CHAPTER 1

AN INTRODUCTION TO MINES AND EXPLOSIVE REMNANTS OF WAR
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SUMMARY
Landmines were developed before the 20th century began but became a weapon of choice for many armed forces and groups from the 1939–1945 War onwards. Widely used in international and internal armed conflicts alike, especially in the 1980s and 1990s, mines typically continue to be a threat to the civilian population long after hostilities have ceased. Similarly, explosive remnants of war – abandoned stockpiles of munitions and unexploded ordnance (bombs, shells, grenades and other ammunition that have been used but which have failed to detonate as designed) – plague post-conflict societies around the world, undoubtedly in even greater numbers. A particularly significant threat comes from duds from cluster munitions.

INTRODUCTION
This chapter looks at the development of landmines and their use in armed conflicts, especially in the latter half of the 20th century. It considers the problems caused by the presence of uncleared landmines and explosive remnants of war in communities around the world.

WHAT ARE LANDMINES?
In their simplest form, landmines (or simply ‘mines’)
are explosive traps that are victim-activated, whether the intended target is a person or a vehicle. A mine comprises a quantity of explosive material contained within some form of casing (typically in metal, plastic or wood), and a fuzing mechanism to detonate the explosives. Mines are generally classified into two categories: anti-tank (or anti-vehicle) and anti-personnel. Technical experts commonly divide anti-personnel mines into four categories: blast, fragmentation, bounding, and directional fragmentation, based on their primary method of causing injury.

Both the term ‘mine’ and ‘anti-personnel mine’ are defined in international law in separate instruments — the Anti-Personnel Mine Ban Convention (AP MBC) and the Convention on Certain Conventional Weapons (CCW). Anti-tank or anti-vehicle mines are often referred to in international negotiations as ‘mines other than anti-personnel mines’. The two different definitions of anti-personnel mine are reviewed in Chapters 3, 4 and 5 below.
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Fragmentation mines  Bounding & directional fragmentation mines

B-40  POMZ-2  OZM-72  MON 50  MON 100

Anti-tank mines

TM-57 metallic mine  TM-62 P2 plastic mine

WHAT ARE EXPLOSIVE REMNANTS OF WAR?

According to Protocol V to the Convention on Certain Conventional Weapons, adopted in November 2003, the term ‘explosive remnants of war’ (ERW) refers to unexploded ordnance and abandoned explosive ordnance. This legal definition explicitly excludes mines, booby-traps or other devices.

Unexploded ordnance or UXO refers to munitions (bombs, shells, mortars, grenades and the like) that have been used but which have failed to detonate as intended, usually on impact with the ground or other hard surface. Failure rates may be as low as 1 or 2 per cent, or as high as 30 or 40 per cent, depending on a range of factors, such as the age of the weapon, its storage conditions, the method of use and environmental conditions.
THE DEVELOPMENT OF THE LANDMINE

The invention of the landmine

The origin of the anti-personnel mine is the subject of debate. A 1998 publication, *The History of Landmines*, argues that modern landmines “trace their lineage from non-explosive predecessors such as the spikes and stakes that were employed by ancient armies.”8 The word ‘mine’, however, probably dates back to the Middle Ages, where “the so-called ‘mine’ was a common feature of medieval siege warfare… The besieger removed as much earth as he could carry away from beneath some exposed corner of the fortifications, and shored up the hole with beams. He then filled the space between the beams with straw and brushwood, and set fire to it. When the supports were consumed, the wall crumbled downwards into the hole, and a breach was produced… Over time, gunpowder and explosives took the place of fire, but the essentially medieval technique was retained, and was used as recently as the First World War.”9

It is claimed that a Russian engineer designed an anti-personnel fragmentation mine in 1855.10 The first known explosive mine can be dated back to at least the 18th century, when a German military historian referred to the use of a ‘fladdermine’ (literally, a flying mine). In April 2001, however, archaeologists in northern China reported the discovery of more than 20 ancient ‘landmines’ dating back more than 600 years.11

But modern explosive landmines, or ‘torpedoes’ as they were initially termed, are more often said to be the invention of the American Civil War.12 In the spring of 1862, when commanding a garrison of 2,500 men at Yorktown, Gabriel Rains, a general in the Confederate army, ordered his troops to prepare artillery shells so that they could be exploded by pulling tripwires or by being stepped on. The first casualties of these early anti-personnel mines were reported on 4 May 1862; even some of the Confederate troops deemed the devices “barbaric” and Rains’ commanding officer forbade their further use, declaring them neither a “proper nor effective method of war”.13

Yet, despite concerns about the weapons on both sides of the civil war, use of the weapons continued and in 1864 at Fort McAllister, near Savannah, mines killed 12 men and wounded 80 others during the Union assault. It was following this battle that the commander of the Union Army, General William T. Sherman uttered his now famous dictum that the use of mines “was not war, but murder”.14
Landmines were a key factor during the battles at El Alamein and Kursk, among others. In late 1943, when given the task of preparing defences against the expected Allied landings of France, Field-Marshal Rommel gave the following instructions to his chief engineer officer General Wilhelm Weise: “Our only possible chance will be at the beaches — that’s where the enemy is always weakest. I want anti-personnel mines, anti-tank mines, anti-paratroop mines. I want mines to sink ships and mines to sink landing craft. I want some minefields designed so that our infantry can cross them, but no enemy tanks. I want mines that detonate when a wire is tripped; mines that explode when a wire is cut; mines that can be remotely controlled and mines that blow up when a beam of light is interrupted.”

It is claimed that one German anti-personnel mine, the Schrapnellmine 35 or S mine as it was later called, “was probably the most feared device encountered by Allied troops in the war”. Following the end of the war, demobilised soldiers introduced the term ‘minefield’ into everyday parlance, meaning a situation beset with problems.
The post-1945 period

Since 1945, the design of mines is said to have concentrated on five criteria: effectiveness, size, detectability, logistic effort and speed of laying. But rapid technological advance has also resulted in rapid obsolescence and by the 1990s more than 600 types of landmine had been produced.24

Anti-personnel mines were used widely in the wars in Korea and Vietnam, with landmines accounting for almost 5 per cent of US troop casualties in Korea.25 As a result of experiences during the Korean War, in particular following human-wave attacks against United Nations (UN) positions, the US developed the M18 Claymore directional fragmentation mine. When detonated, either by tripwire or by electric command wire, hundreds of steel ball bearings are expelled in a 60-degree arc; the lethal radius is around 50 metres.

The Vietnam War saw the first widespread use of remotely-delivered or ‘scatterable’ mines by US forces seeking to stop the flow of men and material from North to South Vietnam through Cambodia and Laos. Aerially delivered anti-personnel mines had a number of obvious advantages over their manually emplaced counterparts: they could be deployed rapidly, required little logistic support, and could be laid deep within enemy-held territory, causing disruption in troop movements and supply lines, all with minimal risk to the air-crews. At the same time, they represented a substantial danger to advances by friendly forces unless equipped with an effective self-destructing or self-neutralising mechanism. It is reported that between 1966 and 1968, the US Department of Defense (DoD) procured more than 114 million anti-personnel mines for use in the Vietnam War.26

Based on its experiences in Vietnam, the US committed considerable resources to the development of anti-personnel mines that would self-destruct within a pre-set time (usually four to 48 hours). The idea had already been around for some time. Following the difficulties encountered in clearing mines left over from the battles in North Africa in the 1939–1945 War, a British report entitled Engineer Lessons from the North African Campaign is said to have recommended the design of a new form of mine capable of “self-destructing after a certain period to avoid the need for lifting”.27

The US also developed landmines that could serve as chemical weapons, each mine containing a quantity of VX nerve gas. Thus, on 30 November 2000, in accordance with the requirements of the 1993 Chemical Weapons Convention, the US DoD reported the successful destruction on Johnston Atoll in the Pacific of more than 13,000 landmines filled with VX gas.28 The US has continued to commit resources to the research and development of new landmines. Indeed, the DoD requested more than US$1 billion over
five years for the production of “alternatives to anti-personnel mines,” including mines based on so-called “man-in-the-loop” technology. This technology places mine detonation in the hands of a soldier via remote control. But, crucially, the new weapons also feature an optional automatic setting – or “battle override” – that allows them to operate just like conventional landmines. So far, the Pentagon has funded the development of two such systems: the Matrix (which is a remote control system for use with a conventional mine), and the Spider XM-7 Landmine System.29

Yet, while mine technology has advanced rapidly over the past few decades, the most prevalent and typical use of landmines involved the manual emplacement of low-tech anti-personnel and anti-tank mines in internal armed conflicts by both government armed forces and armed opposition groups. In Afghanistan, Angola, Bosnia-Herzegovina, Cambodia, Ethiopia, Iraq, Mozambique, Nicaragua, Somalia, Sudan and many other war-torn nations, anti-personnel mines were widely used as part of a deliberate military strategy or simply to terrorise civilians or control their movements. Proliferation was fuelled by low cost and ready availability, with average prices ranging from US$5–15 per mine.30 As the Soviet Union collapsed, bitter conflicts in the Caucasus and the former Yugoslavia, which included some of the world’s leading landmine producers, saw widespread and often indiscriminate use of anti-personnel mines. Moreover, the increasing use of the weapon was not limited to armed forces and groups for, by the 1990s, civilians in many countries were laying mines for their own purposes. These included protection of property, fishing and hunting.

**The landmine threat**

No one knows how many landmines remain uncleared from conflicts old and new. Previous estimates of up to 100 million or more landmines have been widely challenged and any estimates can be little more than speculation. Similarly, the total number of victims is difficult to assess with any degree of certainty. What is certain is that landmines continue to claim human victims, both during and after conflict, many of them civilians. The Landmine Monitor, the monitoring arm of the International Campaign to Ban Landmines (ICBL), a worldwide network of more than 1,400 NGOs, reported deaths and injuries from landmines and ERW in 58 countries and seven other territories in 2005–2006: “In 2005-2006, mine and ERW casualties were still occurring in every region of the world: in 17 countries and one area in sub-Saharan Africa, in 13 countries and one area in the Asia-Pacific region, in 12...
countries and three areas in Europe and Central Asia, in 10 countries and two areas in the Middle East and North Africa, and in six countries in the Americas. Landmine Monitor found that 56 of the 65 countries and areas that suffered new mine casualties in 2005-2006 had not experienced any armed conflict during the research period… Landmines continue to pose a significant, lasting and non-discriminatory threat. Landmine Monitor identified at least 7,328 new landmine and ERW casualties in calendar year 2005, 721 (11 percent) more than in 2004 (6,607)… The vast majority (81 percent) of new landmine casualties in 2005 were civilians, as in past years. The 2005 total included at least 1,518 children (21 percent) and 547 women (5 percent).”

But the landmine threat goes far beyond the killing, maiming and injury of thousands of individuals each year. The social, economic and environmental impact of these weapons is prolonged and often severe. Thus, the loss of fertile agricultural land and access to water points are among the most serious effects for rural developing communities. It has also been found that: “Countries with a minimal infrastructure … are particularly vulnerable to landmine use. Dams and electrical installations have been mined, which can seriously reduce the ability of a nation to produce the power necessary for reconstruction. Transportation systems have been mined, interrupting the movement of people and the flow of goods and services. Market systems have been seriously disrupted or abandoned because farmers and herders have been unable to move over mined roads and footpaths to bring their produce to market.”

In 1995, the UN, declared that mines were “one of the most widespread, lethal and long-lasting forms of pollution” the world has ever known. The environmental impact of landmines had already been recognised at the end of the 1970s. On 5 December 1980, the UN General Assembly adopted Resolution 35/71 entitled Problem of Remnants of War in which it acknowledged that “the presence of material remnants of war, particularly mines, on the territories of certain developing countries seriously impedes their development efforts and entails loss of life and property”. Large-scale use of anti-personnel mines drives rural populations onto increasingly fragile, marginal lands, furthering the land’s rapid degradation, or into the cities thereby contributing to overcrowding, unemployment and other urban problems.
The ERW threat

As it is impossible to give an accurate estimate of the number of uncleared landmines, so it is the case with explosive remnants of war, that is, munitions that have been abandoned or that have been used but which have not exploded as intended. What can be said with some confidence is that the total number of ERW around the world, whatever that may be, far exceeds the total number of landmines. ERW continue to be uncovered in significant quantities from the battlefields of Europe more than 50 years, and in some cases more than 80 years, after the munitions were originally fired. Munitions from the 1914–1918 War sometimes include mustard gas or other chemical agents, resulting in an additional hazard for explosive ordnance disposal teams. In Belarus, disposal teams are sometimes encountering munitions left over from Napoleonic Wars.

The threat posed by ERW, which in some ways has been subordinated to international concern about the humanitarian impact of landmines, especially anti-personnel mines, is now beginning to receive the attention it deserves. In some subsistence economies, civilians collect items of ordnance for their value as scrap metal or the explosives they contain, and children may be killed or injured while playing with ERW they encounter in their daily lives. The consequences of not disposing safely of ERW have all too often been fatal. Particular dangers arise from the use of cluster munitions, as powerful and sensitive submunition duds have killed significant numbers of civilians, particularly children, in countries such as Afghanistan, Iraq, Lebanon, the Russian Federation, and Serbia.
The term landmine is used to distinguish the weapon from sea mines, which are not considered in this work.

The term ‘anti-vehicle mine’ is relatively recent; previously, the term used was ‘anti-tank mine’.

See Chapter 4 for a discussion of the Anti-Personnel Mine Ban Convention.

See Chapter 5 for a discussion of the Convention on Certain Conventional Weapons (CCW) and its annexed protocols, two of which regulate ‘mines, booby-traps and other devices’.

Article 2, Protocol on explosive remnants of war (Protocol V), CCW.

The formal legal definition under Article 2, paragraph 2 of Protocol V is “explosive ordnance that has been primed, fused, armed, or otherwise prepared for use and used in an armed conflict. It may have been fired, dropped, launched or projected and should have exploded but failed to do so.”

The formal legal definition under Article 2, paragraph 3 of Protocol V is “explosive ordnance that has not been used during an armed conflict, that has been left behind or dumped by a party to an armed conflict, and which is no longer under control of the party that left it behind or dumped it. Abandoned explosive ordnance may or may not have been primed, fused, armed or otherwise prepared for use.”

M. Croll, The History of Landmines, Leo Cooper, UK, p. ix; see also pp. 1-8.


M. Croll, The History of Landmines, op. cit., p. 16.

ibid., p. 18.


M. Croll, The History of Landmines, op. cit., p. 26; see also pp. 27-28.


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ENDNOTES

20 See generally M. Healy, Kursk 1943, The Tide Turns in the East, Osprey Military, UK.
24 ibid., p. 96.
25 ibid., p. 97.
30 See for example UN Department for Humanitarian Affairs Fact Sheet on Manufacturing and Trade, New York, 1996.
31 ICBL, Landmine Monitor Report 2006, Toward a Mine-Free World, Mines Action Canada, July 2006, pp. 43, 44 and 45. However, the number of reported new casualties should be viewed as a minimum, as many heavily mine-affected countries were not able to provide statistics for the full year or for the whole country. Some reports refer to several people killed or injured without giving a specific figure; these reports and any with estimates are not included in the total. Furthermore, the figures for mine casualties involving women and children should also be viewed as a minimum; the gender and age of casualties is often not identified, with the gender and age of 2,458 casualties unknown.
35 S. Roberts, and J. Williams, After the Guns Fall Silent, op. cit., p. 11.