightmares? It is impossible to judge the threat unless we know the answers to some key questions. What are WMD? How do chemical, biological and nuclear weapons differ from

each other? What are the effects of the use of these weapons? Which terrorist groups are capable of making and using these weapons? What facilities do countries need to manufacture and deliver WMD?

Weapons of mass destruction take chemical, biological and nuclear form. The use of the term is recent; it is also controversial. The Royal United Services Institute, for example, point out that North Atlantic Treaty Organisation (NATO) still uses the 'nuclear, biological and chemical' description as each type of weapon is distinctive. In effect, it seems that the creation of the blanket acronym WMD blurs these distinctions. Simply put, nuclear, biological and chemical weapons are designed to kill and injure a large number of people: Nuclear weapons have the purpose of destroying much of the enemy's property, particularly its cities and industries; biological weapons spread disease deliberately in human populations; and chemical weapons are designed for the effective dispersal of a chemical warfare agent, for example gas in 1914 and sarin, or potentially VX, today. This book is concerned with the history of the development and deployment of chemical weapons and, as such, the focus hereafter lies in that area.

Most of the weapons used today are chemical. The explosion of tri nitro toluene (TNT) is a chemical reaction and so is the combustion of the nuclear bomb. This book, however, is concerned with those weapons that are based on the toxic properties of chemicals rather than on the energetics of their interaction. As a category, toxins have recently acquired greater prominence in the literature on chemical and biological warfare, though not because of any increase in their potential for weaponisation, despite their being among the most dangerous substances known today. It is true, however, that some toxins are becoming more accessible to quantity production than they once were. 'Toxin' is a word that has no commonly accepted meaning in scientific literature. The 1972 Toxic Weapons Convention (TWC) covers 'toxins whatever their origin or method of production'. The TWC does not define toxins, but its *travaux préparatoires* show that the term is intended to mean toxic chemicals produced by living organisms. Toxins, of course, are both toxic and chemical in nature. According to the Chemical Warfare Convention (CWC), toxic chemical refers to any chemical that through its action on life processes can cause death, temporary incapacitation or permanent harm to humans or animals. Some toxins, although toxins are usually associated with biological warfare, are included in Annex 1 of the CWC. So, although there is no consensus on the term 'toxin' among scientists, international law regards a wide range of substances as toxins. Indeed, Schedule 1 of the CWC lists 'ricin', a toxic glycoprotein

derived from the castor oil plant, in its forbidden substances. A weapon system based on toxic chemicals may be looked at as the sum of four parts: a system to deliver the munitions; munitions to disseminate the chemical agent; the agent itself; and the part played by the environment in transporting the disseminated chemical to its target. Each of the four parts is dependent to a greater or lesser extent on the other parts. For example, if the attacker is relying on the atmosphere to transport the agent to the target's lungs, the agent chosen must be one which can be made airborne in a form which will penetrate the lungs. If the chosen agent is one that is sensitive to heat, then the chosen munition must avoid it.

Chemical warfare means the wartime use, against an enemy, of agents having a direct (toxic) effect on man, animals or plants. The use of chemical warfare agents against man, rather than animals or plants, is referred to as gas warfare, even though the substances used may be solid, liquid or gaseous. The toxic effects produced in gas warfare may be transient or permanent, ranging from a temporary irritation of the eyes to death.² There are four main categories of chemical warfare agents: choking, blister, blood and nerve agents. Choking agents, such as carbonyl chloride or phosgene, attack the respiratory tract making the membranes swell and the lungs fill with fluid so that the victim drowns in his own juices. Choking gases are the classical agents of chemical warfare but are unlikely to be used in a modern chemical war as their initial irritancy or smell immediately warns of their presence, and gas masks can therefore be put on before a lethal exposure. In addition, the toxicity is nowadays too low; for example, the lethal exposure to phosgene is around 3200 mg/min/m³.³ The best-known blister agent is mustard gas, also called 'Yperite'. Mustard gas is a persistent agent that remains toxic for a long period and can be lethal. Blister agents produce large watery blisters on exposed skin that heal slowly and may become infected. Blister agents may also damage the eyes, blood cells and respiratory tract. There are two main classes of blister agent – arsenicals, such as Lewisite which has a sharp, irritating odour and causes immediate eye pain,⁴ and mustards. Arsenicals give enough warning of their presence for protective clothing to be put on in time, mustards do not, and it is for this reason they are still in arsenals today. Agent Q, one of the most lethal variants today was in fact discovered in the 1960s, and will blind at an exposure of less than 50 mg/min/m³ and kill if inhaled at dosages of 200 mg/min/m³. Indeed, Agent Q's inhalation toxicity approaches that of the nerve gases. Blood agents such as AC are absorbed into the body by breathing and kill by entering

the bloodstream and causing vital organs to cease functioning. There are two main groups of nerve agents, the G-agents, typically volatile liquids that break down quickly and cause death when inhaled, and the V-agents which are much more persistent and can be absorbed through the skin. The most lethal nerve agents are three G-agents, tabun, sarin and soman, and a V-agent, VX. Tabun was first discovered in 1936. It is a colourless liquid with a fruity smell, first produced in industrial quantities in Silesia in 1942. Sarin was also discovered in Germany in 1938. It is a colourless liquid with no smell. Soman, again discovered in Germany in 1944, is also a colourless liquid with a fruity smell. Tabun is about half as toxic as sarin, and soman, about twice as toxic.⁵ It is a moot point whether tabun is still considered worth stockpiling as its toxicity is not as high as the other G-agents, but it has a persistency in the field which may be considered tactically useful in that it could provide a vapour hazard for some days after dissemination. A subsidiary of Imperial Chemical Industries (ICI) in Britain and Bayer in Germany, both working independently, discovered VX in the early 1950s.⁶ It too is a colourless liquid with no smell. Nerve agents are organophosphorus compounds (as are, for example, insecticides). In the body they prevent acetylcholinesterase, an enzyme essential for the normal functioning of the nervous system, from acting normally. The initial symptoms vary according to which agent is absorbed. A low dose of any nerve agent will generally cause reactions like a running nose, contraction of the pupils, blurred vision, slurred speech, nausea and hallucinations. A high dose will cause the victim breathing problems, convulsions, deep coma and finally death. At even higher doses, the symptoms will occur very rapidly and the person will die from suffocation as both the nervous and the respiratory systems fail at the same time. A minute drop of a nerve gas, inhaled or absorbed through the skin or eyes, is enough to kill within about twenty minutes.

The job of a chemical munition is to create a toxic environment over as much of the target as is compatible with the toxicity of its charge. It must convert its bulk load either into an even distribution of liquid or solid particles, or into a cloud of vapour, or into both. It must, additionally, do this in a certain time. These are strict demands, and they are made more severe by the diversity of chemical agents now in stockpiles. Each agent has a combination of physical characteristics and toxic behaviour that is unique but, nevertheless, all munitions work on the same basic principle: they cause the transfer of energy from a store, generally an explosive, to the chemical load. The simplest chemicals to disperse are the volatile, non-persistent ones such as phosgene; the hardest ones

are the heat-sensitive solids that include such things as ricin, a protein more toxic than nerve gases and about which much has been said in recent years.

One of the assets of chemical warfare is that it does not depend on extraordinary delivery systems. Chemical munitions may be adapted for delivery by almost any means – grenade throwers, artillery and aircraft. Indeed, in some cases the delivery system may be the environment itself – the chlorine cylinders of the First World War for instance. However, once a chemical weapon has been deployed its user has no further control over it. This, of course, is true for any other weapon, but whereas the effects of, say, high explosive follow within a fraction of a second of detonation, those of a chemical may be delayed for minutes, hours or even days. In this lies both the strength and the weakness of chemical warfare. On the one hand, a toxic atmosphere may be set up which will envelope the whole target area, seeping into tunnels, bunkers and buildings. On the other hand, the entire loads may be blown uselessly away by a sudden wind. Certainly, the weather, winds and, to some extent, precipitation and indeed the practical limitations of dispersal generally limit the use of chemical weapons against concentrated targets as opposed to large geographical areas. Chemical weapons can be very effective against troop concentrations, military facilities and highly populated civilian areas. However, chemical weapons do not, obviously, pose much of a threat to a geographically dispersed civilian population. It must be emphasised then that no matter how well-designed a chemical weapon is, its effectiveness depends critically on the prevailing weather conditions. All this implies that previous knowledge of target conditions is essential to a chemical attack. It appears, therefore, that it was not for nothing that the 12th Earl of Dundonald consulted the Meteorological Office in 1914 before revealing to Lord Kitchener his grandfather's plans for chemical warfare.⁷

Chemical weapons are not a new method of warfare, they have been in recorded use since about 2000 BC. However, science and technology have refined these weapons and now their potential is awesome. It was the rise of the modern chemical industry at the end of the nineteenth century that first made feasible the use of significant quantities of toxic chemicals on large-scale battlefields and, indeed, chemical weapons were first used on a significant scale by both sides in the First World War. They were then used immediately after the war by Britain in Iraq (1920), and Spain in Morocco (1921). They were also used by Italy during its invasion of Abyssinia (Ethiopia) in 1935–1936, Japan during its war against China in 1937–1943, and by the United States in Vietnam

in 1965–1975. Both sides in the Iran–Iraq War used them in 1980–1988, and in a particularly high-profile attack they were deployed by Iraq against the Kurds at Halabja in 1988.

However, the use of poisons that could be considered chemical weapons dates back to antiquity. The wars of ancient India in about 2000 BC were fought with smoke screens, incendiary devices and toxic fumes that caused sleep. Thucydides tells of the use of gas during the Peloponnesian War (431–404 BC); also the use of an incapacitating agent, one which caused incessant diarrhoea, is recorded by Polyaeus, Fronto and Pausanias. The Spartans used arsenic smoke, comprised of pitch and sulphur, during the sieges of Plataea and Delium. The pitch and sulphur were ignited and the consequence was ‘a fire greater than anyone had ever yet seen produced by human agency’, the Greek historian wrote.⁸ There is some debate concerning the effect of this new weapon on the final outcome, but it is unequivocally true that even the crudest chemical weapon will create fear and panic. Undoubtedly, this was exactly what happened during both sieges, making the way then clear for the Spartan Army to seize the advantage presented to them by the incapacity of their enemy, an opportunity they did not squander. Between 82–72 BC the Romans used ‘toxic smoke’ against the Charakitanes in Spain, causing pulmonary problems and blindness not dissimilar to the effects of phosgene centuries later. In this case the effects of this chemical weapon are clear – the Charakitanes were defeated in two days.

Almost a millennium later at the siege of Constantinople (AD 637), the Byzantine Greeks employed ‘Greek Fire’, a weapon invented by an architect, Callinus of Helipolis, which became decisive at this time and was used with success by the Byzantines in their campaigns up to the thirteenth century. Indeed, it can be argued, its effectiveness was a prime reason for the long survival of the Byzantine Empire. The exact composition of Greek Fire is still a mystery but naphtha or petroleum is thought to have been the principle ingredient, probably with sulphur or pitch and other materials added. Indeed, Greek Fire, it can be assumed, was the forerunner of Napalm. It is not clear, however, how it was ignited, but quicklime was probably used, mixed with the main ingredients at the last moment. Once lit, the substance was very hard to extinguish; water was useless, sand or vinegar was the only solution.

In the Middle Ages, chemical warfare was put to similar use as at the siege of Delium and such usage continued through to the fifteenth century. In 1456 an alchemist who prepared a poisonous mixture saved Christian Belgrade from the attacking Turks. The Christians dipped rags

in the chemical and burned them, creating a toxic cloud that was not dissimilar to the chlorine clouds on the Western Front in 1915. This drifting cloud attack with an arsenical smoke is described by the Austrian writer, von Senfftenberg, with the comment: 'It was a sad business. Christians must never use so murderous a weapon against other Christians. Still, it is quite in place against Turks and other miscreants.'⁹

The 'Notebooks' of Leonardo da Vinci reveal a design for a chemical weapon which comprised a mixture of powdered arsenic and powdered sulphur packed into shells and fired against ships. Such a weapon was indeed developed and deployed, and as such is the first recorded usage of a chemical weapon.¹⁰ This use provided a precedent for the use of poison bullets against enemies and also led to the first attempt to prohibit the use of chemical weapons. This was elaborated in the Strasbourg Agreement (27 August 1675), a bilateral French and German accord which directed that neither side should use poison bullets and, as such, constitutes the first international agreement in modern history in which use of such weapons was prohibited.

As chemistry advanced during the nineteenth century, many new proposals for chemical weapons were made; for example, organoarsenical bombs and shells at the time of the Crimean War and a chlorine shell and other devices during the American Civil War. Indeed, Napoleon III is said to have put hydrogen cyanide to military use in 1865.¹¹ An influential figure in the nineteenth-century history of chemical warfare was Thomas Cochrane. In March 1812 Britain's prince regent, the future George IV, received from Cochrane a proposal aimed at undermining the power of Napoleon in a manner guaranteed to revolutionise the rigid customs of warfare. At that time the Duke of Wellington was struggling through Spain and the strength of the Royal Navy was being sapped by the need to maintain a tedious blockade of the key ports where Napoleon's warships waited for an opportunity to escape into the Atlantic. Cochrane's proposals, which the prince turned over to his advisors, offered a radical scheme by which a beachhead on the coast of France could be gained quickly and decisively. Cochrane detailed two new innovative weapons systems, the 'explosion ship' and the 'sulphur ship' or 'stink vessel'.¹² The plan stipulated that the two weapons were to be used in conjunction with each other. First, the explosion ship would be towed into place at an appropriate distance from anchored enemy ships, heeled to a correct angle and anchored. When detonated the immense explosion would cause debris to fall onto the enemy causing mayhem. Then the follow-up, the sulphur ship would be towed into place and when the wind blew windward charcoal covered with sulphur

would be ignited. The resulting clouds of 'noxious effluvia', as Cochrane termed them,¹³ were expected to be pungent enough to reduce all opposition as the defenders ran away to escape the choking gas. A quick landing by the British could then secure an otherwise unattainable position and clear the way for the establishment of a beachhead. Thomas Cochrane had prefaced his plan thus: 'To the Imperial mind, one sentence will suffice. All fortifications, especially marine fortifications, can undercover of dense smoke be irresistibly subdued by fumes of sulphur kindled in masses to windward of their ramparts.'¹⁴ He had, in fact, been partly anticipated by a good two millennia. The Peloponnesians had attempted to reduce the town of Platea with sulphur fumes in the fifth century BC. At length, an expert panel decided there was merit in this unusual scheme, but fear of the implications that such radical devices would have on warfare stifled their enthusiasm. What would happen, they asked, if the enemy gained knowledge of this new technology and turned it against Britain's defences?¹⁵ The proposal was rejected on the grounds, 'It would not accord with the feelings and principles of civilised warfare.'¹⁶

Nearly 40 years later, in July 1853, Cochrane, now 79 years old, urged the First Lord of the Admiralty, Sir James Graham, to reconsider the King's 1812 decision and use the explosion and sulphur ships at Sevastopol as the possibility of war in the Crimea increased. Again, the idea was quickly dismissed. A year later, in July 1854, Cochrane again urged Graham to employ his vessels to force the Russian troops away from the fortifications of the harbour at Kronstadt. He said that once the ships had exploded and the enemy was scattered a British landing could be made and the enemy's guns, once captured, could be manned and turned on the Russian ships anchored below the batteries. Once more, however, the scheme was rejected and the British sailed to the Baltic where they eventually failed to subdue Kronstadt.

Throughout the debate, the details of the scheme remained secret. In the boardroom at the Admiralty, the plan showed the sulphur ships with layers of coke and sulphur ready to emit their choking fog. Added to the scheme was the intention to create a smoke screen by pouring naphtha onto the surface of the harbour and igniting it with potassium,¹⁷ perhaps a nineteenth-century version of Greek Fire. Cochrane was convinced that a few hours would accomplish what months of debilitating conventional warfare had failed to achieve. Palmerstone's government appeared to be close to sanctioning the strategy when Sevastopol was taken in September 1855, followed soon by the end of the war. All discussion of the revolutionary weapons was

dropped, and the plans were sealed away on the shelves reserved for confidential matters at Whitehall. Cochrane died in 1860 and his secret war plan remained secure until 1908 when Palmerstone's correspondence was published. Less than a decade later the sulphuric yellow clouds of mustard gas ravaged thousands in the trenches of France.

A few years after Cochrane's death, as the American Civil War drew to an end, Ulysses Grant's army was stalled outside Richmond during the siege of Petersburg, Virginia (1865). A plan was devised to attack Confederate trenches with a cloud of hydrochloric and sulphuric acids.¹⁸ This plan was not acted upon but this idea, along with Cochrane's proposals, proved to be a prerequisite for the Declaration of St Petersburg (1868). This declaration renounced the use of explosive projectiles charged with fulminating or inflammable substances in war. Additionally, it prohibited 'material of a nature to cause unnecessary suffering'.¹⁹ Twenty signatories participated of which Britain, France and Germany are still adherents.

By the end of the nineteenth century the use of poison gas was still by far the exception and not the rule in war, and yet there were in all the great powers a number of men who foresaw its widespread use should a general conflagration engulf Europe.²⁰ Indeed, a concern with poison gas manifested itself at the Hague Conference of 1899. One of the agenda items dealt with prohibiting the use of shells filled with asphyxiating gas: 'The contracting Powers agree to abstain from the use of projectiles the sole object of which is the diffusion of asphyxiating or deleterious gases.'²¹ The proposed ban eventually passed with only one dissenting voice, that of the American representative, naval Captain Alfred T. Mahan, who declared that,

It is illogical and not demonstrably humane to be tender about asphyxiating men with gas, when all . . . admit it is allowable to blow the bottom out of an ironclad, throwing four or five hundred men into the sea, to be choked by water, with scarcely the remotest chance of escape.²²

For Mahan, it made no sense for the United States to deprive itself of the ability to use, at some later date, a weapon that might prove to be more humane and effective than anything then present in the American arsenal.

The Hague Conference did not prevent some nations from discussing the use of chemical weapons, and at least one country, France, experimented publicly with gas. The French Army tested a grenade filled with

ethyl bromoacetate, a non-toxic tear agent (or lachrymatory) developed for use in the suppression of small-arms fire from the concrete casements then prevalent in the fortifications that dotted western Europe. In 1912, French police used 26-mm grenades filled with this agent to capture a gang of notorious bank robbers. The British and the Germans, unlike the French, did not experiment with chemical agents for military use, but, nevertheless, at the outbreak of the First World War Germany's highly advanced dye industry gave it a technological base from which it was able to easily develop weapons of this nature.

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