Emerging Technologies and Conventional Defence
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As the tank column advanced closer to the battlefield, it noticed itself under observation from small, strange-looking drone-type aircraft buzzing overhead. No sooner had the tank gunners drawn a bead on the mini-aircraft, difficult to follow due to their quick, low, and erratic flight, than the tanks came under sudden attack from swarms of what appeared to be molten slugs of metal falling out of the clouds. This forced the gunners to drop their machine-guns, dive into their armoured turrets, and batten down hatches while trying to call in air cover to knock out the drones. The tank drivers, in the meantime, sought cover in defilade and regrouped for further advance, the column now reduced to two-thirds its original number. Scouts sent out to examine the lost tanks reported that they had been destroyed by armour-piercing warheads entering vertically through turrets and engine covers; crews in the tanks struck through the turret had died instantly by shrapnel ricocheting round the tank insides.

The tanks cautiously and surreptitiously moved forward, rumbling in and out of trees and brush, over the battlefield, keeping one eye to the sky for drones and air attack, the other eye forward scanning for enemy tanks. Suddenly they watched in horror as a small missile darted out of nearby bushes, and pierced the side of the lead tank, killing the crew and setting it afire. Two small vehicles bounced over the rough terrain 500 metres ahead and launched three more mini-missiles at the column, destroying two more tanks, before they were successfully taken under machine-gun fire. As the column advanced past the burning vehicles, they noticed that they appeared to be robot-driven dune buggies. The commanders wondered where the enemy tanks, which they sought, were lurking.

The column decided to wait until evening before advancing further, uncertain just how dangerous the battlefield was actually becoming. Two hours later, under cover of darkness, the tank column began moving forward at a high rate of speed along the major road; air attacks and artillery bombardments had reportedly neutralised the whole area of enemy troops. Yet, out of nowhere, mini-missiles began raining down again vertically onto the tanks, piercing the relatively thin turrets. The lead tank, buttoned up for protection, was surprised when its engine was put out of action. The five remaining tanks once again headed for the bushes, having advanced less than two miles all day.
Having lost two-thirds of their buddies, the remaining tank crews decided to retreat until the battlefield became safer. Unfortunately, retreat turned out to be just as difficult as advance; all tanks had been turned into burning hulks by the next morning, never having met an enemy tank or infantryman.

Such a hypothetical battlefield scenario is not far from reality today. Giving emerging technologies (sometimes affectionately called ‘ET’) in the field of warheads, guidance and surveillance systems, and microelectronics, both the wartime battlefield as well as the peace-time terrorist attack or minor skirmish are becoming more hi-tech and more deadly for protagonists. This chapter will provide a look at some of the more important and central, basic technologies driving the ‘electronic battlefield’ and speculate where such technological evolution is taking military planning.

RECENT EXPERIENCE

Military confrontation, both large and small, has proven costly throughout history in both human and physical terms. However, when examined from the comparative perspective of effort expended (for example, bullets fired) versus result (for example, target(s) destroyed), war has been very inefficient. Arrows, bullets, bombs, rockets, shells, and other such unguided projectiles have more often than not missed their intended targets. Evaluations of Second World War strategic bombing missions, for example, showed that non-nuclear bombing was often off-target and very inefficient. The American Twentieth Air Force’s campaign against urban Japanese targets provided the following estimated results:

- Total urban attacks: 93
- Total aircraft utilised: 173
- Total bomb load: 1026 metric tons
- Area destroyed: 4.7 square kilometres
- Killed and missing: 1850
- Injured: 1850

Such figures, although providing a high casualty rate per geographic area destroyed – 800 people killed or injured per square kilometre – illustrate the extraordinary tonnage and effort necessary to harm the enemy. In this particular case, each aircraft bombing run