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Electronic Warfare in an Evolving World Order

The infantry are not renowned as masters of technology, so I stand here at somewhat of a disadvantage, faced with a group of technocrats skilled in esoteric electronic arts I do not begin to understand. I will fall back onto escape route of the staff officer who has run out of ideas, and confuse you with background information. I hope that there will actually be some information in there that is of interest or even of use.

The first thing to take aboard is a twin reality:

- The world has not become a peaceful place all of a sudden. There is and there will be competition among and within states, and that will sometimes develop into armed conflict.

- South Africa is the regional power in Sub-Saharan Africa. That brings regional interests and responsibilities, including security responsibilities, which South Africa is expected to accept and which it is in our own interests to accept.

To this we need to add the fact that, and this may come as a surprise to some, South Africa is among the top thirty economies (in US $ terms) in the world. That brings the potential to influence world events. But if we want to be heard, we must also pay our dues. Those will include accepting our security responsibilities, regionally and even internationally, and taking them seriously.

The bottom line of this, is that the Defence Force will be kept busy over the next few decades. It will conduct very varied missions against very varied opponents, and do so in a very challenging theatre.

This paper will set out some of the background trends that must be taken into account, outline the likely missions and the nature of the likely opponents, and draw some conclusions regarding what capabilities will be needed. Electronic warfare in all of its forms will be an important factor.

Geo-Strategic Trends

Three major geo-strategic trends have developed since the end of the Cold War: The still evolving role of the United States as the only 'super power', albeit with reduced military capacity; the rise of China as a major international power with aspirations to 'super power' status, and the rise of new major powers at both the international and regional level.

The United States

Immediately after the collapse of the Soviet Union, the world moved from bi-polar to uni-polar, with the United States as the only super power. From there the trend quite

quickly shifted towards a multi-polar world as the US began to turn inward, as it has done after every major foreign military adventure. That trned was stopped in its tracks by '9/11'.

'9/11' has not, however, brought the US back into the international arena with the intention to play the role of super power. What it did, was cause Americans to realize that one cannot ignore the world and hope that it will leave you alone. They are now intent on ensuring their own security by whatever means they believe to be effective. That has brought them back into the arena not as a 'world policeman', but as the big man on the block who wants to be left in peace, and who will take whatever steps are required to achieve that. The return of the US to the arena does not necessarily take us back to a uni-polar world, but it does mean that other actors must remember that there is an '800 pound gorilla' walking around.

This might change if the ongoing 'war against terrorism' develops into a longer-term alliance effort, or if extremist Islamic groups drive other countries into alliance with the United States. Then the US will probably again assume the role of super power for a time - which may, of course, be a very long time indeed if the 'clash of civilizations' theory proves correct.

At least as likely is that the United States will focus on the 'war against terrorism' and leave the rest of the world to its own devices in most other respects. Terrorist groups may, of course, seek to expand the war into other countries, with the aim of tempting the US into over-stretch and drawing the US into actions that will serve to alienate at least neutral countries.

China

One trend that may invalidate many theories, is the rapid economic growth of China and the accompanying modernisation and expansion of its military capabilities. That has drawn the attention of Washington. The US may not want to be the only super power, with all the responsibilities and challenges of that status, but does not really want some other super power to arise. Much as the United States of the 1920s and 1930s watched a strong and expansionist Japan with an eye to bringing it to a fall before it became too serious a competitor, so Washington is today eyeing China.

Beijing, for its part, talks of being a super power on the strength of its population size, speaks openly of its view that all of the region is really its area of interest, and even area of influence, and speaks of building an "international navy", which it has defined as one that can "operate indefinitely in any ocean of the world without a shore base". The only navy that has ever been able to do that since the days of sail, was the US Navy in its heyday of the 1950s and 1960s.

Clearly there is a trend towards serious competition between those two countries that may draw in others, and that may at some point lead to conflict, perhaps even armed conflict. Given the hard line taken by both Washington and Beijing on the future of Taiwan, that may be a trigger. That said, it seems unlikely that there will be any major strategic development in that region until the problem of North Korea has been resolved to the satisfaction of Washington, Beijing and Tokyo.

China has meanwhile launched a major campaign to 'win friends and influence people in Africa, not to mention to win access to oil and other resources, and to markets for its manufactured goods. Its stress on "not interfering in the internal affairs of other countries" has been well received by many African governments that do not welcome any close look at their treatment of opposition or minority groups, or their handling of the national finances. That seems set to assure China of success on this continent.

The Rise of New Powers

Assuming that the world is not actually headed for an extensive and extended 'clash of civilisations', the main long-term effect of the end of the Cold War will be the rise of new major powers. They, in turn, will develop blocs of allies and clients, and will, inevitably, come into competition with each other. The key principle will be the old fundamental truth that "countries do not have permanent friends, they have permanent interests". It is not safe to assume that this competition cannot ever slide into armed conflict, and it is certain that it will result in some low-intensity, covert armed action or support for irregular forces of some kind.

Among those future major powers will be Japan and Germany, both of which are now taking on international roles more commensurate with their economic strength, Russia as it recovers from its post Cold War collapse, India and Brazil. The latter sees itself as a regional power today, but is showing real signs of aspiring to major power status. In the long term, one could also find a united Korea or a stabilised Indonesia joining this circle, but that is perhaps being a little too optimistic at this stage.

There is nothing at all to suggest that these new major powers will not play the power games that the European powers and the two super powers have played in the past – and will continue to play, even Russia in its new major power guise. Russia's military frolic in Georgia is a case in point.

There will, of course, also be what one might term regional powers, with South Africa a good example, and they will play a similar role in their particular arena that the new major powers will play in the world arena. Finally, there will also be a second tier of powers that are not quite major or regional powers but that are strong enough to be in real competition with such a power. They, too, will play power games at some level, if only as 'spoilers' vis a vis their respective regional powers.

Some believe that the United Nations will be effective in reining in the new powers and preventing future conflicts, but its record does not fill one with optimism. Nor will it always be able to launch peacekeeping operations to at least damp down armed conflicts. Today it cannot even find enough troops to deploy an effective force in the Democratic Republic of Congo. The chances of it finding enough countries able and willing to provide troops to stand between two major powers, or even just to stop a major power enforcing its will on a smaller country, do not seem to be great. Also, it is only major powers that are able to provide the airlift, sealift and funding for such operations, and their interest in becoming embroiled in a clash that involves one of their equals is also, at best, open to doubt.

More positively, there is an early but clearly discernable trend for regional groups to take action to stabilise a situation. Thus we have seen the main European powers step

into the arena in the former Yugoslavia; Australia take the initiative to intervene in East Timor, quickly joined by other states of the region; Nigeria and Ghana take the lead in West Africa to stabilise the situation in Liberia and Sierra Leone; South Africa take the lead with a unilateral deployment to Burundi to help the peace process there, soon joined by Ethiopia and Mozambique to form an African Union mission; and we have seen the first attempts by the AU to act on its own initiative in Darfur and now in Somalia. No one of these operations has, however, been on the scale that would be involved in heading off, even just cooling down, a clash between two major powers or a military adventure by a major power.

The impact of this trend on Africa lies in two areas. One is that those new powers will need access to various raw materials as their economies expand and as they develop their armed forces. Many of those raw materials are to be found in Africa, and that that holds potential for competition or even conflict between some of those new major powers playing out in Africa. The most immediate example is the competition for control of Africa's oil reserves, currently being fought out at diplomatic level between the United States and China. Others will join the fray. The effect could be much like that of the Cold War, albeit on a smaller scale.

The second potential impact will also have its similarities with the Cold War era, in that the new powers will vie with each other for regional and international influence, and will seek allies and clients wherever they can find them. The many poor states of Africa will suggest themselves as opportune targets. In this respect it is worth bearing in mind the growing interest in Africa that is being exhibited by countries such as Brazil, China and India.

In fact, Africa is seeing the first stages of what could well prove to be a new colonial era: The form may differ somewhat, although Europe's colonialism also had strong commercial underpinning (flag follows trade), and the actors may differ, with China, India, Brazil and the United States set to be the major players, but the effect is likely to be much the same. Not only is Africa a rich source of important resources, Africa is also one of the few regions of the world that is economically, politically and militarily so weak that budding major powers can look to using it as an arena.

This is not something that the African Union can stave off by itself. It will either have to watch member states succumb, or it will have to develop and alliance policy that is robust enough to serve as an effective guarantor against undue influence by any one of the major powers – new or old.

Conflict Trends

In addition to the geo-strategic trends discussed here, there are discernable trends in the nature and conduct of armed conflict: The rise of truly international terrorism; the development of asymmetric warfare; the shift to urban areas as battlefields; and the dangerous growth of major organised crime.

International Terrorism

The terrorism of the 1960s and 1970s was generally local, and was often funded and encouraged by the intelligence services of the Soviet Union, or through those of its

client states, as a way of irritating the West. There was also some co-operation among some of the terrorist groups, but it was sporadic and ad hoc. The western allies to an extent returned the favour, but not to the extent of supporting pure terrorist groups such as the Baader Meinhof group in Germany or the Red Brigades in Italy.

The new terrorism promises to be something rather different, not only because of its international spread that goes far beyond the earlier occasional co-operation among very different groups with very different aims, but also because of the impact of '11 September', which has changed this aspect of armed conflict forever: For the first time in recent history, a 'non state actor' has been able and willing to inflict damage and casualties at a national level.

That has been the most important change, and has created the real danger of a terrorist group trying to obtain some form of nuclear device. And we must not lull ourselves into believing that this will be an issue only of extremist Islam. There are other groups that have also struck across national boundaries, and there are other groups that have dabbled with one or another 'special weapon'. One example of the latter is the Aum sect in Japan, which distributed Tabun nerve gas in the Tokyo subway.

One must bear in mind here that, while the extremist Islamic groups have the very real advantage of a religious focus and access to co-religionists, some of whom will give tacit support, modern technology has created a situation where that is not essential. A relatively small group of focussed people with access to some funding could cause immense dislocation and damage spread over several countries. That also raises the spectre of a locally focussed terrorist group taking its campaign into the international arena, much as the PLO once did with hijackings but much more dangerously.

Terrorist groups may also turn – perhaps have already turned – to methods that are not directly lethal, most importantly "cyber warfare". This is an area in which the US and most major economic powers are extremely vulnerable to attack, and which promises very interesting results for relatively little effort and risk.

Perhaps most interestingly for your purposes, these terrorist groups make use of the full range of communications technologies, and that is a potential vulnerability.

Asymmetric Warfare

Asymmetric warfare is not a new concept: Weaker powers have relied on guerrilla warfare, asymmetric in its nature, for centuries. It is also important to understand that asymmetry works both ways: There is nothing quite as asymmetric as a tank driving over an infantryman.

Modern armies crush ill-equipped opponents precisely because of the asymmetry in strength, equipment, doctrines, funding, or a combination thereof. The crushing defeat that was inflicted on the Iraqi armed forces in two wars is a perfect example. Nor are guerrillas guaranteed victory because of some magic in the exploitation of asymmetry – far more guerrilla forces have lost their wars than have ever won them. Even South Vietnam was not defeated by Vietcong guerrillas, but by North Vietnam's armoured and infantry divisions.

What has brought 'asymmetry' to the forefront is the ever-expanding gap between the military capability of the major powers and the smaller countries that may come into conflict with them, coupled with the ever-declining willingness of the people of those major powers to accept casualties. The former faces smaller countries with an even greater challenge than in the past, while the latter presents an opportunity to offset their weakness. That opportunity will also draw the attention of non-state actors.

There has also been something of a trend for the people of a defeated country not to accept that the defeat of their armed forces means the defeat of their country, turning instead to some form of armed resistance or guerrilla warfare. That serves to make the winding up of a war more complex, costly and time-consuming that after a 'normal' conventional war. The 'war termination phase' will now sometimes be vastly more demanding than the conduct of the actual war. The current situation in Iraq is a perfect example, as, on a smaller scale, were Ethiopia's intervention in Somalia in 2006 and South Africa's intervention in Lesotho in 1998.

Having argued that asymmetric warfare is nothing new, it is something that will be a factor for the foreseeable future. It must, therefore, be taken into account in planning a campaign and even in developing force designs. The key issue will be combining the ability to conduct classic operations to seize the key parts of a country and defeat any conventional forces, with the ability to secure what has been seized and protect one's own forces and with the ability to counter new, unusual threats. There is no magic to any of this, but it will require proper analysis and planning, force levels matched to the task, and commanders, staffs and soldiers able to react quickly and effectively to entirely new types of threat.

Cyber warfare will have its place here too, and electronic communications will again be a potential vulnerability of the opposing forces.

Cities as Battlefields

Another trend that is likely to expand, and particularly in the developing world, is for operations to be conducted in and around cities and towns.

There is little of value in the rural areas of most developing countries, and they mostly do not have the resources to stage classic battles in open terrain. Their limited forces will concentrate on defending – or taking – the towns and cities. That will see forces dragged into combat in urban and peri-urban areas that often consists largely of slums and shanty townships surrounding a small core city.

This form of combat will, thus, present the forces involved with both the problems of fighting in a built-up area as is trained for in most major armies, and those of fighting in shanty townships, which will be very different.

To take just some examples of the difficulties that will be encountered:

- Shanty townships generally have no formal street layout, and such layout as there is, has few cross-connecting streets. This will complicate manoeuvre and control, while giving forces with immediate local knowledge vast opportunity for ambush and hit-and run attacks.

- The roads will generally be unpaved, making them easy to mine or ditch.

- The shanties will present little resistance to the bullets fired by modern rifles or machineguns, so a round that misses an enemy soldier may very easily kill a civilian in a shack a few hundred meters away.

- The risk of fire will be ever-present, and dangerous to both civilians and the forces operating in the area.

- The population density will be greater than in any conventional urban area, and that will present major problems of controlling refugees during and after the fighting.

One need merely consider the difficulties that Israeli forces have experienced in the course of their recent operations, and add the factor of thin-walled shacks rather than brick and cement houses. The Russian Army's experience in Grozny is a sobering example of what can happen in a conventional urban area.

The fundamental problem here is that armies like to prepare for open terrain warfare, as close to naval warfare on land as possible, but are increasingly likely in most cases to find themselves fighting in and around cities and towns.

Asymmetric warfare is a potentially key factor in such fighting, as the US experience in Iraq, Russia's experience in Chechnya and recent Israeli experience have shown. It is going to present an entirely new set of challenges, not least that of communications at the tactical level. That, of course, again also opens up potential vulnerabilities.

Organised Crime

The issue of major organised crime presents similar problems, although from a rather different background.

The best-known groups are, of course, the narcotics groups and the attached 'narco-terrorists', some of which have been able to recruit technical and military experts from various armed forces to assist them.

Several narcotics groups in Colombia, for instance, are using small submarines and high-speed semi-submersibles to transport their product. The latter run on the surface at high speed during the night, and rendezvous with a fishing vessel or other craft before first light, after which they run at reduced speed semi-submerged with their escort to prevent them accidentally being overrun by other ships. Other groups have been air-dropping product off Guinea-Bissau for collection and onward shipment, and have since graduate to flying product from Venezuela to their own air strops in West Africa. The cross-Mediterranean leg sometimes involves large, high-speed RIBs that can transport as much as 7 tons of product.

There has also been a major escalation in piracy, particularly in South East Asian and African waters. The origins of modern piracy lie in the attacks by Thai fishermen on the Vietnamese 'boat people' fleeing Vietnam after the successful invasion by North Vietnam. This soon grew into attacks on smaller trading craft, and has since grown to

include the taking of large container ships and tankers, some of which are operated as 'ghost' ships for a time, and the holding of crews for ransom. The past few years have also seen an increase in the number of fatal attacks and hostage taking.

One reason why this escalation in piracy has been possible, is the withdrawal of the major navies from many oceans in the wake of the end of the Cold War. Where the US, Royal or French Navies were perfectly willing to respond to a pirate attack in their vicinity, and to do so with force when necessary, smaller regional navies are not just smaller, but are also rather more circumspect. They cannot run the risk of maritime frontier transgressions and all of the legal problems that can result.

In Africa, Somali pirates have attacked ships as far as 450 nautical miles from their bases, and more than 200 nautical miles out to sea. Some of those attacks have been carried out by using 'mother ships' to deploy small, fast craft that execute the attack; others seem to have been carried out from temporary forward bases on uninhabited islands in the Seychelles. Of particular concern is that some of these pirates seem to be providing funding for the al Shabab guerrillas.

In Nigerian waters there is the additional problem of 'illegal bunkering', theft of oil from pipelines or storage tanks, which has also seen loaded tankers stopped and their cargo transhipped. This is currently costing Nigeria some ZAR 14 billion a year – so there is clearly potential to upgrade the technology used by the bunkering gangs. They have meanwhile also to some extent merged their activities with guerrillas operating in the Niger Delta area, some of whom have taken small craft out to sea to board and occupy offshore platforms as far as 100 nautical miles off the coast,

Africa faces the additional problem of serious, large-scale banditry that has very real consequences not just for personal safety but also for national and regional economic development. In much of the Sahel banditry has reached paramilitary proportions with gangs of several hundred not uncommon - well-armed members, using Land Cruisers and equipped with night-vision goggles and satellite telephones. There has been at least one incident – in Kenya - of cattle rustlers using a Strela to shoot down a police helicopter. As is the case with the pirate groups, some bandit and smuggling gangs are becoming with guerrilla groups and with terrorist groups.

All of these groups are as vulnerable to making excessive use of modern electronic communications systems as are we, and therein lie some interesting opportunities. It will also be useful to remember that they will be using modern navigation and night-vision aids and some guided weapons, presenting both challenges and opportunities.

Some Implications

South Africa is going to be affected by events in Sub-Saharan Africa and in the wider region, as well as by some events in the world as such. We are going to have to take a mature view, and offer our assistance when it is needed; and we will sometimes have to take action unilaterally when action is essential and time is short.

SANDF: Missions

The overriding consideration will be that South Africa needs as stable and prosperous region around it, if we are to develop and expand our own economy. Taken together with our regional responsibilities, this is likely to see the Defence Force engaged in:

- **Peacekeeping:** Deploying forces to stabilise a situation and keep the peace by keeping belligerent forces apart while their politicians negotiate a settlement.

- **Peacemaking:** Deploying forces to assist and support a settlement effort by, for instance, providing communications and air transport and local security.

- **Peace-enforcement:** Deploying forces to bring a conflict to an end by directly engaging one or all belligerents, to eliminate or critically reduce their military potential.

- **Conflict prevention:** Making a 'show of force' to discourage one or all parties to a potential conflict from actually engaging in armed operations, by making it clear that they will be prevented from attaining their goals. This could be in support of one party, or neutral. This could involve deploying a force or holding it 'poised' offshore or in a neighbouring country, the latter at, inevitably, some political cost.

- **Conflict containment:** Deploying forces to prevent a conflict spilling over into a neighbouring country. This could take the form of a 'show of force' to keep a belligerent from using neutral territory, or the actual deployment of forces, be it as a 'trip wire' or an actual defensive or counter-attack force.

- **Crisis response:** Deploying forces in response to a sudden crisis. This could take the form of any one of the above operations, but will also include hostage rescue operations and embassy relief operations.

- **Anti-terrorist operations.**

- **Humanitarian intervention:** Deploying forces to assist civilians facing hunger, displacement or other hardship, where ordinary humanitarian assistance is not possible as a result of military, paramilitary or simple criminal activity. This can take the form of actually providing assistance or simply protecting civil society organisations in the course of their work.

- **Non-combatant evacuations.** Some missions of this type may require the deployment of screening or covering forces; others may involve conducting a rescue operation over some distance from the airhead or beachhead.

- **Constabulary operations:** Operations against banditry and piracy, conducted together with other forces or autonomously.

Where possible, these missions will be conducted in conjunction with other countries under the auspices of the African Union and the United Nations. That does not mean,

however, that South Africa will never act autonomously, particularly in the case of a crisis response mission, where waiting until an AU or UN mission can be launched, could defeat the purpose of the mission altogether. The initial SANDF deployment to Burundi is an obvious example as is, to an extent, the intervention in Lesotho.

Even when these are multinational operations, it will in most cases fall to the Defence Force to provide key capabilities that are financially or technologically beyond the practicable reach of our African partners: Fighters, all-weather attack helicopters; all-weather reconnaissance; electronic surveillance, submarine insertion of special forces, airborne and sea-landed operations, offshore and ocean patrol among others.

The SANDF will also conduct search and rescue, disaster relief and emergency aid operations. Some of those may be hampered by bandits, guerrillas or renegade forces. In such circumstances, they become typical military missions to be conducted as such.

Finally, the primary role of deterrence and defence has not gone away. The fact that South Africa does not face any immediate conventional military threat does not mean that this capability can be ignored. The renewed major power interest in Africa means that strategic balances can change very suddenly and very quickly. Even ruling out an attack on South Africa, it is quite possible that South Africa might have to deploy its forces to defend an allied country against conventional or semi-conventional attack by a neighbour. More to the point, maintaining a credible conventional capability may be the one factor that makes a conventional attack in the region unlikely.

The Theatre

The theatre will present its own set of difficult challenges. Among them will be:

- Low force densities. Africa is large, and even the smallest of African countries are actually quite large. That has implications for finding the opponent, for the force levels required, for the communications links that will be required and for logistic support and the protection of rear area elements.

- Distances. With size come great distances that will make deployment and re-deployment an interesting exercise, and that will complicate logistic support.

- Weather. Many parts of Africa have weather that can severely hamper military operations and even their communications.

- Poor infrastructure. Most of Africa has very poor road and rail systems, few heavy-duty bridges, and little in the way of locally available technical support. In many parts even finding fuel, safe water and food will be difficult.

- Poverty. Wherever a force deploys, it will resemble an upmarket Woolworths on wheels to the local population. That will trigger expectations, cause some level of resentment, and bring the problem of theft.

The size of the theatre, the inevitably poor force densities and the poor road links add up to the critical importance of good, current intelligence. A small force hampered by

poor road links in a large theatre must know where the opposing forces are and what they are doing.

It is going to be essential to be able to:
- Build a useful intelligence picture of the opposing forces.
- Find the opposing forces and identify them.
- Track the opposing forces.

Reconnaissance and surveillance of all kinds will be critical to being able to operate effectively, the latter including the routine monitoring of trunk roads, river crossings, river transport routes and river ports, airfields and potential lakeshore landing areas.

Opposing Forces

In the course of these various operations the Defence Force will encounter opponents of widely – not to say wildly – varying composition and capabilities. Among them may be:

- Elements of national armed forces operating in another country in the guise of guerrillas or in support of guerrillas.

- Elements of national armed forces that are supporting a secession.

- Elements of national armed forces engaged on opposite sides of a civil war.

- Renegade elements of national armed forces, that that have mutinied or staged a coup d'etat.

- Proxy forces inserted by an outside power, overtly or covertly in the guise of mercenaries or some form of 'solidarity', to ensure a desired outcome. In this respect it is important to bear in mind the renewed outside interest in Africa's raw materials.

- Serious guerrilla forces, which can have come conventional capability.

- Terrorists, who must be expected to have access to good equipment.

- Bandits, pirates and warlords, all of whom are increasingly well equipped and armed.

At the top end, we might encounter equipment as sophisticated as T-72s, BMP-2s, modern anti-tank and light anti-aircraft missiles, Mi-35 attack helicopters and MiF-29 and Su-27 fighters.

It is also worth bearing in mind that even guerrillas and bandits are using air transport.

Lower down the scale, it is as well to remember that what Chad Army Land Cruisers achieved against Libyan tanks; that a Kenya Police helicopter was shot down by cattle rustlers using an SA-7; that bandits arrested by the Cameroon Army were found to

have night vision goggles and satellite telephones, and that some bandit groups in Africa are not just well armed, but also highly experienced and often operate in large groups: In 2005 a group of 2 000 crossed from Tanzania in Kenya, and raids by groups of 100 or stronger are far from rare in much of the Sahel.

It is also well to remember that a fifty-year-old T-55 can kill a Land Rover or a Ratel just as easily as a modern T-90 could; that a 14.5 mm heavy machinegun mounted on a 'technical' can be lethal to light armoured vehicles; and that the same RPG-7s that brought down UH-60s over Mogadishu, can also bring down a Rooivalk somewhere else. Come to think of it, three rounds from an 84 mm Carl Gustav and a few hundred rounds of 7.62 mm ball stopped a 1 000 ton corvette at South Georgia in 1982. Not for long, but for a bit, and with casualties. And, of course, at the very bottom of the technological scale, the best night vision goggles, body armour, radios and rifles will not save a small group of soldiers overrun by a few hundred men armed with old guns and spears. It has happened to other armies in other theatres, and there is nothing that says that South African soldiers are immune.

We must also remember that people do come up with ingenious improvised weapons and tactics. Our forces could very well encounter:
- Improvised mines or 'fougasse' type devices.
- Command-detonated 'culvert bombs' or improvised anti-ship mines.
- Car or boat bombs (a la USS Cole), including car bombs used against ships in harbour. In fact, consider one built into a small tourist submersible.
- Improvised mortars (a la IRA attacks in Ulster and London).
- Craft of opportunity used by rebels or terrorists to attack patrol vessels or cargo ships, and which could be armed with a variety of weapons, including light cannon or anti-tank missiles.
- 'Swarming' attack by large numbers of small craft intent on boarding a ship.
- 'Swarming' attack by "demonstrators" intent on stealing equipment, seizing hostages or seizing an installation – or, indeed, a ship lying alongside.
- Infantry weapons used against landing or low-flying aircraft (a la RPG-7s in Mogadishu).
- Fire by ground forces against naval vessels engaged in inshore operations.
- And, of course, 9/11 is not something that can only happen in the United States, as incidents involving light aircraft in other countries have already demonstrated.

Finally it is important to remember that the opposing force may be rather, even vastly, more competent than the appearance of its fighters suggests. There is no guarantee at all that the Defence Force will only encounter poorly trained and poorly equipped amateurs. There is every indication that the opponent will at the very least include a proportion of highly experienced personnel and have access to a range of modern aids. In that context, the next time you see photos of the comic opera-like militias in the DRC or elsewhere, look at their weapons: They are clean, the spare magazine is not taped on upside down to swallow dirt and stones and jab the rifle.

Consider also the guerrilla raids on Chad's capital, Ndjamena. Each of the major raids conducted from Darfur since 2006 has involved a force comprising several hundred vehicles, moving in small groups that formed up just east of the city before attacking.

Moving that number of vehicles over distances of around 1 000 km over poor roads or tracks, arriving more or less on time, carrying out the raid and then withdrawing successfully, argues outstanding planning capability and outstanding logistic support. Definitely not amateur hour!

Electronics

Now to the nub of things for the purposes of this conference: The Defence Force's future opponents will all use electronic communication links of some kind, including laptops with an internet connection; most will use electronic navigation aids and night vision equipment; many will homing or guided weapons; and a few will have radars, optronic surveillance systems and radar warning receivers. A few will also have some COMINT capability.

We must consider the full spectrum of electronic and information warfare, perhaps not in the upper reaches of the latest technology, but very definitely present:

- Smugglers, bandits, pirates, guerrillas and terrorists are all using cellular and satellite telephones and radios of various types, from old CB sets to modern, secure military types.

- All of these groups use GPS and some may use GLONAS for navigation.

- Many of these groups have access to night vision goggles, which impacts on how we assess their ability to move and operate at night, and on camouflage of our own forces.

- Some groups will use remotely-detonated charges of various types.

- Some groups have demonstrated access to shoulder-launched anti-aircraft missiles. There is nothing to suggest that they cannot also acquire anti-tank missiles, which can also be lethal to warships and helicopters – and the self-defence systems of the latter will find some of those missiles difficult to deal with.

All will present both threats and opportunities that fall within the ambit of electronic warfare.

Should foreign forces become directly involved in a conflict in Africa, or should some foreign government choose to re-equip an African force, we must expect to encounter modern equipment of all types. Bear in mind that Ethiopia and Eritrea went from flying old MiG-23s and MB-339 trainers respectively, to flying Su-27s and MiG-29s – and having the missiles that go with them – in a matter of a few months when they went to war with each other. It is as well to bear this in mind.

The origin of the electronic equipment and systems that will be encountered will be extremely varied. It will include items from China, Pakistan, India, Russia, Iran and North Korea as well as from western countries. The equipment will include military, paramilitary, police and civilian items.

The EW Capability Requirement

Considering the various factors, it is inescapable to conclude that there will be a need for electronic warfare capability of all kinds:

- SIGINT to locate and track opposing forces, identify airfields in use and warn of new systems arriving in the theatre.
- COMINT to identify and monitor opposing forces, covering the full range of electronic communications systems.
- Day/night/all-weather reconnaissance and surveillance systems.
- Day/night/all-weather target acquisition and fire direction systems.
- Self-protection equipment for combat vehicles, aircraft and ships, to counter weapons from RPGs through homing missiles to guided missiles.
- IED remote detonation jamming equipment.
- Communications jamming equipment.
- Secure tactical and long-range communications.
- Information warfare capability to enable spoofing of the opposing force and to prevent their use of radio broadcasts to influence local populations.

In some cases it may also be necessary to have radar jamming capability to cover own air movements, be they special forces insertions, airborne/heliborne operations or air strikes.

In closing, consider a few specific examples of where EW capability played a decisive part in operations other than war:

- Carlos 'the Jackal' was located a particular apartment in an appartment block in Khartoum by tracking and monitoring his cellular telephone.
- The Chechen leader General Dudayev was killed by a radar-homing bomb that had been modified to home on his satellite telephone.
- Dr Jonas Savimbi was ambushed by a special forces team who were inserted ahead of his command group using intelligence gleaned by a COMINT team in a Kingair that had been monitoring his satellite telephone.
- The Indian authorities have been able to demonstrate the Pakistani links of the terrorists that attacked in Mumbai by analyzing their use of cellular telephones during the attack, which also enabled them to back-track to identify some local support cells.

The latter of these examples is particularly useful because it is becoming clear that the attacking terrorists were in cellular telephone contact with their handlers throughout much of the attack. They, in turn, were in cellular telephone contact with spotters who were on the scene, providing information on what the security forces were doing.

The near and medium-term future of conflict may be unconventional and asymmetric, but the electronics age and the information age hold sway nonetheless. Dealing with that, exploiting that, is your responsibility.