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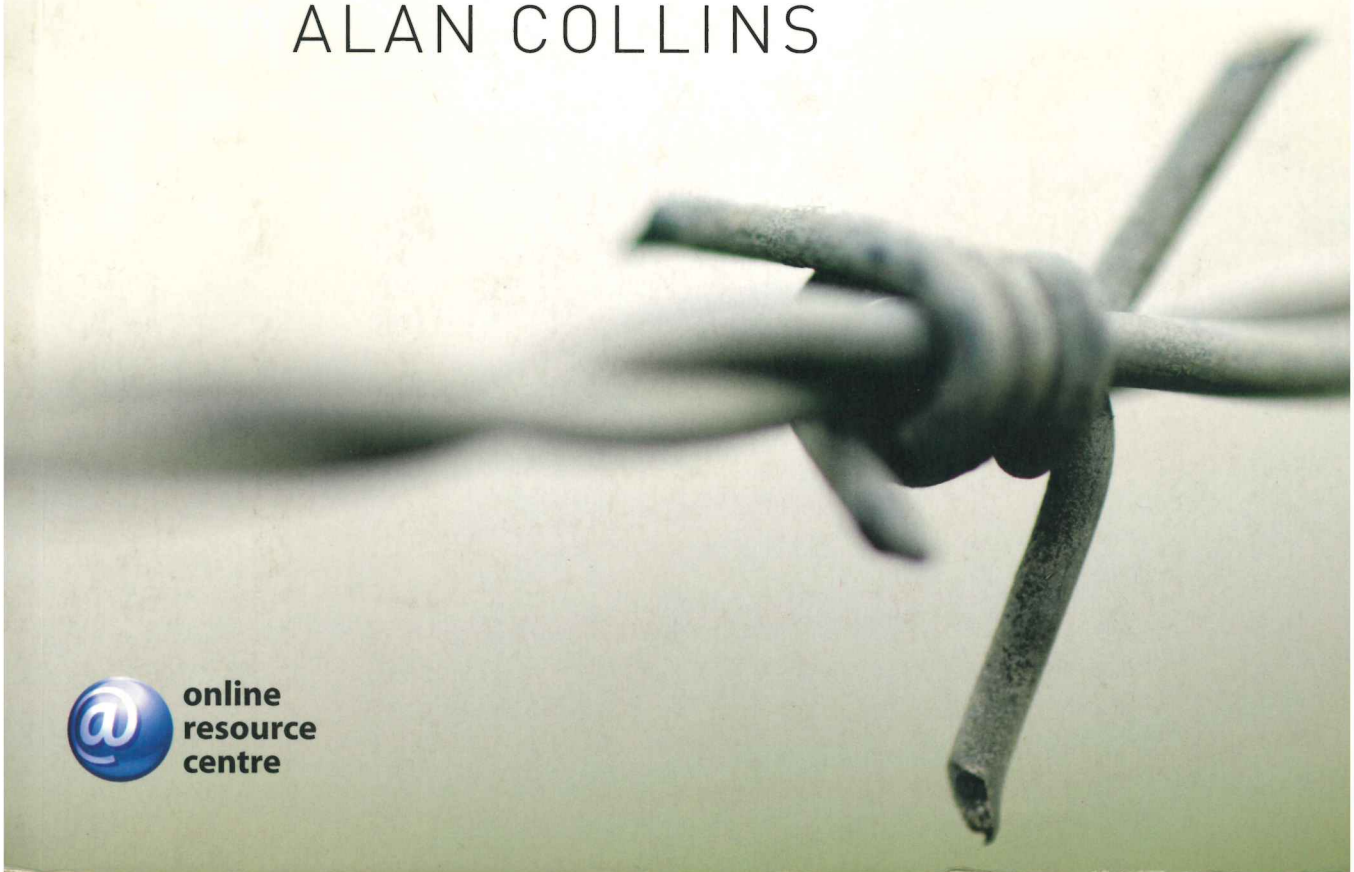

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15 Weapons of Mass Destruction

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Chapter Contents

Reader's Guide

Today, policy makers everywhere are deeply concerned about the possibility that weapons of mass destruction—chemical, biological, nuclear and radiological weapons—are not only becoming fixtures in the arsenals of states, but might fall into the hands of terrorists. This chapter explains how these weapons work and the effects they might have if used on the battlefield or against civilian targets. It describes how they have been used in war and how they have shaped the practice of international politics.

Introduction

Although many observers hoped that the danger posed by weapons of mass destruction (WMD)—chemical, biological, nuclear and radiological weapons—would fade with the end of the Cold War, these armaments continue to pose a worldwide threat. Some progress has been made in terms of rolling back WMD proliferation. Iraq no longer menaces its neighbours with its chemical arsenal and its efforts to acquire nuclear and biological weapons have been thwarted. Libya has also abandoned its nuclear weapons programme. The international community has bolstered the non-proliferation regime by undertaking a series of diplomatic efforts, for example the Chemical Weapons Convention, the Biological Weapons Convention, the Proliferation Security Initiative and the 2002 Moscow Treaty. Despite these concerted efforts, however, several state and non-state actors find WMD to be an attractive part of their arsenals. Black-market trade in nuclear materials, technology and know how is increasing. In 2004, revelations that the Pakistani scientist A.Q. Khan might have provided information about gas-centrifuges (used to produce weapons-grade uranium) and nuclear bomb designs to North Korea, Iraq, Iran, Libya and Syria sent a shock wave through the non-proliferation community (Clary 2004; Albright and Hinderstein 2005). Indigenous nuclear programmes also are making existing proliferation safeguards obsolete (Braun and Chyba 2004). For some states, WMD provide a way to offset their inferiority in conventional armaments compared to stronger regional rivals or the United States and its allies. Leaders of these regimes probably hope that the threat of chemical, biological or nuclear warfare might deter stronger opponents contemplating attack, defeat those opponents once battle is joined or even threaten domestic opponents (Lavoy, Sagan and Wirtz 2000). Weapons of mass destruction also serve as status symbols that highlight the 'success' of otherwise dubious regimes.

If the threat posed by WMD proliferation to state actors is of increasing concern, then the possibility that these weapons could fall into the hands of terrorists is alarming. A chemical weapons attack against a major sporting venue could kill thousands of people, while a successful anthrax attack might place hundreds of thousands at risk. A 'dirty bomb', a device that uses high explosives to spread radioactive contamination, could poison scores of city blocks. It would be extraordinarily difficult for even a well-funded terrorist organization to construct a primitive gun-type nuclear weapon, but international terrorist networks, domestic terrorist organizations, or even individuals have the resources and materials to construct and use chemical, biological and radiological weapons. Weapons of mass destruction have been used in terrorist attacks, albeit with relatively limited effects. In 1995, for instance, Chechen rebels planted radiological source (caesium-137) in Moscow's Izmailovsky Park, probably to show Russian authorities that they had the capability to make a 'dirty bomb'. The Aum Shinrikyo (Aum Supreme Truth) cult experimented with several toxic substances before launching their Sarin attack against the Tokyo subway in 1995 that injured thousands of people. In the wake of the 11 September 2001 terrorist attacks against the World Trade Center and Pentagon, some person or group in 2001 used the US postal system to mail letters contaminated with anthrax, which was probably derived from materials supplied to US weapons laboratories.

Weapons of mass destruction vary greatly in terms of their availability, lethality, destructive potential, and the ease with which they can be manufactured and employed. High-yield, lightweight nuclear weapons are some of the most sophisticated machines ever manufactured by humans, while

some chemical and biological weapons have been available for centuries. What separates WMD from conventional weapons, created from chemical-based explosives, however, is their potential to generate truly catastrophic levels of death and destruction. A small nuclear weapon can devastate a city: the fission device that destroyed Hiroshima produced an explosive blast (yield) that was equivalent to about 20 kilotons (kt) of trinitrotoluene (TNT). A smallpox attack against an unprotected (unvaccinated) population could kill 30% of its victims and leave survivors horribly scarred for life. Because of their ability to strike terror worldwide, these weapons are attractive as political instruments.

The remainder of this chapter will first describe the technology that underlies nuclear, chemical and biological weapons, and explain how they are constructed. What is reassuring about this overview is the fact that while these weapons can be extraordinarily destructive, state and non-state actors would have to overcome significant technical hurdles before they could maximize their destructive power. The chapter will also describe their destructive effects, the systems used to deliver them, and the history of their use in war. It will then outline the impact these weapons have on national defence policy and international security.

Nuclear weapons

The design and development of nuclear weapons were based on advances in theoretical and experimental physics that began at the start of the last century. By the late 1930s, Leo Szilard, a physicist who escaped Nazi persecution by fleeing to the United States, realized that it might be possible to construct an 'atomic bomb'. Unlike conventional (chemical) explosions, which are produced by a rapid rearrangement of the hydrogen, oxygen, carbon and nitrogen atoms that are components of TNT, for example, Szilard suggested that a nuclear explosion could be created by a change in atomic nuclei themselves. If an atom of uranium-235, for instance, is fragmented into two relatively equal parts, the remaining mass of the two new atoms would have less mass than the original atom. The lost mass would be instantaneously converted into energy. Nuclear weapons are so powerful because, as Albert Einstein predicted, under certain conditions mass and energy are interchangeable ($E = MC^2$). The difficult aspect of setting off this interchange would be to create a device that would sustain a nuclear reaction for a fraction of a second before it is destroyed in the resulting nuclear explosion.

Szilard's opinion was not widely shared among American scientists or government officials, so he enlisted the aid of his friend, Albert Einstein, to bring the issue to the attention of President Franklin D. Roosevelt. In a letter dated 2 August 1939, Einstein informed Roosevelt that it was theoretically possible to construct an atomic bomb and that the Nazis might be hard at work constructing such a device. It took the US entry into the Second World War to launch a full-scale project to construct a nuclear weapon, the British-American Manhattan Project that began in September 1942. The first nuclear (fission) device was ready for testing at Alamagordo New Mexico on 6 July 1945. It was quickly followed by the detonation of 'Little Boy' over Hiroshima on 6 August 1945 and 'Fat Man' over Nagasaki on 9 August 1945.

Fission weapons all share similar components: fissile material (e.g., U-235 or Plutonium); chemical explosives; non-fissile materials to reflect neutrons and tamp the explosion; and some sort of neutron generator to help initiate the nuclear reaction. Weapons also need triggers, a mechanical safety, arming and firing mechanisms. There are two basic types of fission weapons. 'Little Boy' was a gun-type fission device. This is the simplest and least efficient nuclear weapon design (the design requires a relatively large amount of fissile material to produce a relatively small blast). In a gun-design, two sub-critical masses of U-235 are fired down a barrel, striking each other at extremely high velocities producing a fission reaction. Gun-type devices, however, are rugged and have a relatively high probability of 'going critical', i.e., producing a nuclear detonation. The second design, an implosion-type device, uses high-explosive lenses to compress the fissile material— 'Fat Man' utilized plutonium—until it reaches criticality. Implosion devices are relatively difficult to manufacture and assemble because the shaped charges that compress the fissile material need to be manufactured to critical tolerances and detonated with more than split-second timing. The physics and engineering behind the design and manufacture of nuclear weapons are widely available. What is far more difficult to acquire are highly enriched uranium (U-235) and plutonium. These materials are under safeguards and their production and storage are monitored by the International Atomic Energy Agency (IAEA) and the declared and undeclared nuclear weapons states themselves.

Table 15.1 Nuclear weapons states

Country	Fission Device	Fusion Device
United States	1945	1952
Soviet Union	1949	1953
Great Britain	1952	1957
France	1960	1966
PRC	1964	1967
Israel	1967?	1973?
India	1974	1998?
Pakistan	1998	1998?
North Korea	2002?	

A fusion weapon is a three-stage bomb that uses an implosion device to trigger a fission reaction, which in turn detonates a fusion reaction (a process whereby one heavier nucleus is produced from two lighter nuclei). When the nuclei of light elements are combined, the resulting heaver element has less mass than the two original nuclei, and the difference in mass is instantaneously translated into energy. Often referred to as a thermo-nuclear weapon, or a hydrogen bomb, fusion weapons can be relatively small, light-weight, and pack virtually unlimited destructive force. During the Cold War, large nuclear weapons had yields in the millions of tons—megatons (mgt)—of TNT. On 31 October 1952, for example, the United Stated tested its first fusion device (Test Mike) at Eniwetok atoll in the Pacific Ocean. It produced a yield of about 10 mgt, which is equivalent to 10,000 kt. The most powerful nuclear weapon ever detonated was the Tsar Bomba (King of Bombs), which was a reduced-yield test of a 100-mgt bomb design. A product of Soviet science, the device was detonated with a 50-mgt yield on 30 October 1961 at the Mityushikha Bay Test range, Novayua Zemlya Island, producing a flash so bright that it was visible 1,000 km away. Bombs in the multi-megaton range generally have limited military utility since their destructive radius often exceeds the size of potential urban or military targets.

Nuclear weapons effects

Compared to the devices we encounter in our everyday lives, nuclear weapons operate at the extremes of time, pressure, and temperature. The entire explosive process of a hydrogen bomb, for example, occurs over the period of a few thousand nanoseconds (a nanosecond is 1/100,000,000 of a second). Pressure within a fusion bomb core can reach up to 8,000,000,000 tons per square inch and temperatures exceeding those found on the surface of the sun (6,000°C). Nuclear weapons introduce galactic scale forces into a terrestrial environment, producing devastating consequences.

Nuclear weapons effects are shaped by a variety of factors including the weapon's explosive yield, its height of detonation, weather conditions and terrain features. For example, an airburst occurs when the nuclear fireball does not touch the ground. Airbursts distribute the explosive blast and the radiation burst produced at detonation over a relatively wide area. Raising the height of burst lowers the pressure generated immediately below the detonation, but covers a larger area with somewhat lower overpressure. A ground burst maximizes the overpressure against a specific target—a missile silo or a command and control complex. A ground burst produces a great deal of fallout because the fireball irradiates and lofts dirt and debris high into the atmosphere. Nuclear weapons also can be driven deep beneath the earth's surface in an effort to more efficiently couple their explosive power to the ground to destroy deeply buried and hardened targets.

All nuclear weapons produce similar effects, although the balance between these effects can be somewhat altered by design. An average nuclear weapon (about 100 kt) detonated in the atmosphere will deliver 50% of its energy as blast, 35% as thermal radiation and about 15% into gamma and residual radiation. A so-called neutron bomb, for instance, shifts some of the energy involved in a nuclear detonation from blast into radiation effects. Not all nuclear effects, however, are known or well understood. In the aftermath of a US high-altitude test of a 1.4 mgt weapon in 1962, for example, scientists were surprised to learn that the resulting electro-magnetic pulse (EMP) burned out street lights, fuses and opened circuit breakers 800 miles away in Oahu (Hansen 1988). In the 1980s, scientists and analysts also debated whether a full-scale nuclear exchange would plunge the world into nuclear winter (Turco et al 1990). By contrast, nuclear blast and thermal effects can be predicted with great precision; the US military generally relies on blast effects to estimate the damage that will be produced by a nuclear detonation.

The best-known and most important nuclear weapons effects are EMP, a thermal-light pulse, blast, and fallout. EMP and the thermal-light pulse are produced at the instant of detonation. Electro-magnetic pulse occurs when gamma radiation interacts with matter (e.g., the atmosphere)—a process known as the Compton effect. EMP produces a high-voltage electrical charge, which is harmless to humans, but can destroy electronic systems that are not specifically shielded against its effects. EMP effects are maximized by detonating weapons at relatively high altitudes (100,000 ft). In theory, a single high-altitude nuclear detonation could temporarily knock out most electronic systems in a medium-sized country. Thermal-light pulse, which lasts about two seconds, can cause flash blindness and fire. A 1-mgt airburst could produce flash blindness in individuals fifty-three miles away on a clear night and thirteen miles away on a clear day. At closer ranges, retinal burn (permanent blindness) might occur if an individual was looking directly at the thermal-light pulse. This airburst would cause first-degree burns on unprotected skin seven miles away, second-degree burns at about 6 miles away and third-degree burns at about five miles away. Third degree burns over 25% of the body will cause the victim to go into shock quickly, a condition that requires immediate medical attention.

A shockwave (a sudden rise in atmosphere pressure) and dynamic overpressure (wind) follows a few seconds behind the thermal light pulse. At about one mile away, a 1-mgt airburst will produce 20 pounds per square inch (psi) overpressure and 470 mph winds, pressure sufficient to level steel-reinforced concrete structures. At three miles away, overpressure reaches 10 psi, producing winds of about 290 mph, sufficient to destroy most commercial structures and private residences. At five miles away, winds reach about 160 mph and overpressure reaches 5 psi, enough to damage most structures and subject people caught in the open to lethal collisions with flying debris. Blast effects were generally used by military planners to calculate casualty rates in a nuclear attack: it was estimated that about 50% of the people living within five miles of a 1-mgt airburst would either be killed or wounded by blast effects.

Individuals can be exposed to the fourth nuclear effect, radiation, either in the initial nuclear detonation or from fallout, which is irradiated debris picked up by the nuclear fireball and lofted into the atmosphere. A REM (roentgen-equivalent-man) is a measure of radiation energy absorbed by living creatures. 600 REM is likely to produce lethal radiation sickness in an exposed population, while a dose of 300 REM would produce lethal radiation sickness in about 10% of an exposed population. Exposure to about 250 REM, however, impedes the body's ability to heal from burns and kinetic injury, making non-lethal injuries deadly. Exposure to about 50 REM increases the incidence of cancer across an entire population by about 2% (United States Congress 1979).

A dirty bomb uses chemical high-explosive to disperse radioactive material. It primarily relies on radiation to produce a lethal effect. A dirty bomb's lethality thus would be governed by how far radioactive materials might be lofted by the conventional chemical explosive and the radioactivity of the material used in the bomb. Many observers believe that the explosive blast produced by a dirty bomb, not the radioactive material it disperses, would cause the greatest amount of actual damage. Panic set off by even a limited dispersion of radioactive material, however, might be more costly in terms of the disruption it causes than the actual casualties or damage to property produced by the detonation of a dirty bomb.

Methods of delivery

Nuclear weapons have taken a variety of forms over the years. Early weapons were relatively large and heavy; only four-engine bombers were capable of lifting them. With the advent of thermonuclear (fusion) weapons, the size and weight of weapons began to decrease as their yields increased. Nuclear 'warheads' were soon mounted on cruise missiles, medium range ballistic missiles and eventually intercontinental ballistic missiles (ICBMs) and submarine-launched ballistic missiles that were launched beneath the surface of the ocean from nuclear-powered submarines. By the 1970s, multiple independently targetable reentry vehicles were being installed aboard US and Soviet ICBMs, giving both superpowers the ability to strike up to a dozen targets with one missile. Nuclear warheads were soon available for air-to-air missiles that were to be fired by aircraft to knock down incoming bombers, artillery shells, and even man-portable demolition charges. Neutron warheads were created to arm interceptor missiles that were part of the Safeguard Anti-Ballistic Missile System, which was developed by the United States in the 1970s. Safeguard interceptor warheads were intended to detonate in close proximity to incoming warheads, bathing them in EMP and turning them into duds. Both superpowers also investigated the possibility of deploying Fractional Orbital Bombardment Systems (FOBS), i.e., parking nuclear weapons in orbit so that they could be armed and targeted following an alert from ground control stations. Mercifully, officials on both sides of the Cold War divide thought better of living literally with a sword of Damocles over their heads and in the 1967 Outer Space Treaty, they banned placement of nuclear weapons in space.

Today, officials are worried about the possibility that terrorists might somehow manufacture or acquire a nuclear weapon or a radiological device. Although a missile or airborne attack is possible, there is much concern that a weapon might be smuggled into a country in one of the thousands of marine shipping containers that travel the world's oceans everyday. There is also a possibility that a weapon's components could be shipped separately and assembled on site. Local police forces and national intelligence agencies also closely monitor efforts to sell radioactive materials on the black market. In 1998, for instance, Mamdough Mamud Salim, an al-Qaeda operative, was arrested after attempting to buy 'enriched uranium' in Western Europe (Boureston 2002). Nuclear or radiological weapons manufactured by terrorists would probably be relatively crude, suggesting that they would be relatively large and difficult to transport. Small, man-portable nuclear devices (e.g., atomic demolitions) were manufactured by the superpowers

during the Cold War, which has raised concerns that these weapons might find their way onto the black market. In September 1997, for instance, the CBS news program *Sixty Minutes* reported that former Russian National Security Advisor Aleksander Lebed claimed that the Russian military had lost track of 100 'suit-case bombs', each with a yield of about 10 kt. Russian officials confirmed that such devices were constructed, but it remains unclear if they have been secured or destroyed.

Impact on international politics

Despite the fact that nuclear weapons emerged on the world scene over sixty years ago and have played a dominant role in the Cold War standoff between the North Atlantic Treaty Organisation (NATO) and the Warsaw Pact, debate continues about their impact on world politics (Paul, Harknett and Wirtz 1998). Disarmament advocates bemoan the failure of the existing nuclear powers to reduce their reliance on nuclear weapons, the failure of the US Senate to ratify the Comprehensive Test Ban Treaty, and the decision of the George W. Bush administration' to withdraw from the 1972 Anti-Ballistic Missile Treaty, which in their mind threatens a new round in the arms race. They also are concerned that the non-proliferation regime is slowly losing ground as several states continue to press ahead with covert and overt programmes to develop nuclear weapons. Others see the cup as half full. The United States and Russia have greatly decreased the size of their deployed nuclear forces—the 2002 Moscow Treaty cuts Russian and American nuclear forces to about 20% of the level they reached during the Cold War. The Bush administration's 2002 Nuclear Posture Review also declared an end to the nuclear deterrence relationship that dominated Soviet (Russian)–American relations for nearly sixty years. The chance that nuclear Armageddon will occur, a fear that preoccupied people for decades, is lower now that it ever was during the Cold War.

Scholars are divided about the impact of nuclear weapons on world politics (Sagan and Waltz 2002). Some believe that a nuclear arsenal helps to deter attack by other states armed with conventional and nuclear weapons. The ability to retaliate with nuclear weapons after suffering an attack—known as a secure second-strike capability—is especially desirable because it can effectively eliminate an opponent's potential gain produced by using nuclear weapons first, a situation known as crisis stability. Because even a few nuclear weapons can cause catastrophic destruction and it is virtually impossible to defend against the effects of nuclear weapons, these scholars believe that they are truly revolutionary weapons that force militaries to concentrate on preventing, not fighting wars (Brodie 1946). Some, focusing on Soviet-American relations during the Cold War, suggest that peace is the logical outcome, especially if potential enemies obtain secure-second strike capabilities: it is not logical for officials to engage in conflicts if they know in advance that a nuclear exchange will devastate, if not completely destroy, their country (Jervis 1989).

By contrast, proliferation pessimists worry that the superpower Cold War experience was at best an anomaly, and at worse, a situation that often teetered on the brink of disaster. They worry that human frailty, communication failures and misperception, bureaucratic snafus or psychological or technological breakdowns in a crisis can cause failures of deterrence, leading to inadvertent or accidental nuclear war. Others point to normal accidents—the inability to anticipate all human-machine interaction in complex systems—as a potential path to accidental nuclear war, especially because nuclear warning and command and control systems interact intensively during a crisis. Proliferation pessimists also point out that there is no guarantee that all militaries and governments will be good stewards of their nuclear arsenals. Those who possess nuclear weapons might take risks that expose their arsenals to sabotage, loss through theft, or accidental or inadvertent use. Some governments might not use their newly found weapons for deterrence purposes, but instead for purposes of intimidation or aggression. They might gravitate toward nuclear warfighting strategies that seek to introduce nuclear weapons quickly and massively on the battlefield in an attempt either to pre-empt an adversary's use of nuclear weapons or to end a conflict with a quick knock-out blow.

Although the debate between optimists and pessimists continues, all agree that the spread of nuclear or radiological weapons to non-state actors or even individuals would be a global disaster. Existing deterrent strategies and capabilities do not address terrorist use of nuclear weapons. The threat that these nuclear weapons could fall into the hands of non-state actors will force states to heighten domestic surveillance and security efforts.

KEY POINTS

- A gun-type fission device is a relatively simple, reliable and rugged nuclear-weapon design that would be attractive to terrorist organizations or states developing a nuclear programme.
- Fusion weapons are highly complex devices that can produce enormous destructive energy from relatively small, light-weight packages.
- Primary nuclear effects are electromagnetic pulse, thermal-light energy, blast and radiation.
- Although the risk of nuclear Armageddon has receded since the end of the Cold War, concerns are increasing that terrorists might acquire and detonate a dirty bomb or a gun-type device.
- Scholars continue to debate if nuclear weapons are a source of peace in world politics or an unjustified risk to international security.

Chemical weapons

Although poisons and chemicals have been used in war since ancient times, chemical weapons emerged in the late 1800s as part of the modern chemical industry. Scholars debate whether chemical weapons should be considered a weapon of mass destruction because large quantities of chemical weapons often have to be used on the battlefield to have a significant effect against a prepared opponent and these weapons have to be expertly employed to produce massive casualties. On 20 March 1995, for instance, the Aum Shinrikyo cult launched a sarin attack against the Tokyo subway system that resulted in twelve deaths. By contrast, the al-Qaeda attack against the Madrid train system on 11 March 2004 used conventional explosives and killed nearly two hundred innocent civilians. What worries analysts, however, is that any state with a chemical industry could quickly convert production processes from civilian use to weapons manufacturing and that even readily available household products can be mixed to create relatively dangerous concoctions. Weapons can be created from commonly available chemicals using well-understood technologies. Household insecticides, for example, are simply 'watered-down' nerve agents.

The first significant employment of chemical weapons occurred in the First World War as both sides sought a way to break through the stalemate of trench warfare. On 22 April 1915, German units unleashed a cloud of chlorine gas (an asphyxiating agent) against allied lines at Ypres, Belgium, but failed to exploit the gap created in the French lines. Petrified by the sight of corpses that exhibited no obvious causes of death, attacking German soldiers refused to advance. The Germans introduced mustard gas (a blistering agent) on the battlefield on 12 July 1917. The Allies also developed their own

blister agent, Lewisite, but it was just reaching the battlefield as the First World War came to an end. Although chemical weapons only caused about 4% of the casualties suffered by all sides during the First World War, the use of gas on the battlefield affected societies everywhere as veterans related stories of helpless soldiers struggling to put on gas masks as they chocked to death or were blinded by blister agents. This imagery, best exemplified by the painting of a field dressing station in Arras, France, made by the American artist John Singer Sargent, highlighted the horror and cruelty of gas warfare.

Photo 15.1 John Singer Sargent (1918) 'Gassed'

Source: Reproduced with permission from the Art Archive/Imperial War Museum.

Although the Italians employed mustard agent against Ethopia in 1935 and the Japanese attacked Chinese troops with chemical weapons in the 1930s, chemical weapons were not used extensively on Second World War battlefields. Many speculate that Adolf Hitler, a mustard gas casualty in the First World War, was personally reluctant to be the first to introduce these weapons in Europe (although this apparent aversion did not stop the Nazis from using Zyclon-B, a prussic acid based substance used as a pesticide and disinfectant, to kill thousands of victims in gas chambers). In fact, only one major chemical weapons incident occurred during the war. On 2 December 1943, a Nazi air raid on the harbour in Bari, Italy, damaged a merchant ship carrying 2,000 100 lb M 47A1 bombs filled with mustard agent. The accidental release of agent affected thousands of allied soldiers and civilians. It was not until the Iran–Iraq war, however, that chemical weapons were again employed on the battlefield. In 1982, Iraqi units, hard pressed by far more numerous Iranian forces, dispensed mass concentrations of the riot control agent CS to break up opposing formations. By 1983, Iraq was using mustard agents on the battlefield and continued experimenting with more lethal agents and concoctions. In a February 1986 strike against al-Faw, the Iraqis employed a mixture of mustard and tabun (a nerve agent) against the Iranians, which resulted in thousands of casualties. Saddam Hussein's murderous regime also attacked its own citizens with chemical weapons. On 16 March 1988 Iraq forces sprayed a mixture of mustard and nerve agents over the Kurdish village of Halabja, killing more than 10,000 civilians.

Chemical weapons effects

Chemical weapons vary in terms of their lethality, their complexity, and the way they cause injury and death. They also vary in terms of their persistence: some disperse quickly allowing attacking troops to move through an area while 'area denial agents', which might be used to attack an airfield to reduce the tempo of flight operations, might persist for a long time. Traditionally, chemical weapons have been characterized as blood agents, choking agents, blister agents, nerve agents and incapacitants.

Blood agents, which are generally based on hydrocyanic acid (HCN), interfere with the body's ability to transport oxygen in the blood. Because cyanide has been used as a poison throughout history, several countries experimented with using this agent as a weapon. Owing to its high volatility—it evaporates quickly, making it hard to create a lethal concentration over a battlefield—most states long ago abandoned it as a toxic agent for military use.

Choking agents—phosgene and chlorine—get their name from the fact that their victims literally drown in the fluids produced when the tissues lining the lungs interact with the agent. Choking agents produce hydrochloric acid when they are inhaled, causing blood and fluid to infiltrate the lungs. Phosgene, which reacts with water in the body to produce hydrochloric acid, is a common industrial chemical which is more toxic than chlorine. Most of the deaths caused in the First World War by chemical weapons were caused by phosgene.

Blister agents are primarily intended to generate serious causalities in an opposing force, thereby placing enormous demands on supporting medical services. Before the development of more lethal nerve agents, sulphur mustard, was considered to be the chemical weapon of choice. It exists as a thick liquid at room temperature, but can be suspended in air (i.e., turned into an aerosol that can be inhaled) by using a conventional explosive. It can also be used to contaminate people, terrain or equipment. Although the exact reason why mustard agent is an extreme irritant is not well understood, it causes severe blistering on exposed skin and mucous membranes. It also can cause temporary blindness. Long-term effects from a single moderate exposure to mustard agent are not usually lethal. The effects of mustard can sometimes take several hours to develop; Lewisite, another blister agent, works more rapidly than mustard.

Nerve agents are by far the most lethal chemical weapons. Invented during the 1930s as insecticides, they entered Nazi and Allied military inventories in the Second World War but were not used in combat. The name 'nerve agent' reflects the fact that these chemicals interfere with the body's neurological system by irreversibly inactivating acetyl cholinesterase (AChE), which 'deactivates' the neurotransmitter acetylcholine. Nerve agents bind to the active site of AchE, making it incapable of deactivating acetylcholine. Without an ability to deactivate acetylcholine, muscles fire continuously, glandular hypersecretion occurs (e.g., excess saliva) leading to paralysis and suffocation. Second generation nerve agents, G (German) series agents (GA) Tabun, (GB) Sarin, (GD) Soman, (GF) Cyclosarin, are considered to be non-persistent agents. G series agents are all water and fat soluble, and can enter the skin and cause lethal effects. Third generation V Series—VX, VE, VG, VM—nerve agents, a product of British science, are persistent agents that are about ten times more lethal than Sarin. Less is publicly known about fourth generation A-series agents (also known as 'Novichok' agents), a product of Soviet science. Exposure to high aerosol concentrations of nerve agents causes prompt collapse and death.

Incapacitants are used for riot control (CS or tear gas) or for personal protection (CN or mace). They are less toxic than other chemical weapons and usually do not produce lethal effects when used in the open at a proper concentration. Vomiting agents (adamsite) have been developed for use in combat. Both Soviet and US scientists also experimented with psychochemicals (i.e., lysergic acid diethylamide [LSD] and BZ) in an effort to cause altered states of situational awareness. BZ was weaponized by the United States, but it was dropped from its arsenal because its effects were unpredictable. In October 2002, Russian security forces used an opiod form of fentanyl in an attempt to incapacitate Chechin separatists who were holding 800 hostages in a Moscow theatre. Owing to either a lack of prompt medical attention or an overdose of fentanyl, 126 people died from this 'incapacitant'.

Methods of delivery

Chemical weapons are delivered either from a line or a point source. Bombs, artillery shells, missile warheads or parcels, for instance, are all point sources because they deliver chemical weapons to a specific location. A line source, which is generated by a series of dispensing devices, a crop duster or even a moving crop sprayer, creates a cloud or 'line' of gas that drifts towards the target. Wind, temperature, and terrain can effect the lethality and persistence of an agent. For example, a gallon of VX is sufficient to kill thousands of people, but only if individuals are brought into contact with the correct amount of agent to cause casualties. Agents can be blown off target, diluted by rain or even solidify if the temperature drops too low.

Because proper dispersal is key to employing chemical weapons, analysts are most concerned about their use in closed venues such as sporting arenas or large buildings with ventilation systems that could be subject to tampering. Aum Shinryko targeted the Tokyo subway because of the large numbers of people who travel daily through its contained spaces and choke points. The cult experimented with a suitcase mechanism to deliver sarin aerosol in the subway: two small electric fans were used to disperse chemical agent after it was released from vials stored inside the suitcase. To conduct the actual attack, however, the cult relied on a far simpler method: they punched holes in plastic bags containing sarin and simply allowed the agent to evaporate in the subway cars.

Impact on international politics

By the 1970s, NATO militaries began to view chemical weapons as a deterrent, not as a weapon they preferred to use on the battlefield. Chemical weapons pose obvious difficulties in terms of transportation and handling, and most military observers agree there are safer and more efficient ways to hold targets at risk. Thus the preferences of military professionals helped to foster a taboo against the use of chemical weapons in war, restraint codified in the 1925 *Geneva Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous, or Other Gases, and of Bacteriological Methods of Warfare*. Although the Geneva Protocol banned first use of chemical weapons, it did not prevent states from stockpiling chemical munitions. The Chemical Weapons Convention (CWC), which entered into force on 29 April 1997, makes it illegal for signatories to possess or employ chemical weapons, with the exception of small samples used to test protective equipment. States party to the CWC are required to declare their existing stocks of chemical weapons, to identify facilities that once were involved in chemical weapons production, and to announce when their existing stocks will be completely destroyed. The Organization for the Prohibition of Chemical Weapons (OPCW) is authorized to verify compliance with the CWC and can undertake challenge inspections when demanded by states parties (Larsen 2002).

While 148 nations have ratified the CWC, about twenty countries, some of which maintain a large chemical arsenal (e.g., North Korea and Syria) have not signed the treaty. Most military analysts believe that these large arsenals would have only a modest effect on well-equipped and trained troops on the battlefield. In their view, a chemical arsenal is the 'poor man's' weapon of mass destruction because it is based on old, relatively simple, and inexpensive technologies that have limited military utility. Nevertheless, if employed deliberately against relatively defenseless civilian populations, these weapons could wreak havoc. Analysts are most concerned that terrorist organizations or even individuals might gain access to poisonous chemicals that are part of industrial processes and attack urban targets. Iraqi use of chemical weapons in war is considered an anomaly; the fear is that Aum Shinrikyo's sarin attack might be a harbinger of things to come.

KEY POINTS

- There are five types of chemical weapons: blood agents, choking agents, blister agents, nerve agents and incapacitants.
- Chemical agents can be persistent or non-persistent and can be delivered from a point or a line source.
- State and non-state actors with access to even a rudimentary chemical industry can acquire chemical weapons.
- The nearly universal Chemical Weapons Convention bans the manufacture or use of chemical weapons and only allows signatories to possess small amounts of agents for research into defensive equipment and prophylaxis.

Biological weapons

Biological weapons (BW) make use of living organisms or toxins to sicken or kill humans, animals and plants. These organisms and toxins all occur in nature, which makes it difficult to differentiate natural disease outbreaks from a BW attack. BW is probably the most potentially destructive weapon known to humans in the sense that a single organism or infected individual can affect millions of human beings, although scientists debate the degree of difficulty any state or non-state actor might encounter in infecting large numbers of people quickly. Although extremely contagious diseases are generally not lethal, some, smallpox, for example, are easily transmitted and produce high morbidity. Sometimes, diseases that are considered relatively mundane can be extremely lethal: the 1918–1919 'Spanish Flu' killed upwards of 40 million people, striking hardest among healthy adults between the ages of 20 and 40.

Disease has been a part of war throughout history. Until recently, most people died in war from illness, not from wounds suffered in combat. Deliberate use of disease as a weapon of war, however, has been sporadic, producing mixed results. In 1346, Mongol invaders hurled the corpses of soldiers who had died from bubonic plague into the besieged city of Kaffa in an effort to deliberately spread disease. The Mongols did not know, however, that the causative bacteria of plague *Yersinia pestis* is spread by fleas that only feed on live hosts. At the end of the Seven Years War (1756–1763), British forces apparently provided American Indians with smallpox-infected blankets, although it is difficult to determine whether or not they succeeded in infecting anyone because smallpox was already endemic in the Americas and had decimated Indian populations about two hundred years earlier. During the First World War, German saboteurs apparently succeeded in infecting horses used by the allies with glanders. During the Second World War, the Japanese filled glass bombs with plague-infected fleas to spread disease and Japanese scientists working in the infamous Unit 731 conducted biological warfare experiments on prisoners of war.

Although the United States, Britain and Canada conducted research into the weaponization of Anthrax, Tularemia, Q-fever, Venezuelan equine encephalitis and anti-agricultural agents, biological weapons were generally viewed in the West as lacking military utility. By contrast, Soviet researchers concentrated on perfecting a variety of biological agents during the Cold War and exploited the emerging science of genetic engineering to better weaponize naturally occurring diseases. According

to Ken Alibek, who was a leading figure in Biopreperat, the Soviet Union's complex of biological weapons facilities, Soviet science worked with a variety of bacteria (e.g., an antibiotic-resistant strain of anthrax), viruses (e.g., smallpox) and even haemorrhagic fevers, e.g., Ebola (Alibek 2000). Although the 'Soviet' biological weapons programme apparently ended in Russia in the early 1990s, experts still debate what motivated the Soviets to undertake such an extensive BW programme. The Soviets probably saw their BW program as a counter to the precision, global-strike complex that was emerging in NATO in the 1970s or as a way to retard Western recovery following an all-out nuclear exchange. The Soviets apparently loaded several SS-18 intercontinental ballistic missiles with plague in an attempt to provide Western survivors of a nuclear war with an additional reason to envy the dead.

Biological weapons effects

Although naturally occurring diseases have been a scourge of humankind, not every disease provides the basis for an effective biological weapon. An agent's storage, delivery, mode of transmission, and its very resilience (i.e., how long can it survive in the environment) can shape its effects on a target population. Military professionals believe that most biological weapons are simply too unpredictable in their effects to be a reliable weapon. Because they are easy to manufacture and can be potentially highly lethal in small quantities—any basic medical laboratory has the capability to cultivate a biological agent—biological agents might be attractive and available to terrorists. Relatively large industrial facilities are needed to produce militarily significant quantities of chemical weapons, but relatively small fermenters used to make legitimate vaccines, for instance, could be quickly converted to produce biological agents.

There are three varieties of biological agents: bacteria, viruses, and toxins. As an area attack agent, anthrax is probably the best-known bacterial agent. Its spores are extremely hardy (they can live for literally hundreds of years) and it can be spread quickly across large areas. Anthrax is not contagious, so its effects can be relatively contained and focused on specific targets. It also can be genetically engineered to be resistant to most antibiotics and it can be formulated with inert matter to better form an aerosol. These qualities make anthrax the agent of choice for many biological weapons programmes. The cutaneous form of anthrax occurs in the animal industry and can be treated relatively easily; by contrast, the inhalation form of the disease is extremely dangerous. By the time the victim begins to show symptoms of inhalation anthrax, a near-lethal dose of toxins produced by the anthrax bacteria has already built up in the body. The Aum Shinrikyo cult attempted to disperse anthrax in Tokyo in 1996; they failed because they used a non-toxic vaccine strain of the virus. The terrorist who sent anthrax through the US mail in autumn 2001, however, used a deadly 'Ames' strain which US weapons laboratories employ to test defensive equipment and prophylaxis (Stern 2000).

Although haemorrhagic fevers—Marburg, Lassa fever, or Ebola—are viral agents that could serve as potent weapons, policy makers are most worried about the threat posed by smallpox. As smallpox was eradicated as a naturally occurring disease, global vaccination programmes were terminated, leaving entire generations unprotected against the disease for the first time in hundreds of years. Smallpox is an airborne virus that is about as contagious as the flu, but it has a lethality of about 30% in its ordinary form (rarer malignant and haemorrhagic forms of smallpox are 100% lethal). It also leaves survivors horribly scarred by its effects. Smallpox vaccination can stop the disease, even if administered a few days after exposure, but to prevent a pandemic, potentially millions of doses of vaccine need to be made quickly available. Reintroduction of general inoculation programmes, however, have not been advocated by

Table 15.2 Likely biological warfare agents—bacterial and rickettsial agents

Agent/Disease	Organism	Lethality	Onset	Symptoms	Target
Anthrax	*Bacillus anthracis*	80% lethality, non-contagious	1–5 days	Pulmonary form: chest cold symptoms, respiratory distress, fever, shock death	Area attack
Brucellosis	Brucella	3–20% lethality, non-contagious	5–60 days	Fever, headaches, pain in joints and mussels fatigue	Area attack
Plague	*Yersinia pesstis*	80% lethality, contagious	2–3 days	High fever, headache, extreme weakness, haemorrhages in skin and mucous membranes	Area attack
Tularemia	*Francisella tularensis*	50% lethality contagious	2–10 days	Chills, fever, headache, loss of body fluids	Area attack
Q Fever	Coxiella burnettii	2% lethality non-contagious	10–40 days	Fever, headache, cough, muscle and joint pain	Area attack

Table 15.3 Likely biological warfare agents—viral agents

Agent/Disease	Organism	Lethality	Onset	Symptoms	Target
Smallpox	Variola virus	2–49% lethality, contagious	7–17 days	Severe fever, small blisters on skin, bleeding on skin and mucous	Area attack
Viral encephalitis	Eastern Equine Encephalitis (EEE) virus	80% lethality, non-contagious	1–14 days	Headache, general aches and pains, photophobia	Area attack
Viral haemorrhagic fevers	Ebola	80% lethality, contagious	4–21 days	Subcutaneous haemorrhage, bleeding from body orifices, headache, fever, stupor, convulsion	Area attack

Table 15.4 Likely biological warfare agents—toxins

Agent/Disease	Organism	Lethality	Onset	Symptoms	Target
Botulinum Toxin	*Clostridium botulinum*	80% lethality, non-contagious	1–5 days	Blurred vision, photophobia, paralysis	Proximity attack
SEB Toxin	*Staphylococcus aureus*	2% lethality, non-contagious	1–6 hours	Headache, sudden fever, nausea, vomiting	Proximity attack

public health authorities because the smallpox vaccine itself leads to about 50 instances of side effects per one million people vaccinated. The impact of a smallpox outbreak, however, cannot be underestimated. The 'Dark Winter' exercise run by the US Federal Emergency Management Agency in June 2001 was based on a smallpox outbreak in the American Midwest. Within 30 days, over 300,000 people in 25 states and 10 foreign countries had already contracted the disease. Smallpox truly has the capability of creating a global catastrophe.

Although toxins are not living organisms and are in fact a by-product of metabolic activity, they are generally discussed as a biological weapon. Toxins are probably best thought of as a poison, which is often used to attack specific individuals. Like chemical weapons, individuals have to be brought into direct contact with the toxin to suffer from its effects. Toxins, however, can be extremely lethal. Ricin, which is made from castor bean, kills by inhibiting protein synthesis within cells. Used as an assassination weapon—the Bulgarian dissident Georgy Markov was killed by a ricin injection in 1978—it can kill within three days. Because it can be made easily from readily available materials, many analysts believe that terrorists will seek to use ricin. In 2003, for instance, British officials arrested a terrorist who was plotting to smear ricin on the door handles of cars and buildings in London. In 2004, Victor Yushchenko was badly disfigured from a toxin attack (see Think Point 15.1).

Methods of delivery

Biological agents are generally delivered in the form of an infectious aerosol. Precise preparation of the aerosol is crucial because the agent has to be the proper size to infect a host by lodging in the small alveoli of the lungs. Vectors—lice, fleas, mosquitoes—transmit disease in nature, but it would be difficult to use this mode of transmission as a military weapon because it is inherently difficult to control. Terrorists might attempt to infect individuals surreptitiously with a disease such as smallpox, but the disease is difficult to grow in vitro and the terrorists themselves would have to be vaccinated to work with the virus. Because smallpox vaccine is not readily available, seeking vaccine might allow public health officials to detect some nefarious scheme. The difficulty of controlling infectious diseases also should give terrorists pause. Unleashing highly contagious diseases can backfire because a pandemic does not respect religious, political, or cultural boundaries, although public health services in rich countries are far more likely to cope with an outbreak of infectious disease than poorer countries whose health care system is already stretched to the breaking point.

Impact on international politics

Following revelations in the early 1990s about the Soviet biological weapons programme and renewed concerns about biological warfare following the 1991 Gulf War, policy makers devoted renewed attention to strengthening the 1972 Biological and Toxin Weapons Convention (BWC) by devising an inspection protocol similar to the verification mechanism embedded in the CWC. By late 2001, however, negotiations over an inspection protocol for the BWC reached an impasse. Officials concluded that it was too difficult to devise an inspection regime that could provide any significant insight into what was being manufactured in the tens of thousands of medical laboratories around the planet and that regardless of the efforts of inspection teams, it was simply too easy to conceal work on biological agents. Efforts instead shifted from the diplomatic realm to strengthening domestic criminal laws against the manufacture or possession of biological weapons or agents and improving international health monitoring to spot the outbreak of infectious diseases.

THINK POINT 15.1

Who poisoned Yushchenko?

Although toxins could be employed against troops in the field or against large groups of individuals in sporting arenas or transportation systems, history suggests that they often serve as an exotic weapon for assassination. In the latest example of attempted 'toxin assassination', Austrian doctors reported in December 2004 that Ukrainian presidential candidate Victor Yushchenko was suffering from dioxin poisoning. Yushchenko apparently developed symptoms—fatigue, pain and disfiguring chloracne—quickly after he had apparently ingested TCDD dioxin in his food. The concentration of dioxin in Yushchenko's body, the second highest ever recorded, was as least 1,000 times more than is found in most people. Some observes speculate that dioxin was used because it would disfigure and sicken Yushchenko, literally making him an unattractive candidate to the Ukrainian electorate. Compaigning in extreme pain, and badly disfigured by dioxin, Yushchenko went on to ride the 'Orange Revolution' in Ukraine that followed the electoral fraud in the November 2004 presidential elections. He took office as the Ukraine's President on 23 January 2005.

Photo 15.2 Who poisoned Yushchenko?

Combination image shows the changing face of Ukraine's opposition leader Viktor Yushchenko in file photos taken on 4 July 2004 (left) and 1 November 2004 (right).

Source: Reproduced with permission from Reuters/Gleb Garanich and Vasily Fedosenko.

KEY POINTS

- Biological weapons are derived from naturally occurring diseases and can be manufactured in medical laboratories.
- Biological weapons vary in terms of their lethality and whether or not they are contagious.
- Anthrax is a biological agent of great concern because it is a hardy, non-contagious agent that can be used to contaminate large areas. It can potentially directly infect many people quickly.
- The revolution in genetic engineering has been used to weaponize naturally occurring diseases.

Conclusion: the future of WMD

In some respects, the WMD threat has greatly receded since the end of the Cold War. The number of deployed Soviet (Russian) and American strategic nuclear warheads has been reduced by 80% over the last decade, and US tactical nuclear weapons have largely been withdrawn from service. The threat of Armageddon produced by a massive nuclear exchange is now only a remote possibility. The International Non-proliferation Regime has survived the 1998 Indian and Pakistani nuclear tests and a de facto nuclear test ban remains in place, despite the fact that the US Senate failed to ratify the Comprehensive Test Ban Treaty. The CWC and BWC not only provide a basis in international law to stop the spread of these deadly chemical and biological agents, but they also serve as a useful diplomatic framework for devising new ways to stop the spread and use of these weapons. The Proliferation Security Initiative (PSI), for instance, is a new international undertaking to stop illicit trade in materials related to chemical, biological and nuclear weapons. The PSI also reflects a shift towards counterproliferation in the international effort to stop the spread of chemical, biological and nuclear weapons. In the wake of revelations about A.Q. Khan's clandestine nuclear supply network and the interception of a shipment of North Korean SCUD missiles that were bound for Yemen, officials are taking more active steps to stop trade in illicit materials, weapons and delivery systems.

Although Iranian efforts to develop a nuclear weapon or the fact that North Korea has a nascent nuclear arsenal dominates headlines, officials today are most concerned by the prospect that WMD is escaping the control of state actors. Because terrorists rely on shock to hold their audience, many observers believe that they might be attracted to WMD because it is the next rung in the escalation ladder and it is bound to gain worldwide attention. This would not be an unprecedented development. Non-state actors already have employed chemical, biological and radiological weapons. WMD terrorism, however, poses a threat that is not easily met by today's policy or military establishments. Officials everywhere are scrambling to develop effective responses to this potential threat.

Since the First World War, the use of WMD in war has been episodic. Nation-states have mostly abandoned their chemical and biological arsenals. Terrorists' efforts to use chemical, biological or radiological weapons have been largely ineffective. Nuclear weapons, the centrepiece of the Soviet–American Cold War competition, have only been used on the battlefield twice. Lingering questions remain. Is there a taboo against the use of weapons of mass destruction? Have we all just been incredibly lucky?

QUESTIONS

Why might nuclear weapons be a source of stability in international relations?

Why do you think that the use of weapons of mass destruction in war is relatively rare?

Why would terrorists be attracted to chemical, biological, radiological or nuclear weapons?

What effect would another use of nuclear weapons have on world politics?

Toxins are often used against what type of target?

Which variety of WMD is most destructive? Which is most easily manufactured?

What steps should governments take to prevent WMD terrorism?

Is direct action or international negotiation the best way to counter the spread of WMD?

Do you think Aum Shinrikyo's experience with sarin will be emulated by other groups or individuals?

Do you think that weapons of mass destruction serve as status symbols in world politics?

FURTHER READING

■ **Freedman, Lawrence (2003), *The Evolution of Nuclear Strategy*, 3rd edn, New York: Palgrave Macmillan**. This is the best single volume on the history of nuclear arsenals and the strategic thinking that guided nuclear strategy.

■ ***The Effects of Nuclear War* (1979), Washington, DC**: Office of Technology Assessment. This volume provides a fine overview of nuclear weapons effects.

■ **Schell, Jonathan (1982), *The Fate of the Earth*, New York: Knopf**. This is probably the best description of the existential threat posed by the widespread use of nuclear weapons.

■ **Sagan, Scott D. and Waltz, Kenneth (2002), *The Spread of Nuclear Weapons: A Debate Renewed*, 2nd edn, New York: W.W. Norton & Co**. Provides an engaging debate between proliferation optimists and pessimists.

■ **Croddy, Eric A. and Wirtz, James J. (eds.) (2005), *Weapons of Mass Destruction: An Encyclopedia of Worldwide Policy, Technology, and History* 2 vols., Santa Barbara, CA: ABC-Clio**. A handy reference on WMD.

IMPORTANT WEBSITES

- **http://ww.cdc.gov/** Center for Disease Control and Prevention provides information on diseases.
- **http://www.ucsusa.org/** Union of Concerned Scientists. Established in 1969, this is an independent non-profit alliance of more than 100,000 citizens and scientists concerned by the misuse of science and technology in society.
- **www.ccc.nps.navy.mil** Center for Contemporary Conflict. Launched in 2001, the CCC conducts research on current and emerging security issues and conveys its findings to US and Allied policy-makers and military forces.

- **http://nuclearweaponarchive.org/** Nuclear Weapons Archive. The purpose of this archive is to illuminate the reader regarding the effects of these destructive devices, and to warn against their use.
- **http://cns.miis.edu/** Center for Nonproliferation Studies, Monterey Institute of International Studies. The Center strives to combat the spread of weapons of mass destruction (WMD) by training the next generation of nonproliferation specialists and disseminating timely information and analysis.
- **http://www.fas.org/main/home.jsp** Federation of American Scientists. Formed in 1945 by atomic scientists from the Manhattan Project, the FAS conducts research and provides education on nuclear arms control and global security; conventional arms transfers; proliferation of weapons of mass destruction; information technology for human health; and government information policy.

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16 Terrorism

BRENDA LUTZ AND JAMES LUTZ

Chapter Contents

Reader's Guide

This chapter analyses the threat that **terrorism** poses for countries and the world. Efforts to deal with terrorism can be considered within the framework of terrorism as warfare, terrorism as crime, and terrorism as disease. Which of these views is adopted determines what kinds of countermeasures countries will use in their effort to deal with terrorism. Terrorism is a technique of action available to all groups; security measures that work with one group may not be effective with others. Dealing with terrorism in today's world can be a very complex process indeed.

began in 1991. The data are not restricted to attacks involving the United States and against US interests or American citizens abroad. The data from 1991 to 2003 are comprehensive and considered reliable. Questions were raised about the 2004 data, which were then withdrawn for possible correction and later release.

Visit the Online Resource Centre that accompanies this book for lots of interesting additional material: www.oxfordtextbooks.co.uk/orc/collins/

17 The Defence Trade

JOANNA SPEAR AND NEIL COOPER

Chapter Contents

Reader's Guide

This chapter aims to provide the reader with an understanding of key aspects of the contemporary defence trade. It begins by examining the main theoretical approaches that have been developed to explain why states acquire defence equipment. This section includes an analysis of the action-reaction, domestic factor and technological imperative models as well as a brief discussion of the military-industrial complex thesis. The first section concludes by considering the various ways in which the symbolic meaning attached to military technology may influence decisions on both the acquisition and sale of defence equipment.

The chapter then examines trends in both defence expenditure and defence exports. With respect to the former, it highlights, in particular, the way in which the US war on terror has legitimized a return to Cold War levels of defence expenditure and how the vast amounts expended on defence by the US is creating a growing technology gap between it and other producers. With respect to the latter, the chapter draws on the notion of 'tiers' in the defence market to analyse trends in the defence export trade, focusing on the policies of specific states that can be viewed as exemplars of each tier. This section also includes a brief discussion of the role played by non-state actors in the supply of defence material as well as an examination of demand factors in the market. The final section of the chapter outlines the changes in the content of the contemporary defence trade, in particular the shift away from the supply of complete major weapons systems to the provision of upgrades, dual-use technologies, communications equipment, spare parts and training.

The authors would like to extend sincere thanks to Mandy Turner for her research work for this project and to Saket Vemprala for preparing all the tables and charts.

Introduction

This chapter aims to outline both the dynamics underpinning the acquisition of defence technology and the various features of the contemporary export market in defence goods. The first section briefly outlines the main schools of thought that have been developed to explain why states acquire arms. We then go on to outline the key trends in defence expenditure both globally and for key states as well as examining current trends in the defence export market and the way the market itself is changing. We use the term 'defence trade' throughout this chapter when discussing the export market to indicate that the contemporary market involves much more than the supply of arms.

Explaining the arms dynamic

This section will examine the various attempts to conceptualize the factors that drive actors to acquire weapons and defence technology.

Perhaps the first point to note is that academic analyses of the motivations underpinning the acquisition of arms more commonly refer to the arms dynamic which can be understood as 'the entire set of pressures that make actors (usually states) both acquire armed forces and change the quantity and quality of the armed forces they already possess' (Buzan and Herring 1998: 790). The arms dynamic can be distinguished in two important ways. First, one can make a distinction between arms dynamics that have different levels of intensity e.g. build-down, maintenance, competition/build-up and arms racing (ibid: 75–81). Second, one can also distinguish between the notion of a primary arms dynamic, which describes the set of pressures to acquire armed forces that are experienced by major arms producers and a secondary arms dynamic, which describes the set of pressures experienced by part-producers or non-producers who are far more reliant on defence imports and who may therefore be open to a different mix of pressures.

There have been various attempts to theorize the processes that drive the arms dynamic but they are commonly differentiated according to whether they emphasize either action-reaction factors, domestic factors or what is termed the technological imperative. We also discuss the symbolic meaning attached to weapons as a factor influencing the acquisition of defence equipment. These are not necessarily mutually exclusive models, however. Indeed, most commentators on the arms dynamic would probably take the view that for most, if not all societies with significant military forces, some combination of these models is likely to be in operation. Rather, the key question concerns the extent to which one or the other factor predominates.

Action-reaction

The action-reaction model assumes that actors increase either the quantity or quality of their military forces in response to increases on the part of potential adversaries. The pressure for states to act in this way is rooted in the conditions of the security dilemma, under which any attempt by states to provide for their own defence are, regardless of intent, viewed by others as potentially threatening (Herz 1950; Snyder 1984; Wheeler and Booth 1992). Not least, because a self-help international system creates pressures for states to make worst-case analyses of the actions of others.

The action-reaction model is at the heart of the notion that particularly intense rivalries can give rise to arms races. However, there remain significant debates both about exactly what characteristics distinguish arms races from the regular operation of the arms dynamic (Hammond 1993), whether arms races make conflict more likely or less, and indeed, over whether the concept has any explanatory value at all (Gray 1986). Similarly, critics point to a number of key problems in the action-reaction model. These include questions over the timing of reaction and whether the concept needs to (and can) incorporate anticipatory reactions based on assumptions about what potential enemies might do in the future. These issues are particularly salient given the long lead times involved in the development of major weapons systems, which means that by the time a weapon actually rolls off the production line the threat it was originally designed to respond to may well have changed or disappeared altogether—the example of the Typhoon noted in Case Study 17.1 being a case in point. Other issues concern the scale of the activity required before one can identify a reaction, the form in which a reaction occurs (quantitative, qualitative, like for like, like for unlike) and the extent to which broader factors such as strategic culture and economic constraints limiting the ability of governments to react need to be taken into account, or whether doing so essentially undermines the model itself.

Moreover, specific studies of the weapons acquisition process tend to highlight the fact that strategic necessity may often be of marginal significance in the decision to procure specific weapons. For instance, Farrell has contrasted the concern over micro-wastage in US weapons procurement (e.g. political controversies over the excessive cost of basic equipment such as hammers or toilet seats) with the macro-wastage that arises from spending on billion dollar weapons systems that are not actually needed (Farrell 1997).

Domestic factor explanations

In these explanations emphasis is placed on the idea of a domestic arms dynamic that, to varying degrees, is self-generating and not strongly linked to the external actions of other states. Domestic factor explanations can be broadly sub-divided into four types: bureaucratic/organizational explanations, political explanations, economic explanations and Military-Industrial Complex perspectives. Bureaucratic or organizational explanations emphasize the idea that defence procurement decisions can be understood either as the outcome of bureaucratic politics—bargaining between different sets of policy actors—or as a reflection of particular organizational cultures such as the traditions and military doctrines of the armed services (Allison 1971; Farrell 1996, 1997).

Political explanations focus on the role that domestic political considerations may play in both defence budgeting and weapons acquisition. These can include a concern with the way public opinion influences defence spending (Hartley and Russet 1992) or alternatively with the way in which politicians may use increases in defence spending to garner political support (Nincic 1982: 32–3; Mayer 1991: 203–7). A common feature of political explanations focused on the US emphasizes the way in which electoral funding from defence contractors has the potential to shape the attitudes of legislators towards budgeting and procurement decisions and/or the way electoral considerations lead members of Congress to promote weapons and defence contracts that will benefit their constituents irrespective of their merit (Stiles 1995: 74–6). This latter phenomenon is known as 'pork barrel' politics, although there is evidence to suggest the phenomenon may be more apparent than real (Mayer 1991; Lindsay 1991).

Economic explanations can take a number of forms. First, some analyses emphasize the way in which increases in defence spending are sometimes used by governments to provide a boost to the economy in times of economic downturn or to protect jobs in particular regions or industrial sectors (Cooper 1997: 9–12). Second, it is argued

that the need to maintain a viable defence industrial base can create a 'follow-on imperative' under which governments place orders simply to keep companies and skilled workers in being rather than as a function of any immediate military necessity. At its worst, according to Kaldor (1982), the follow-on imperative can combine with the innate conservatism of the military to produce successive incremental changes to existing major defence systems that result in 'baroque weapons'. Such weapons are hugely expensive, overly sophisticated to the point that their effectiveness in combat is debatable, frequently break down and are ill-suited to the real military needs of the armed forces. Third, Marxist analyses have argued that military expenditure and war production is intimately linked to the needs and nature of capitalism, either because it is necessary for the maintenance of capitalism as an economic system, because it produces specifically capitalist forms of weaponry, or because it is linked to capitalist imperialism (Baran and Sweezy 1966; Shaw 1984; Stavrianakis 2005).

Elements of the various domestic factor explanations: bureaucratic, political, economic, have often been combined in approaches that explain arms acquisition as a function of the Military Industrial Complex. Although the term was coined by President Eisenhower in his 1961 farewell speech, some of the key ideas underpinning the term had already been elaborated by C. Wright Mills in his book *The Power Elite*. For Mills there was a coincidence of interest that existed between economic, political and military actors which had led to the creation of a permanent war economy in the US and 'a nation whose elite and whose underlying population have accepted what can only be called a military definition of reality' (1956: 198). The notion of a military industrial complex or iron triangle (Adams 1982) was particularly popular in accounts of US arms policy in the 1960s, 1970s and early 1980s. However, whilst there is a significant body of work that utilizes the term with respect to both the US (Melman 1970; Lens 1970; Stiles 1995) and other states (Andersson 1992; Conca 1997) there is little consensus on what groups form part of the complex, how powerful it is in relation to other groups in society and how much cohesion it really has.

Nevertheless the concept has experienced something of a resurgence of late. For example, James Der Derian (2001) has produced a variant of it in his concept of a military-industrial-media-entertainment network whilst others have attempted to re-work it to take account of new mechanisms by which defence industrial interests are promoted. In the UK, for instance, Mayhew has highlighted the disproportionate influence of the defence industry on the numerous, and often unaccountable, task forces, policy review and advisory groups established by the Blair government to advise on aspects of defence policy (Mayhew 2005). Similarly, the influence of the defence industry in policy task forces established by the European Commission has been taken as evidence of an emerging EU Military-Industrial Complex (Slijper 2005). It is also worth noting that a series of transnational mergers and other linkages amongst defence companies has led to debates about the globalization of the defence industry (Bitzinger 2003). For some, this may presage an era of global private arsenals—relatively few defence-industrial giants possessing near monopoly control over 'world weapons' sourced from a variety of countries (Markusen 1999).

Technological imperative (TI) explanations

TI explanations can take a number of forms. One approach places particular emphasis on the way the predominance of military research and development activity—both at the domestic and the global level—creates an autonomous push for the continued development of weapons technology that is distinct from broader action-reaction and domestic factor processes (Thee 1986). This also raises questions about the extent to which military research distorts the direction of the civilian economy (Buzan and Sen 1990). Other studies, however, are more sceptical about the extent to which technology or the influence of technologists is an independent force in the arms dynamic highlighting the way social forces, military culture, the direction of resources and strategic goals have a significant influence in determining what technologies are taken up and in what ways (Mackenzie 1990).

A second and more contemporary way of understanding the idea of a technological imperative is to view military modernization as a process that is both fuelled and shaped by an underlying process of permanent technological change in the civil sector. This has become a particularly popular conception given the way in which civil advances in electronics, computing and IT are feeding into contemporary military technology producing what some see as a revolution in military affairs (RMA) (see below). Whereas during the Cold War it was common to talk of 'spin offs' from military technology to the civil sector, it is now more usual to see 'spin ons' from civil technologies to the military sector.

It is also argued that the spread of specific Western military technologies (e.g. the weapons system) underpinned by military aid, commercial sales and military training programmes provided to allies has produced a global military culture which has established the possession of capital-intensive high-tech weapons supported by professional armies as the norm. Not only does this underpin broader relations of dependency between developed world suppliers and developing world recipients but it results in the acquisition of weapons that are inordinately expensive and which may actually be unsuitable for recipients (Wendt and Barnett 1993).

To the extent that states then attempt to establish the domestic production of defence goods in this context, it is also possible to describe a global military order or hierarchy of states (Krause 1992; Held et al 1999: 87–148) of the sort that we outline below, where different states have attained different levels of production capability but where all are geared around essentially the same models (if not sophistication) of technology.

A related aspect of this debate is the idea that the current model of defence technology based around high-tech weapons systems and perpetual advances in capability produces inexorable real terms rises in weapons costs. For some this is producing a form of military Malthusianism—in which there is a growing mismatch between the cost of weapons and the ability of national defence budgets to afford them. In this view, states are thus likely to be faced with either purchasing fewer weapons, cheaper versions of existing models or opting out of the current global military culture (Scheetz 2004).

The symbolic meaning of weapons

The notion of a global military culture also highlights the way in which motivations for the acquisition of defence technology may have less to do with objective threats and the military application of technology and more to do with the meanings attached to such technology. Indeed, given the limits on most national defence budgets and the high cost of modern weaponry it can be argued that, for most states in the international system, the conventional idea that arms, and even armed forces, are acquired to enable actors to fight independent wars is far from the reality. Thus, weapons and armed forces may more often be acquired for reasons of national prestige, as symbols of statehood, as both agents and symbols of modernization, as vehicles to cement alliances, or simply to act as trip-wires that signal a state of emergency to which others may be expected to respond.

Postmodernists take such ideas even further, arguing that the practice of foreign policy is not about responding to objective threats but about manufacturing an 'other' against which an imagined political identity can be forged. In this context, the acquisition of armies and arms are both an outcome of this manufacturing of the other and part of a series of performative acts by which borders, identities and difference are inscribed (Campbell 1998a).

Similarly, the decision to provide or prohibit the supply of weapons may be a function of the specific meaning attached to them. Thus, from this perspective what is interesting about the ban on the production and trade in landmines is not so much the

arguments about how odious they may or may not be as weapons but how, within a few short years, a particular meaning came to be attached to them as odious weapons where no such meaning had previously existed. Similarly, Mutimer has highlighted how the language used to describe the transfer of conventional weapons ('defence trade', 'arms trade' etc.) invokes a commercial metaphor that is implicitly legitimizing even when it is deployed by critics decrying the activities of the 'merchants of death' (Mutimer 2000).

KEY POINTS

- The notion of an 'arms dynamic' refers to the set of pressures that make actors acquire armed forces and adjust their quantity and quality.
- Action-reaction explanations of the arms dynamic explain arms acquisition as a response to the external actions of potential adversaries.
- Domestic factor explanations emphasize the idea that the arms dynamic is primarily self-generating and is a function of bureaucratic, economic or domestic political factors.
- Technological imperative explanations understand the arms dynamic either as a function of the disproportionate influence of military R&D (Research and Development) or as fuelled by perpetual modernization in the civil sector.
- Symbolic explanations suggest that both the acquisition and prohibition of defence technology may be more a function of the meanings invested in weapons rather than strategic necessity or any inherent qualities they may have.

Trends in defence expenditure

In the next section of the chapter we first highlight key differences between the high-technology defence trade and that in low-technology equipment. We then outline the trends in defence expenditure, highlighting some of the major players and other states who illustrate key trends.

Within the defence market there is a clear distinction between the high-technology defence trade and the low-technology defence trade. The distinction is in terms of the suppliers, the recipients, the money involved, the attention paid to the deals and the degree to which the trade is seen as political.

Somewhat counter-intuitively the high-tech defence trade is increasingly depoliticized and seen primarily in terms of economics, whereas the supply of second-hand and low-tech weapons is often highly politicized as these are the weapons that are being used in conflicts. This disparity is highlighted by the two examples of defence sales outlined in Case Studies 17.1 and 17.2.

One thing that both of the deals show, however, is that there is over-supply in the defence trade and this means that at the low-tech end weapons are cheap and plentiful and at the high-tech end, competition to make sales is intense. This leads analysts to characterize the market as a buyer's market.

Defence expenditure includes not only weapons and equipment but wages, training, pensions, etc. Defence expenditure on equipment can either be through domestic procurement (i.e. buying from a defence firm in your state) or international purchase.

The high-point in global defence expenditures came in the mid-1980s during the Cold War, when significant percentages of gross domestic product (GDP) were channelled into defence spending.

CASE STUDY 17.1

A high-technology sale

Some of the key aspects of the high-tech defence trade can be illustrated by examining one big defence sale: the December 2005 announcement by BAE Systems and the British Government of a deal to supply Saudi Arabia with the Eurofighter *Typhoon*. From this we can see that:

- Defence sales are now primarily discussed in terms of economic and employment issues. There has been no discussion of the impact of the sale on the military balance in the region, nor of the threat that these aircraft will guard against. This may be because the *Typhoon* is seen by some critics as unsuited to Saudi Arabia's defence needs.
- So keen were the British to secure the deal that they have pledged that the first 24 aircraft will be drawn from the British Royal Air Force's production run of 89 Tranche 2 fighters. Thus, the Royal Saudi Air Force will get some of the fighters before the British do (Hoyle 2005).
- The deal has been valued at anything between £8 and £20 billion, depending on how many aircraft and what equipment the Saudis acquire (Hope 2005). It has also been touted as securing 14,000 British jobs for the next ten years and will secure defence industry jobs throughout Europe.
- Upon news of the deal BAE Systems shares increased 6% in value (Smith 2005).
- Rather than paying for the aircraft in cash, following past precedents, the Saudi government is expected to pay in a mix of cash and oil.
- In order to secure the deal both Prime Minister Blair and Defence Minister Reid visited Saudi Arabia and agreed a crucial memorandum of understanding promising to 'establish a greater partnership in modernising the Saudi Arabian Armed Forces and developing close service-to-service contacts especially through joint training and exercises' (cited in *Guardian* 2005). Thus the British government's commitment was crucial to making the deal.
- Although this has been touted as a British deal, in actual fact the *Typhoon* is made by a consortium of BAE Systems, the European aerospace group EADS and Italian Alenia Aerospazio.
- BAE Systems will also be involved in a number of **offset** deals, whereby the cost of the purchase is offset by investment in the Saudi economy. Saudi Arabia routinely asks for 30% offsets into commercially viable businesses on all defence sales. This deal includes defence technology transfers and establishing defence facilities in the country (Hoyle 2005). Past offset deals between BAE Systems' predecessor British Aerospace and the Saudi Arabian government included education and training, joint ventures such as that to establish the pharmaceutical firm Glaxo Saudi Arabia (*Gulf Industry Magazine* 2004), and one to produce polymers for the paint and adhesives market, establishing a sugar refinery, a propylene manufacturing plant, an aluminium smelter, and a project to convert petroleum gas into benzene and xylene (British Offset). All of these initiatives are designed to diversify the Saudi economy but the track record is of significant underperformance.

Things have changed somewhat over time as Table 17.1 below shows. The main trends that can be discerned here are as follows.

The United States is back at the peak military expenditure levels of the Cold War as it prosecutes the Global War on Terror (GWOT) and faces regional challenges. It is predicted that in 2006 US military spending will surpass that of the rest of the world combined (Anderson 2005). US involvement in Afghanistan and Iraq is increasingly costly and has led to defence cuts in other areas (for example, the National Defense University in Washington DC has experienced an across-the-board cut of 20%) and a diversion of funds to the

CASE STUDY 17.2

A low-technology sale

In 1994 war was raging in the former Yugoslavia and the position of the Muslim-led government of Bosnia-Herzegovina looked particularly dire. The United Nations had imposed an arms embargo on the region in the hope of stopping the fighting but it had the counter-productive effect of giving an advantage to Serb forces that had access to the defence industries of the former Yugoslavia.

There was some pressure from the US Congress to lift the embargo, but British Foreign Secretary Douglas Hurd said he did not want to 'level the killing field' (Sims 2001) and the US government was concerned about the precedent that unilaterally breaching the embargo would have on their attempts to keep United Nations' sanctions on Iraq. President Clinton therefore publicly declined to act.

However, the Croatian government (which had recently made peace with Bosnia) secretly approached the Clinton Administration and asked if the US would object if it created an arms pipeline to Bosnia (*Newshour* 1996). The Clinton Administration replied that they neither approved nor objected to what they were doing; tacitly giving Croatia the go-ahead.

- The weapons came from Iran—via Turkey and Croatia—to Bosnia and involved cooperation from sub-state Islamist groups such as the Afghan Mojahedin and pro-Iran Hizbullah (Wiebes 2003).
- The weapons were small arms, anti-tank weapons, surface-to-surface missiles, and mortars. Many tons of the weapons were transferred at relatively low cost, as the weapons were cheap and particularly plentiful since the end of the Cold War had resulted in many states putting their arsenals on the market.
- Part of the reason for the large shipments was that Croatia imposed a high 'transit tax' on all the weapons, creaming off between 20 and 50% of every shipment (Aldrich 2002).
- The deal was financed by Saudi Arabia.
- The weapons deals were seen as providing a political entrée into Bosnia for Iran. Subsequently the Clinton Administration was heavily criticized by its Republican opponents for tacitly approving the deal as it allowed Islamists to establish a foothold in Bosnia where they trained and fought beside the Bosnian Muslims (Cox 1996).
- Whilst the US was involved in arming the Bosnians, Ukraine, Greece and Israel were arming the Bosnian Serbs.

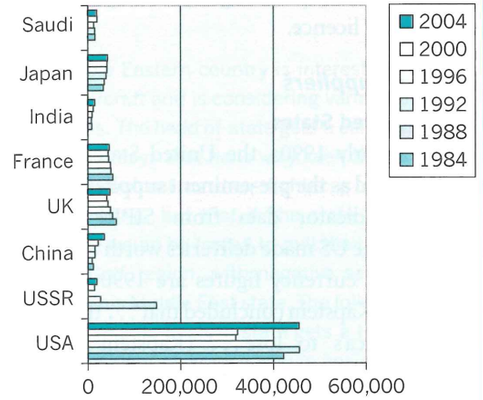
This then was a highly political arms transfer, with minimal economic significance, but which was justified on the grounds that it helped ensure the survival of the Bosnian Government and led the way to the Dayton Peace Accord of 1995.

two conflicts. The Congressional Research Service has calculated that for Fiscal Years 2001 to 2006 Defense Department funding for Iraq and Afghanistan amounts to at least $318.6 billion (Belasco 2005: 2). There is also an expectation that the President will ask Congress for extra money for the two conflicts in 2006.

The USSR/Russia has seen a significant decline in defence expenditure. With the end of the Cold War and domestic economic and social needs more pressing, defence expenditures were dramatically decreased, at great cost to the traditionally cosseted defence industrial complex. There were unsuccessful attempts at defence 'conversion' (Zisk 1997). Subsequently Russia has been trying to raise more money to spend on national defence by selling more weapons abroad. They have run into stiff competition from former Soviet States such as Ukraine and Belarus, who retained sections of the USSR's military industrial complex and have sold the weapons they produce at rock-bottom prices.

China's military expenditures might be understated in Table 17.1 for a number of reasons. The first is the current under-valuation of the Chinese currency, the renminbi. Second is that the cost of living is cheap in China (though rising) so pensions, wages, etc. are relatively low. Third is that the People's Liberation Army is a major entrepreneur within the economy and earns money that goes into defence spending as well as being engaged in arms production that is not covered in national defence expenditure statistics. Despite the clear disparity between Chinese and US defence spending levels, the US Department of Defense has recently raised the alarm over China's military progress. Defense Secretary Rumsfeld declared that China now has the world's third-largest military budget, behind the United States and Russia (CNN 2005).

Table 17.1 Military expenditures for selected countries 1984–2004



2003 US$ millions adjusted for inflation using CPI.

Created from military expenditure data from Stockholm International Peace Research Institute (SIPRI) http://www.sipri.org/contents/milap/

Britain and France still invest major resources in their militaries. Despite significant pressure to shift spending into social programmes, both regard themselves as significant military players and have sought efficiency savings and economies of scale through joint purchases rather than contemplating large cuts in defence spending. British defence spending has been rising due to operations such as Sierra Leone, Afghanistan (where it assumed control of the ISAF (International Security Assistance Force) in 2006) and Iraq. There is increasing discussion of British military 'overstretch', primarily in terms of personnel.

A panel reported to the French Defence Minister in 2005 that all European Union spending on military hardware is equal to a third of the US's equipment budget, while research and development spending across the whole EU is around one fifth of US expenditure, suggesting an ever-widening technology gap between the US and Europe with implications for alliance operations and the future of European defence sales (Anderson 2005a).

Japan has surprisingly significant and steady levels of defence spending, despite a constitution that limits her military forces to a self-defence role. Japan's military spending did not diminish with the end of the Cold War in large part because her major concern is China, whose spending has been creeping up.

India's military expenditure has risen since the end of the Cold War when she lost the support of her traditional ally USSR/Russia (including subsidized defence sales) and had to prepare to protect herself alone. India perceives major (conventional and nuclear) threats from China and Pakistan and is fighting an insurgency against Pakistani-supported militants in Kashmir.

Saudi Arabia is an apparent conundrum as it has relatively high levels of military expenditure but to date does not have a well-regarded defence capability. The answer to this riddle is that Saudi Arabia uses its military expenditure to buy allies and mutual defence agreements; it needs a less able force of its own if it knows that the US, France and Britain (its major defence suppliers) will come to its aid if it is threatened.

A number of the countries we have considered here are also significant arms producers and exporters. Every unit that they sell abroad gives them a lower unit price on military equipment that they buy from their defence industries. This makes competition for all sales significant and for big defence contracts very intense. Indeed, the variety of subsidies, offset and financing deals now offered by exporters to secure deals has led critics to suggest that, despite the huge sums involved,

the economic benefits of defence sales to the economies of major exporters may actually be negligible or even non-existent (Ingram and Davis 2001; Hartung 1998).

Suppliers and recipients in the defence market

In order to categorize suppliers we use the notion of 'tiers' in the defence trade taken from the work of Keith Krause (Krause 1992). The first tier is composed of suppliers who are at the highest levels of technological sophistication across the entire range of defence production. At the second tier of the trade, suppliers have some research and development capabilities and exhibit some areas of technological sophistication, but the majority of their defence products are below the cutting edge. At the third tier of the trade, supplier states show little technological sophistication and often do not progress much beyond slightly modifying products made under licence.

First-tier suppliers

(A) The United States

Since the early 1990s, the United States has stood unchallenged as the pre-eminent supplier. According to trend-indicator data from SIPRI shown in Table 17.2 the US made deliveries worth $12.8 billion in 1989 (all currency figures are 1990 dollars). In 1997 Ethan Kapstein concluded that '. . . the market is now America's to lose . . .' (Kapstein 1997: 77). Although delivery levels rose in the years 1991–1999 (Table 17.3), there has been a significant drop in weapons exports (globally and for the US) since 2000.

One factor in US primacy is that the battlefield performance of US weaponry in conflicts in the Persian Gulf in 1991 and 2003 and Afghanistan in 2001–02 increased the desire of many states to obtain US high-technology weaponry—in particular because US weapons performed so much better than the Russian equipment used by their opponents.

It has been pointed out (bitterly, by other would-be suppliers) that there is no 'level playing field' for defence industries, as the geo-strategic position and interests of the US significantly advantages

Figure 17.1 Major exporters 2001

Table 17.2 Selected weapons exporters 1989

Country	Exports $ value
USSR	13,902
USA	12,832
France	3,259
UK	1,932
F R Germany	930
Israel	272

(All figures in 1990 $ millions)

Table 17.3 Selected weapons exporters 2001

Country	Export $ value
Russia	5,516
USA	5,079
France	1,111
UK	1,081
Germany	529
Israel	226

(All figures in 1990 $ millions)

American firms. This is illustrated by a joke, which was told to us by a representative of a European defence firm:

> "A Middle Eastern country is interested in acquiring fighter aircraft and is considering various bids from defence firms. The head of state gets a call from the US President who says that he is very keen that a US firm secures the contract as their fighter is obviously the best in the world, but that if the state failed to buy American, he would be forced to pull the US Sixth Fleet out of the Gulf region, with negative security consequences for this Middle East state. The following day the head of the Middle Eastern state gets a telephone call from the President of France who is anxious to ensure that the French fighter wins the competition. He tells the head of state that the French plane is obviously the best on the market, but that if the state failed to buy it, he would be forced to withdraw the French soccer team from the region . . . "
>
> (Transparency International 2001)

Although a joke, this is quite telling as to the balance of power between the US and other suppliers. Nevertheless, representatives of American defence firms have made it clear that *they* feel disadvantaged in the defence market by the close ties that some European states have with their ex-colonies.

Although Table 17.3 suggests Russia is managing to maintain parity with the US in the defence export market, the reality is really one of US primacy. All other supplier states are essentially engaged in a Darwinian struggle to maintain their shares of the contracted defence market. Rather than trying to move up to the next technology tier, suppliers are fighting to avoid sinking into the tiers below.

(B) Russia

In the immediate aftermath of the Cold War, Russian defence deliveries dropped precipitously, from $12.2 billion in 1989 to $763 million in 1994. Although recovering, Russian defence transfers remain nowhere near Cold War levels. The more recent improvement in trade levels is due to a combination of bargain prices and a willingness to transfer technologies and even production facilities. Russia has also shown increasing creativity in the ways that it finances deals; e.g., using defence transfers to pay off the massive debts of the Soviet regime.

John Dowdy has noted that Russian technologies lag behind those of the West as a consequence of the old business practices retained from the Soviet era (Dowdy 1997: 93). Russia is currently trading on its heritage as a superpower first-tier supplier and is not making the necessary investments in research and development. Whether it will be able to maintain a foothold in the first-tier for much longer is, therefore, in severe doubt.

Second-tier suppliers

(A) West European states

West European supplier states have traditionally occupied the second tier of the trade, exhibiting some areas of technological primacy, but not across the board (Krause 1992: 127–52). As second-tier suppliers, they have increasingly seen their positions in the market threatened both by the US—which has been sweeping into new areas of the market (such as Eastern Europe) with high-technology weaponry—and by third-tier suppliers willing to provide plentiful amounts of more basic weaponry at bargain prices. This trend is clear from the data in Tables 17.2 and 17.3 showing French, German and British defence deliveries in decline in the years 1989–2001.

Although losing ground to the US in high-technology sales, one of the ways in which European suppliers have shored up defence sales levels has been through clever financing and offset deals. The European share of the defence trade has been shored up to an extent because some recipient states fear over-dependence on the US, and have therefore continued to make purchases from these second-tier suppliers, for example, the United Arab Emirates (UAE).

One of the strategies increasingly being exploited by European supplier states is to work on creating market 'niches', in such areas as air-to-surface missiles, frigates and corvettes.

Third-tier suppliers

Third-tier suppliers are those with limited innovative capacity. They primarily copy and reproduce existing technologies, and often aim to develop their own defence industries, intending to enhance their status as regional military powers, with a secondary interest in becoming suppliers (often for economic reasons). Most of the states in the third tier have been unable to move beyond fairly basic weapons production (Krause: 158–81). They have been badly affected by the post-Gulf War 'flight to quality', that is, to Western technologies.

(A) Israel

From its inception the Israeli state has sought to build up a defence industrial base (DIB). By the 1980s Israel had earned a reputation as a serious competitor in the international defence market (Kleinman 1985: ix). Over the last decade of fiscal austerity, Israel has moved towards using its comparative advantage in key areas to become a 'niche supplier', specializing in upgrading aircraft, systems integration and UAV (Unmanned Aerial Vehicle) technology. It is a major player in the latter sector and has been at the forefront of their development, although this is an increasingly competitive sector of the market.

Israel has benefited from the end of the Cold War and the US-sponsored peace process, both of which opened up new markets for her (Bruce 1994; Reuters 1999). Nonetheless, the 1989–2001 period witnessed fluctuating weapons sales, and Israel's weapons export earnings have not significantly improved, as the data in Tables 17.2 and 17.3 indicate.

(B) South Korea

Seoul has ambitions to a 'full service' defence industry, fed by 'spin-ons' (as opposed to 'spin-offs') from civilian industries (Seok-jae 1995). Overall, the aim is to reduce South Korean military industrial dependence on allies. With American help, South Korea's defence industrial base seemed to be flourishing by the early 1990s. However, although it has proved adept at assembling platform technologies and producing goods under licence, it has not been successful in the sphere of development.

The Asian economic crisis of the late 1990s had a profound effect on defence production in South Korea, with the privately owned *chaebols* experiencing severe economic problems that made them unable to continue to subsidize (thus far uneconomic) indigenous defence production.

Given the primacy of developing a DIB over being a defence trade exporter in South Korean planning, Seoul's supplier role in the defence market is unlikely to significantly expand as its energies will be increasingly directed inwards.

(C) China

Although only a third-tier player in terms of technological advancement, China is nevertheless the only remaining developing world 'full-service' supplier, offering major land, sea and air systems to recipients (Bitzinger 1992: 84). According to Arthur Ding, China has a couple of 'pockets of excellence' in indigenous production, particularly surface-to-surface missiles and sea-based anti-warship cruise missiles (Ding 2000: 62).

China has technologies that are desired by those states at even lower levels of technological sophistication. For example, Pakistan and China have organized a joint venture to produce the *Al-Khalid* tank, with Pakistan expected to produce up to 50% of the main battle tank in the initial stages (Farooq 1999: 15). This is illustrative of the ways in which a third-tier supplier can institute relationships that may affect balances of power in a conflict zone.

(D) Eastern Europe

The position of many of the East European supplier states is precarious, as many of them manufacture out-of-date Soviet-derived technologies. This brings them into competition with the states of the FSU (including Russia) and other licensed producers such as India and China. Competition is stiff and the East European states have been losing ground.

Despite having benefited from offset agreements, questions remain whether these states will be able to maintain a position in the competitive defence market of the twenty-first century. The manipulation of direct offsets to help modernize their defence industries will keep them in the market for longer, although possibly more as components manufacturers than suppliers of finished weapons systems.

Table 17.4 South American weapons exporters

Country	1989	2002
Brazil	218	31
Chile	—	2

(All figures in 1990 $ millions)

(E) Latin America

As Table 17.4 shows, third-tier suppliers such as Chile and Brazil are struggling to maintain their market shares. Some firms in the third tier are seeking creative ways to re-orient their defence industries. For example, Brazil's Embraer nearly went bankrupt in 1994 when the firm was under the control of the Brazilian Air Force. However, since its privatization in 1994 and its reorientation towards the civilian market, it has recovered to become the fourth-largest civil aircraft manufacturer and Brazil's largest exporter (Barham and Owen 1999).

Chile's defence industry has always pursued a market orientation, with the industry built around private firms associated with branches of the armed forces. One of the methods employed by Chile has been to align with other third-tier suppliers. In the 1990s it formed defence industrial partnerships with China, Malaysia, Paraguay, South Korea, Brazil and improved its relationship with Russia.

All third-tier suppliers in the twenty-first century market are clearly fighting for survival. Most third-tier suppliers are receiving technical assistance via offset agreements and technology transfers from second-tier suppliers eager to maintain their role in the market, even at the cost of their long-term positions. For their part, several third-tier suppliers have begun trading with states that have less advanced DIBs. However, this strategy is unlikely to work for much longer and one can predict further market exits from the third tier.

Market entrants

Despite the obvious competition, a number of states are trying to enter the defence market at present. Motives for this vary, but can include a sense of threat driving the development of an indigenous defence industrial base, the desire to profit from the one functioning manufacturing sector bequeathed to them, or a desire to assert sovereignty and gain prestige through defence independence (Pengelly 1997: 19–21; McCarthy 2000: 16). We consider two suppliers who had an established DIB from the Cold War period, and after an initial downturn are now beginning to have an impact on the market: Ukraine and Croatia.

(A) Ukraine

States such as Ukraine, Belarus and Kazakhstan are attempting to capitalize on the ex-Soviet defence industries within their territories (Vasilevitch and Belosludtsev 2001: 8–20). This means that they are directly competing with Russia, and undercutting Moscow by offering newly manufactured Soviet-era weaponry at bargain prices (*Arms Trade News* 1997: 3). Areas of the market where Ukraine has potential advantage are ballistic missile technologies, space technologies and launch services.

(B) Croatia

Croatia is attempting to carve out for itself a number of niches in the international defence trade, specifically on two fronts:

> "One consists of highly specialized, 'exotic' weapons, such as those usually associated with the special forces, while the other revolves around 'hybrid' weapons systems. These systems combine different technologies, along the East-West axis, which have been indigenously assimilated, modified, applied and eventually upgraded"
>
> (Simunovic 1998: 140–1)

The experience of war allows the Croatians to market their weaponry as 'battle tested', seen as a distinct advantage in an overcrowded market. To

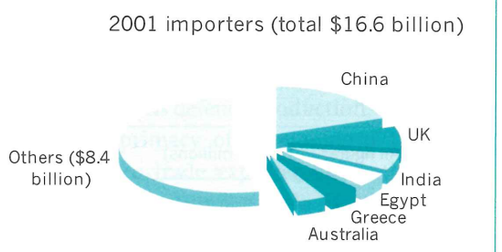
date, Croatia's impact on the defence trade has been limited, with only one significant delivery year, 2000. Nevertheless, its marketing efforts are having a psychological impact, which Croatia hopes will be turned into future sales.

Another class of emerging players should also be briefly considered: non-state suppliers. The end of the Cold War and the subsequent release of vast amounts of second-hand, relatively low-technology weapons into the market place has provided much greater opportunities for brokers and middle-men than existed before. Moreover, increasingly independent defence firms and enterprises (particularly those struggling to survive) are sometimes willing to deal not only with state recipients, but with brokers. They are actors that cannot be ignored in any serious analysis of the operation of the defence trade in the twenty-first century (Wood and Peleman 1999). Markusen has drawn attention to the potential change in the balance of power in state–firm relations:

> "... the dramatic decline in the number of major weapons manufacturers and their increasing international orientation will shift the balance of power in the arms market away from governments and towards business"
>
> (Markusen 1999: 47)

The black arms trade, controlled mainly by crime syndicates and arms dealers, is composed of sales that are clearly illegal, either because of the type of transfer involved, the source of supply or the recipient, or because the transaction breaks an international embargo (Guy 1989). The imposition of an arms embargo is a sales opportunity for an entrepreneurial supplier state or broker. Karp argues that black markets primarily serve crime syndicates and drugs cartels because insurgent groups cannot afford black market prices. Hence, the market is best suited to providing select high-value items (Karp 1994: 175–89).

Figure 17.2 Major recipients 2001



To briefly consider recipients, there have been important structural changes that are affecting the demand for major weapons, with old Cold War protagonists for the most part significantly scaling back high-technology procurement (exceptions being areas of lingering tension such as the Korean Peninsula). The reality is that there are fewer major recipients in the market than there are suppliers. In this buyer's market recipients are able to play suppliers off against each other to extract the best possible deals.

The most important regional defence markets are East Asia and the Middle East. The rise in importance of non-state recipients should also be considered. Sales opportunities previously thought too risky because of the legal and ethical difficulties involved are now being considered and even actively pursued by some suppliers. Moreover, the use of middle-men and brokers has allowed some states to benefit from making transfers to non-state actors such as terrorist groups, without having to pay any direct political price.

KEY POINTS

- There is a distinction between the high-technology defence trade and the low-technology defence trade with the former increasingly depoliticized and the latter often highly politicized.
- The US has returned to the military expenditure levels of the Cold War with defence expenditure in 2006 predicted to exceed that of the rest of the world combined.
- A useful way of categorizing producers in the defence trade is by reference to their position in the various 'tiers' of the market. The first tier consists of suppliers who produce an extensive range of defence equipment to a high level of technological sophistication. The second tier consists of suppliers that retain significant capacity for independent production and possess some areas of technological sophistication. The third tier of suppliers are those that generally possess more limited capacity for independent production, whose products exhibit little technological sophistication and who may specialize in the provision of goods or services for particular niches of the defence market.
- The end of the Cold War and the release of large amounts of second-hand weaponry has provided a market opportunity for a variety of non-state actors to act as suppliers, particularly to customers in the black market.

The content of the contemporary defence trade

The twenty-first century is witnessing changes in the substance of the defence trade with moves away from the supply of complete major weapons platforms (aircraft, ships, etc.). For example, in 1998 the premier defence supplier, the US, transferred 180 aircraft around the world. By 2004 the number was down to 51. The trade is moving towards the purchase of upgrades, dual-use technologies, communications equipment and spare parts. Indeed, a lot of what counts as the high-tech defence trade does not look anything like a weapon—hence our abandonment of the term 'arms trade'. Amongst the key trends in the trade are the following.

Modernization of platforms and upgrades: in an era of constrained procurement budgets, the emphasis is on various forms of force multipliers to be incorporated into existing platforms (e.g. new engines, weapons pods), as opposed to new purchases. Indigenous modernization is also occurring, as recipient states apply their ingenuity to improving weapons they bought. Upgrades offer the opportunity to hybridize weapons systems: marrying western technologies to eastern platforms—or vice versa. For example, Israeli and Russian cooperation to upgrade MiG fighters offers the opportunity to install advanced Western avionics (some of which were developed for the Lavi fighter) into the solid platforms of the Soviet era (Sher 1995: 40).

Retro-fitting: the increasing trade in upgrades involves the retro-fitting of sophisticated new technologies to existing systems. The move to modular weapons systems mean that retro-fitting and upgrading are increasingly practised and can extend the life of a basic platform significantly. In terms of threat assessment it means that you can no longer look at a particular weapons platform and know what its capabilities are.

Re-transfers: there is an increasing trade in re-transfers (second-hand sales). Weapons and weapons platforms that are surplus to requirements are sold on rather than stored or scrapped (Tusa 1994, *Flight International* 1994). They are a challenge to new sales as they tend to be cut-price and are often fairly sophisticated technologies.

Dual use technologies: a major trend in the international market is towards the supply of technologies, whose spread is more difficult to control. Part of this greater trade is accounted for in dual use technologies; those with both legitimate civil and military applications. For example, computers and software which can coordinate air traffic control can also coordinate battlefield operations or missile attacks. There is increased pressure within states to loosen the controls over dual-use exports—on the grounds that in the aftermath of the Cold War, the security risks attached to such sales are much lower.

The trade in dual-use goods brings into the market a whole stratum of new firms and (possibly) states. In addition to the deliberate marketing of goods as militarily useful, there is an increasing range of goods not marketed with military intent, but having latent military applicability. One of the more extreme examples of latent military applicability was the Sony PlayStation2. According to Japanese trade officials these video game consoles contain a graphics processing facility fast enough to help guide some types of missile towards their target (McCurry 2000).

Systems Integration: with the hybridization of weapons systems comes the birth of a new type of defence sale: systems integration to make the different systems work together. The work requires highly skilled personnel. Israel has made good inroads into this area of the market. Occasionally though, systems just do not combine well. For example, in 2006 the US Defense Department abandoned an attempt to procure a combined regional jet produced by Embraer SA of Brazil with a multi-intelligence sensor system from Lockheed Martin Corporation, designed to detect enemy signals and troop movements from 37,000 feet. Essentially the US Army wanted too much crammed into a small platform and the technical problems were too expensive to fix (Merle 2006: A8).

Training: Countries like India and Israel are marketing their ability to train fighter pilots—in India's case, in response to the perceived inadequacy of Russian support services. Israel trained fifteen Ugandan pilots to fly the three MiG-21 fighters the state acquired in 1998. Israel Aircraft Industries upgraded the fighters and the pilots spent a year in Tel Aviv undergoing training (*Xinuha*, 2000). Corporate giants such as SAIC, BDM, and its subsidiary Vinnell Corporation, are primarily high-technology suppliers but have diversified into military training. They are contracted by the Saudi Arabian government to upgrade and train its armed forces in the use of mainly US weaponry (Shearer 1999: 84).

People: the transfers of personnel are taken to higher levels in the Middle East, where several countries employ foreign military specialists not just to maintain and repair equipment, but to actually use it. For example, Saudi Arabia has for many years employed foreign nationals such as Pakistanis (on leave from their national armed forces) to fly their fighter planes. This enables the Pakistanis to maintain a large, well-trained reserve force without incurring massive costs (Lock 1998). For Saudi Arabia, this helps to fill a skills and employment gap.

Software and Software Source Codes: modern weapons increasingly rely on sophisticated software. Of fundamental importance are the software source codes. Simply put:

> "These codes provide a blueprint of how a specific system's software works and are at the heart of nearly all modern weaponry. The codes are the keys to understanding everything about a weapon, including its avionics, communications and guidance system. If an enemy gains access to such codes, they can clone the weapon, pinpoint its weak points and build counter-technology"
>
> (Defense News 1999: 56)

In some instances these valuable commodities are 'black boxed' by a supplier to ensure that although the systems work, the technology is protected and cannot be reverse-engineered. However, in a buyer's defence market, the would-be recipients often demand access to software source codes as the price for securing the deal.

Leasing: states do not always purchase weapons nowadays; there are also attractive leasing deals on offer. For example, in 2001 Hungary struck a deal to lease 14 *Gripen* fighters from the Swedish Air Force and in 2004 the Czech Republic struck a similar leasing deal (Air Force Technology 2006).

Revolution in Military Affairs (RMA): this is the term given to a basket of military technologies and approaches to warfare that has the potential to 'transform' the nature of military operations. The introduction of precision guided munitions and 'smart' weapons has resulted in conventional weapons achieving previously unimaginable levels of lethality and accuracy. There have also been improvements in materials, aircraft design and military avionics, which led to the emergence of a new generation of 'stealthy' aircraft and ships. The advantage—and the problem—of stealth is that it re-introduces the possibility of surprise attack. Equally important have been technological improvements in stand-off missiles; that is, missiles launched from weapons platforms miles outside the theatre of operation which are then guided to a distant target.

Developments on the non-weapons side of the equation include electronic warfare technologies, sensors, radars and night vision equipment. These technologies act as force multipliers through permitting the real-time relay of vital information to the battlefield and by allowing all-weather and night use of military hardware.

One interesting aspect of the RMA is the increased use of unmanned aircraft. These unmanned aerial vehicles (UAVs) were initially thought of in terms of reconnaissance missions, but are now being deployed in a variety of lethal missions, including US remote attacks on terrorists in Yemen, Afghanistan and elsewhere. The UAV has a number of advantages, including removing the danger of losing valuable pilots over hostile territory.

Taken together, these technological trends have the potential to revolutionize the battlefield. To date the only country able to reap the technological advantage has been the United States. The US technological edge—amply demonstrated by the Gulf Wars of 1991 and 2003—has, however, not proved so useful in the counterinsurgency campaigns in Iraq and Afghanistan, though there is increasing adaptation of some of these technologies for urban guerrilla warfare.

Small Arms and Light Weapons (SALW): a more instantly recognized form of defence trade is in SALW, where business has been facilitated by an abundance of supplies from excess post-Cold War stocks, lower transport costs as a consequence of globalization, sustained demand from a number of internal conflicts that have raged in the last fifteen years and the reality of porous borders. With respect to the latter for instance, one study has identified 21 known arms trafficking routes into Colombia from Venezuela, 26 from Ecuador, 37 from Panama and 14 from Brazil (Cragin and Hoffman 2003). One feature of the small arms trade that has come under particular scrutiny in the post-Cold War era is the way the trade in 'conflict goods' or 'conflict commodities' (e.g. diamonds, timber, coltan) from conflict zones have been used to fund the acquisition of arms by combatants (Le Billon 2005). Concern about this relationship has even led the UN to impose commodity embargoes on some actors such as UNITA in Angola (diamonds) and the regime of Charles Taylor in Liberia (diamonds and timber).

KEY POINTS

- The post-Cold War defence export market has been characterized by a move away from the supply of complete weapons systems to the provision of upgrades, dual-use technologies, communications equipment and spare parts.
- The term 'revolution in military affairs' is often used to describe the way in which simultaneous advances in a number of technologies are deemed to be radically transforming, or have the potential to transform, the way military operations are conducted.

Conclusion

Like all issues in international relations, the main focus of academic engagement with the defence trade has shifted in response to changes in the nature of global politics. Thus, in the Cold War, the concern was to investigate the ways in which defence expenditure, weapons acquisition and defence sales were either determined by superpower rivalry via the logic of action-reaction or, alternatively, how they determined superpower rivalry via the institutionalization of the military-industrial complex or the mechanisms of military aid. The end of the Cold War, however, saw a relative decline in the study of such factors and a turn to research on those aspects of the arms trade that seemed more germane to the political concerns of the day—at the higher end of the defence trade this has been reflected in a concern with the mechanisms of nuclear proliferation, whilst at the lower end of the trade, research and policy activity has focused on the role played by the trade in small arms in sustaining the 'new wars' of the post-Cold War. As we have already noted, this both reflected and reinforced the fact that the conventional trade in major weapons has become profoundly de-politicized.

Interestingly however, the war on terror and its various corollaries—e.g. the huge increase in US defence expenditure and (at least in some cases) a renewed emphasis on the politics as well as the economics of defence sales and military aid—appears to be producing something of a renewed concern with issues such as the relationship between an apparent threat (now understood as global terrorism) and defence spending, or with the existence, role and nature of a putative military-industrial (media-entertainment) complex. Nevertheless, this has yet to translate into solid academic work on these issues.

In addition some areas of study that were only beginning to emerge towards the end of the Cold War have become far more consolidated—in particular the challenge of fighting a stateless and globally networked enemy, combined with the opportunities presented by an apparent RMA has spurred academic and policy engagement with the idea of network-centric warfare and the implications this is having, and will have, for our way of doing war. These are interesting and important issues for a new generation of security analysts to explore.

QUESTIONS

Which model of the arms dynamic is more convincing and why?

Does the notion of a military-industrial complex still have relevance given the globalization of the defence industry and the growing emphasis on dual-use technologies?

To what extent does the symbolic meaning attached to defence technology determine both supply and demand in the defence trade?

'Arms embargoes simply create new market opportunities for illicit weapons dealers'. Discuss.

To what extent has the content of the defence trade changed and what does this imply for attempts at regulation?

Is it accurate for commentators to refer to a revolution in military affairs, and if so, what are its likely consequences?

To what extent has the transfer of major conventional weapons been depoliticized in the post-Cold War era?

How does the trade in 'conflict goods' contribute to the trade in small arms?

What are the differences between the licit and illicit trade in small arms?

Defence exports are often justified on the basis of the economic benefits they provide to the economies of suppliers. What is the evidence to support this contention?

FURTHER READING

- **Bitzinger, Richard A. (2003), *Towards a Brave New Arms Industry?* Adelphi Paper 356, London: International Institute for Strategic Studies**. An excellent survey of what Bitzinger describes as the 'hub and spoke model' of arms industry globalization.
- **Buzan, Barry and Herring, Eric (1998), *The Arms Dynamic in World Politics*, London: Lynne Rienner**. A revised (and improved) follow-up to Buzan's *Introduction to Strategic Studies*, this is essential reading for students wishing to understand the various debates on the arms trade and the methods for controlling it.
- **Der Derian, James (2001), *Virtuous War: Mapping the Military-Industrial-Media-Entertainment Network*, Boulder, Co: Westview**. At its worst, this book lapses into self-indulgent travelogue, but it nevertheless manages to reinvent the notion of the military industrial complex for the post-Cold War era and contains important insights into the relationship between modern military technology, the media and the nature of modern warfare.
- **Farrell, Theo (1997), *Weapons Without A Cause: The Politics of Weapons Acquisition in the United States*, London: Macmillan**. Although somewhat dated now, this nevertheless remains an excellent account of the factors that influence procurement decisions, particularly in the USA.
- **Hammond, Grant T. (1993), *Plowshares into Swords: Arms Races in International Politics, 1840–1991*, Colombia: University of South Carolina Press**. An impressive attempt to refine the concept of arms racing based on a number of case studies dating back to the nineteenth century.
- **Krause, Keith (1992), *Arms and the State: Patterns of Military Production and Trade*, Cambridge: Cambridge University Press**. This book provides a thorough analysis of the history and structure of the arms trade.
- **Le Billon, Philippe (2005), 'Fuelling War: Natural Resources and Armed Conflict', *Adelphi Paper*, Vol. 45, No. 373**. There is a growing literature on the relationship between the trade in 'conflict goods' and conflict but this provides an excellent survey of the key issues as well as a detailed discussion of the various regulatory initiatives that have emerged to address the connection between natural resources and conflict.
- **Markusen, Ann (1999), 'The Rise of World Weapons', *Foreign Policy*, 114 (Spring): 40–51**. This is a provocative analysis of the challenges implied by the globalization of the defence industry.
- **Mutimer, David (2000), *The Weapons State: Proliferation and the Framing of Security*, Boulder, CO: Lynne Rienner**. This is the definitive postmodern take on both nuclear proliferation and the defence trade more generally.

There are two very good yearbooks on aspects of the defence trade:

- **The Stockholm International Peace Research Institute (SIPRI) publishes *The SIPRI Yearbook: Armaments, Disarmament and International Security* (Oxford: Oxford University Press).** This contains extensive quantitative data on military expenditure and the defence trade. It also has excellent analytical essays on features of the trade such as the activities of key defence firms.

- **The Small Arms Survey publishes an annual *Small Arms Survey* (Oxford: Oxford University Press)** and is a major attempt to get over the problem of lack of information about the trade in SALW.

There are a number of defence magazines that provide good coverage of the trade.

- *Defense News* is published in the US and comes out weekly. *Jane's Defence Weekly* is published in the UK. Both have excellent coverage of the market.

IMPORTANT WEBSITES

- An excellent source for information on global military expenditures is the SIPRI website **http://www.sipri.org**

- The Small Arms Survey is an excellent source on SALW issues **http://www.smallarmssurvey.org**

- The Federation of American Scientists provides excellent coverage of all aspects of the defence trade as well as web links to relevant reports. It also publishes an annual newsletter, *Arms Sales Monitor* **http://www.fas.org/main/home.jsp**

- The British American Security Information Council engages with a wide range of defence-related issues from nuclear weapons to the small arms trade **http://www.basic.org**

- The Centre for Defense Information covers a wide range of defence-related topics including the arms trade and small arms **http://www.cdi.org/index.cfm**

- The Arms Trade Resource Centre of the World Policy Institute is a particularly useful resource for information on the US defence trade **http://www.worldpolicy.org/projects/arms/index.html**

Visit the Online Resource Centre that accompanies this book for lots of interesting additional material: www.oxfordtextbooks.co.uk/orc/collins/

18 HIV/AIDS and Security

STEFAN ELBE

Chapter Contents

Reader's Guide

This chapter shows how the AIDS pandemic is no longer just a global health and development issue, but also has important security implications. Following an initial overview of the scope of the global AIDS pandemic, the chapter begins to explore both the direct and indirect effects of HIV/AIDS on human security. The chapter then goes on to highlight how in some of the worst-affected countries the AIDS pandemic also has national security implications because of its eroding effects on the armed forces and state capacity. HIV/AIDS even has implications for international security, as the chapter subsequently illustrates by highlighting the role of HIV/AIDS in international peacekeeping operations. Awareness of these security implications is vital for understanding the seriousness of the global challenge posed by HIV/AIDS, and because the security sector can make an important contribution to wider international efforts to reduce the transmission of HIV/AIDS.