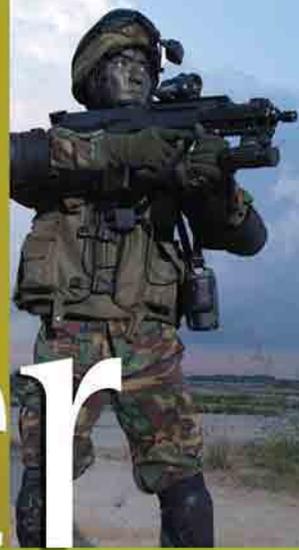


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Vol. 32 No. 4 [2007]



## The Impact of Airpower Transformation

*by COL Lim Soon Chia and MAJ Choy Dawen*

## After the Lebanon War:

## Perspectives for Stability and Peace in the Middle East

*by Dr Christoph Marcinkowski*

## Armoured Warfare in Urban Operations

*by MAJ Patrick Foo Peng-Kang*

## Evolution of Modelling and Simulation in the Singapore Armed Forces

*by Mr Victor Tay Su-Han*



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# EDITORIAL

2006 has been an eventful year. Looking back, there were the North Korean claim to have conducted its first nuclear test, the Mumbai train bombings in July, the referendum that led to the dissolution of the union between Serbia and Montenegro, and the alleged terrorist plot to destroy aircraft on transatlantic flights from the United Kingdom to the United States, just to name a few. However, no other region attracted more attention than the Middle East.

The situation in Iraq remains volatile, and recent events like the Israeli-Hizbullah conflict and the Fatah-Hamas clashes in Palestine have added to the tension in the region. Chronic instability in the energy-rich Middle East would affect the entire world, and with globalisation and technological advancements, its effects may be felt faster than before. It is with this background that we are pleased to publish a good range of current and relevant articles in this issue, with topics relating to warfighting and transformation; leadership and organisational development; and conflict and security studies.

*The Impact of Airpower Transformation* by COL Lim Soon Chia and MAJ Choy Dawen beckons us to examine how the greatest benefits are reaped when technological transformation takes place with operational-level concepts

and strategic-level strategic relevance in mind. As it is, airpower has been proven to be viable and effective in resolving limited conflicts without having to commit ground forces. Moving forward, the authors posit that airpower transformation must be developed in line with the idea of delivering new political options to national leaders which can serve to further a country's strategic interests.

In *After the Lebanon War: Perspectives for Stability and Peace in the Middle East*, Dr Christoph Marcinkowski seeks to throw a different light on the Shi'ite-Sunni schism, by making reference to the recent Israeli-Hizbullah conflict. He expounds on the characteristics of Shi'ite Islam, relates it to the current context, and argues for a more sanguine perspective to the conventional view that a 'Shi'ite crescent' is forming in the Middle East.

*Armoured Warfare in Urban Operations* by MAJ Patrick Foo examines the growing trend of urban fighting and the re-discovery of the importance of armoured vehicles in urban operations. He also elaborates on the current doctrines and operational tactics for armoured vehicles operating in urban terrain, and concludes that an institutional review must be undertaken for armoured forces to remain relevant, efficient and effective in urban operations as well as in other types of terrain.

The SAF has been capitalising on Modelling and Simulation (M&S) technologies for its simulation and training systems since the early 1980s. In his paper *Evolution of Modelling and Simulation in the Singapore Armed Forces*, Mr Victor Tay traces the evolution of M&S in the SAF, and provides a view of the changing M&S landscape with each successive wave of technology advancement. It also provides an assessment and forecast of the nature of M&S systems in the future.

We are also glad to publish two winning essays from CDF Essay Competition 2005. In his essay entitled *The Laments of Cassandra: Reflections on Warning Intelligence in the Information Eden*, CPT Guo Jinghua points out that technological revolutions and new geopolitical paradigms have changed

the playing field for intelligence services, and proposes that the confluence of both psychology and technology is perhaps the key to emerging the victor in today's constantly evolving battlefield.

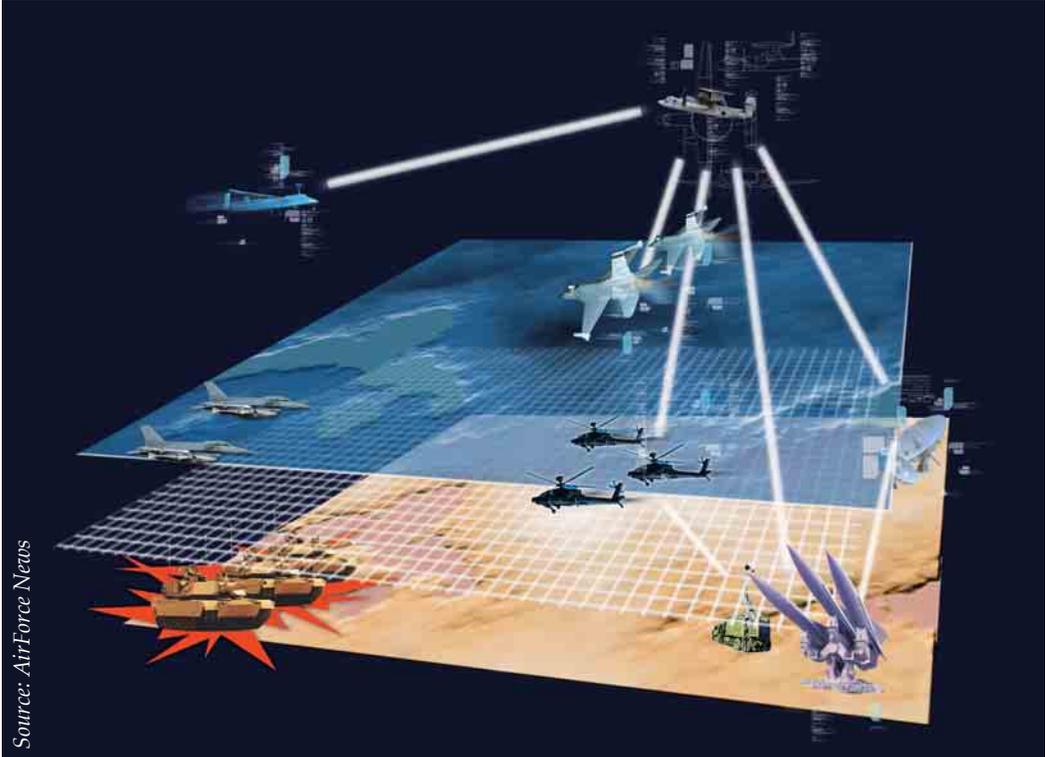
In *Social Capital: Cultivating this Vital Element for the 3<sup>rd</sup> Generation SAF*, CPT Kelvin Fan examines the Congruence Model and the notion of social capital, elaborates on the importance and inherent challenges of introducing social capital in the SAF, and concludes by outlining how social capital should be built up to facilitate the SAF's transformation efforts.

We hope you will enjoy this issue. Have a wonderful 2007!

Editor, *POINTER*

# The Impact of Airpower Transformation

by COL Lim Soon Chia and MAJ Choy Dawen



## Introduction

Most essays that deal with the transformation of airpower today invariably exhort how unmanned air vehicles (UAVs) allow air forces to overcome the traditional handicap of temporality; how Precision Strike (PS) weaponry can significantly accelerate destruction schedules while reducing attrition risk and minimising collateral damage to innocents; and how advanced sensors and pervasive datalinks would impart the all-round situational awareness that is the critical edge in air operations.

However, this essay does not.

Although technological transformation and the opportunities it brings can have profound impact, the greatest benefits are accrued only when these changes are considered within the larger context of operational-level concepts and strategic-level political relevance. For example, the tank, when first conceived during World War One, was a tactical weapon designed to help infantry break through enemy lines defended by machine guns and artillery fire. But while the French continued to view the tank as part of a larger

combined arms force, in subordination to the infantry, the Germans realised the operational significance of the tank's combination of both mobility and firepower.<sup>1</sup> Thus, instead of tying the tank to slower-moving infantry and other supporting arms, the Germans developed the Blitzkrieg doctrine of utilising pure-armoured formations that could exploit the tank's high-speed and firepower to break through weak points in the enemy lines.<sup>2</sup> But the operational significance of this innovation pales even in comparison to the strategic impact that Blitzkrieg offered – a means of bypassing the powerful static defences of the French Maginot Line that would make war with France possible, even winnable.

The relationship between military transformation and strategic relevance is therefore recursive – while transformation is frequently driven by shifts in technology and the wider security environment, it is also capable of changing national grand strategies and the definition of victory. The clearest example of this effect at work is the trend today towards ever more accurate weapons in the pursuit of zero collateral damage. Several decades ago, flattening an entire neighbourhood to destroy a single ball-bearing factory would have been tragic, but entirely acceptable within the norms of war – because bombing technology was so crude that some collateral damage was to be expected. However, as precision strike technology improved and proliferated (initially driven by demands for better destructive potential), the ability to minimise collateral damage became a *requirement* to minimise collateral damage.<sup>3</sup> Amongst first-world nations,

at least, “could” became “should”. Especially in wars of liberation such as Operation Iraqi Freedom in 2003, indiscriminate bombing would have been incongruent with the objective of liberating ordinary Iraqi citizens from the tyranny of Saddam Hussein.

This essay therefore takes the imminent transformation of airpower as a foundation, and instead focuses on deriving its impact on future political options so as to demonstrate the national relevance of airpower transformation. We will first identify some of the major trends in airpower transformation, and then show how these trends contribute to the suite of national capabilities to achieve strategic outcomes.

## NEW AIRPOWER CAPABILITIES

Since airpower transformation is a topic that has already been exhaustively discussed in countless other articles and publications, this section will just highlight two major trends whose strategic relevance would be shown subsequently.

### Comprehensive Awareness

Airborne surveillance has been a traditional mission for air forces, ever since militaries first used aircraft in World War One to perform artillery spotting and forward reconnaissance. After all, aircraft can fly almost anywhere at short notice, providing a God's eye view of the battlespace to commanders who need up-to-date information. However, its utility has always been hampered by the short endurance of aircraft, which prevents commanders from maintaining a persistent watch over an area of interest. The other

longstanding limitation has been the performance constraints of conventional electro-optic sensors, which continue to be hampered by darkness, weather and foliage cover.

However, these two limitations are rapidly being overcome. Firstly, many air forces are investing in unmanned aerial vehicles (UAV), whose long endurance makes them ideal for the surveillance mission. Secondly, radar-based sensor technologies – such as Synthetic Aperture Radar (SAR), FOPEN SAR (which uses lower-frequency bands to penetrate vegetation) and Millimetric Wave Radar (MMW) – can increasingly see through darkness, haze, rain and even forest canopies to pick out elusive enemies. Together with rapid advances in digital signal processing and the resulting improvement in signals intelligence capabilities, these changes actually offer the possibility of achieving comprehensive awareness over the battlespace via airborne sensors, thereby enabling commanders to see first and hence act earlier.



*UAVs: Providing more persistent surveillance*

## **Precision Strike and Calibrated Weapon Effects**

The most talked-about transformation in airpower is precision strike technology and how it allows air forces to dramatically increase their strike potential while minimising collateral

damage to innocents. This change is certainly significant as it dramatically reduces the operating cost of airpower (since each sortie is much more effective than before) and enables militaries to conduct combat operations using proportionate force.

What is equally important, however, is that the high accuracy afforded by PS weapons enables airpower planners to create a larger variety of weapon effects customised to the strategic outcome desired (low collateral damage being the most well-known, but not the only case). For example, one could use bombs loaded with graphite strands to only temporarily bring down an electrical power distribution grid, so that power can be quickly restored to the civilian population after the war is over. Alternatively, one could deliver High-Power Microwave (HPM) bombs that can disable nearby electronic devices without destroying infrastructure or killing personnel, which might be useful in certain situations short of war when one desires to send a warning message to the other nation without provoking all-out conflict. This calibrated range of weapon effects is only possible when you can deliver bombs very accurately, because many of them are only effective over very short distances.

## **NEW POLITICAL OPTIONS AND OUTCOMES**

But while the array of new capabilities that most modern, first-rate Air Forces can expect to develop is impressive, like the tank they have to produce new political outcomes so that they make a difference at the strategic/campaign level rather than just at the tactical level.

Indeed, the process of transformation cannot be considered complete until we find new ways of exploiting the new capabilities; otherwise, we would be doomed to repeat the mistake of the French in World War Two. This section will thus draw out the strategic implications of these trends in airpower transformation, and show how they contribute towards providing new political options and outcomes at the national level.

## 1. Enlarging Political Space and Enhancing International Standing

As an instrument of national policy, one of the military's vital peacetime missions is providing avenues for enlarging political manoeuvring space and enhancing international standing.

Today, countries who desire a voice at the table of international opinion are expected to share commensurately in the responsibilities of global citizenship. Such

responsibilities range from participation in non-violent Humanitarian Assistance and Disaster Relief (HADR) operations and Peace Keeping / Peace Support Operations (PKO/PSO), to high-end coalition combat operations to enforce UN Security Council resolutions. Furthermore, the end of the Cold War and the resulting cut-backs in militaries worldwide has raised the scarcity value of military capabilities, which are often the only forces capable of operating under harsh environmental or violent conditions. It is therefore no longer enough merely to contribute monetary aid, as Japan discovered after the 1991 Gulf War when it only provided financial support for coalition combat operations, to have influence in international affairs today, it is necessary to contribute concrete military capabilities.

But the flexibility, speed and reach demanded by such peacetime operations is exactly what airpower transformation can provide.



*A C-130 delivering relief supplies to Bander Aceh.*

Already, during Singapore's Operation Flying Eagle for tsunami relief in 2005, we saw a glimpse of what the future could bring. With the introduction of medium-lift Chinook helicopters – originally designed to ferry large troop formations, artillery and vehicles – the RSAF was able to, for the first time, deliver humanitarian aid to disaster areas not within the vicinity of a prepared airstrip. Singaporean relief efforts were thus able to reach remote areas such as Meulaboh, where the airstrip had been damaged and whose land links with major towns had been severed. Operating from Medan and Banda Aceh, whose airports were open to C-130s bringing relief supplies from Singapore, Chinooks rapidly established an “air bridge” to Meulaboh, delivering food and medical supplies within the critical first few days of the disaster. Although reconstruction efforts could only begin much later when Navy ships arrived with heavy equipment and manpower, the air bridge allowed time-critical supplies to reach the disaster area and sustained the villagers until the sea links were restored.

In future disaster relief operations, we can expect even greater contributions from air platforms and sensors. Airborne

sensors with high bandwidth video datalinks can be quickly despatched to disaster areas to survey the damage and identify suitable access sites for follow-on relief forces. UAVs might even maintain a persistent watch over the disaster area, using their high-resolution sensors to help search for survivors. For peacekeeping operations in conflict zones, tactical UAVs may also provide ground troops with enhanced situation awareness of their surroundings, enabling them to deal with (or avoid, if the situation becomes dangerous) potentially hostile elements. Clearly, by enlarging the suite of flexible capabilities available to national and military leaders, airpower transformation can provide a means of enhancing a country's international standing and enlarging its diplomatic manoeuvring space.

## 2. Flexible Response in Situations Short of War

The array of capabilities that airpower transformation promises to bring also gives national leaders more flexible response options in situations short of war. For example, given the heightened risk of piracy and maritime terrorism today, airborne sensors



*A Chinook helicopter involved in Operation Flying Eagle.*

may be able to provide affordable yet effective comprehensive awareness over designated sea lines of communication, either using long-endurance UAVs to maintain a persistent 24/7 watch or employing MPAs equipped with high-resolution SAR sensors that can accurately identify unusual traffic within busy sea lanes. Such an airborne solution may well also be more attractive than the alternative of visible naval patrols that might seem unnecessarily alarming or even provocative.

More importantly, however, the range of weapon effects provided by precision strike technology – ranging from temporal disablement to outright surgical destruction – allows political leaders to send calibrated signals to potential adversaries in troubled peace situations, so as to stave off a possibly more serious crisis.

The classical example of where a surgical attack was sufficient to achieve a decisive strategic outcome was the Israeli airstrike on the Iraqi Osiraq nuclear reactor in 1981.<sup>4</sup> When the Israeli government received strong intelligence that the Osiraq reactor being built at that time had the capability to produce weapons-grade nuclear material, they concluded that decisive action had to be taken to prevent Iraq from obtaining nuclear weapons. An airstrike (which required months of preparation and rehearsals) was planned against the reactor and the Israelis succeeded in destroying the reactor; so surgical and well-executed was the strike that the Iraqi air defences did not even have time to react. With the reactor destroyed, the Iraqi nuclear

weapons programme was delayed by several years while fresh plans were being drawn up, and in fact the programme never recovered due to the distraction caused by the Iran-Iraq War during the 1980s and the subsequent Persian Gulf Wars in 1991 and 2003.

One may question why the destruction of just a single reactor would deliver such a big setback to the Iraqi nuclear weapons programme; furthermore, the attack also strangely did not escalate into a more serious conflict between Israel and Iraq. It is possible that the ongoing Iran-Iraq War sapped Iraqi resources and diverted attention away from the Israeli attack, so the success of the operation may well be a unique case that is hard to repeat.

Nevertheless, the Osiraq strike demonstrates that, under the right conditions, a well-placed attack in situations short of war might achieve strategic outcomes without, as it appears, significant repercussions. Moreover, with the added flexibility of calibrated weapon effects available today, national leaders are no longer confined to Osiraq-type destructive operations that may be too inflammatory for the situation at hand. Rather, they might choose to initially conduct a non-destructive strike on a vital installation (perhaps using a HPM bomb to disable critical electronic systems) to give the adversary a chance to back down, before employing the harsher option of outright destruction should the adversary remain recalcitrant. Such a flexible set of national responses will be possible in the future with the achievement of airpower transformation.

### 3. Rapid and Decisive War Operations

The final, and perhaps most dramatic, impact of airpower transformation on national grand strategies is the possibility of rapidly concluding a conflict using airpower alone.

Today, airpower continues to be viewed as an expensive form of fire support for ground or maritime forces. It is generally not perceived to be capable of achieving decisive political outcomes independently, because most wars in history have required at least intervention by ground or maritime forces to reach final resolution. The only example of a conflict whose resolution could plausibly be attributed to airpower alone was Operation Allied Force (Kosovo, 1997), where several weeks of airstrikes appeared to have forced Milosevic to terminate his campaign of genocide against the Kosovar population.

However, a blanket assertion that airpower cannot alone resolve wars disregards the true complexity and diversity of armed conflicts between warring states. Whilst airpower probably cannot be the decisive lever in wars that demand the complete overthrow of an enemy government or wholesale occupation of foreign territory, it is conceivable that in limited conflicts where the political objectives on both sides are less ambitious, airpower alone might prove to be sufficient in either achieving one's goals or denying the enemy his.

In Kosovo, for example, by targeting Milosevic's key ground forces executing the genocide campaign, as well as the

critical infrastructure supporting the Serbian economy, NATO was able to force Milosevic back to the negotiating table without resorting to the costlier and messier alternative of invading Serbia. This strategy worked because Milosevic was not prepared to sacrifice the Serbian economy and his military forces (whose might kept him in power) in pursuit of what was arguably a less-important political outcome (control over Kosovo). It was thus sufficient to use airpower to threaten Milosevic's "centres of gravity" so as to achieve a quicker return to normalcy.

Skeptics will of course point out that the record of airpower's role in deciding conflicts is spotty at best. The 'strategic airpower' school of thought, which was the first to believe that air forces might be able to win wars by themselves, is generally regarded today as a quaint ideal that can never be achieved. Nevertheless, with the Iraqi insurgency and the Palestinian *intifada* also proving very clearly that territorial occupation and regime change are extremely hard to sustain even with some of the best ground troops in the world, it is worthwhile reflecting whether nations today can afford the cost of a protracted war that the employment of ground forces might create. Whereas a stand-off, calibrated air bombing campaign with low collateral damage might conceivably allow countries to achieve their national objectives without overly-provoking their adversaries, face-to-face close-quarters combat using ground forces rarely engenders emotions that would be constructive to post-war reconciliation.

By giving military commanders comprehensive awareness in the battlespace, coupled with highly-

effective precision strike weapons that allow rapid destruction of selected enemy capabilities (a medium-sized air force can easily destroy several hundred targets a day), airpower transformation for the first time offers national leaders the possibility of resolving limited conflicts rapidly from the air alone. Although not all types of wars and conflicts will be amenable to airpower resolution, the crucial change is that political leaders will have an additional option to consider beyond traditional ground operations to secure territory. This expanded flexibility will be highly valuable, especially considering the increasing political and diplomatic ramifications of ground operations in foreign lands today.

## CONCLUSION

Most previous discussions of airpower transformation have focused on its tactical and operational impact, highlighting how airpower can help accomplish current missions better, faster and cheaper.<sup>5</sup> However, such a focus would miss an important point of transformation. Just as military operations are ultimately an extension of national policy, so too must new capabilities and fighting concepts serve to expand the range of grand strategy options available to policymakers.

This article has thus highlighted several examples of how airpower transformation can deliver new political options to national leaders which can further a country's strategic interests. In peace, airpower flexibility and reach will allow countries to enlarge their political

manoeuvring space and improve their international standing by enhancing participation in HADR, PSO/PKO and coalition combat operations. During periods of tension, airpower can provide a flexible range of escalatory or de-escalatory response options to achieve the desired strategic outcome. Finally, in war, airpower may prove increasingly viable at resolving limited conflicts without the need to commit ground forces, an invaluable option that is worth considering in view of the high costs and repercussions of land operations on foreign soil.

In the dynamic environment that we live in, we must continually expand our range of grand strategy options to ensure that we do not use yesterday's tools to solve tomorrow's problems. The success of the airpower transformation effort will therefore rest on whether it can help provide an expanded set of political options and outcomes to national leaders. 🌐

## Endnotes

- <sup>1</sup> At any given level of technology, mobility and firepower are typically traded off against each other, because the additional weight and complexity required to gain firepower usually causes a decline in mobility.
- <sup>2</sup> Although it is true that specialised armoured units were vulnerable to well-prepared defences such as minefields, anti-tank guns and artillery, the key German insight was that there were occasions the tanks could use their superior mobility to probe weak points in the defence and exploit them for follow-on forces. The French, however, erroneously concluded that the tanks' vulnerability to these defences meant they had to be tied closely with other divisional forces. Robert A Doughty, *Seeds of Disaster: The Developing of French Army Doctrine 1919-1939*, Hamden: Archon (1985).

<sup>3</sup> Today, the desire for accuracy and precise effects has gone beyond the original intent of bombing effectiveness and is instead largely driven by collateral damage concerns, hence the development, for example, of concrete bombs that have a highly-restrained damage radius.

<sup>4</sup> Lucien S. Vandenbroucke, "The Israeli strike against Osiraq", *Air University Review* (Sep-Oct 1984).

<sup>5</sup> Of course, enhanced operational effectiveness and efficiency is by no means a trivial accomplishment, especially for Singapore whose small size and limited resources means that even efficiency gains can have strategic significance.



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MAJ Choy Dawen, a Weapon Systems Officer (C3) by training, is currently a Branch Head in Air Plans Department. Prior to his current appointment, he has been a Staff Officer in the SAF Transformation Office, and a Controller in Air Systems Brigade. MAJ Choy is a SAF (Overseas) Scholar, and he graduated with degrees in BSc (Physics), BSc (Economics), MSc (Physics), and MSc (Political Science) from the Massachusetts Institute of Technology, USA.

# After the Lebanon War

## Perspectives for Stability and Peace in the Middle East

by Dr Christoph Marcinkowski



### Introduction

Not too long ago, King Abdullah II of Jordan alluded to a “threat”, a “Shi’ite crescent” stretching from Iran over Iraq and the Arab littoral of the Persian Gulf region to Lebanon.<sup>1</sup> According to this view, local Arab Shi’ites, such as recently in the case of Lebanon’s Hizbullah, are merely satellites in the orbit of Tehran, thus “potentially illoyal fifth columns”. However, a more differentiated approach can be taken. Within this context, the recent war of Israel against Hizbullah appears to be only *one* facet in a larger picture.

It should also not be forgotten that there has also emerged a significant Shi’ite community in Southeast Asia – and even in Singapore.<sup>2</sup> Most of them are well-educated and well-integrated into the societies of their respective home countries and most of them are able to discern for themselves what is going on in the Middle East. In general,

Shi’ites tend to approach matters of politics more pragmatically, based on the prevailing circumstances. Events in the Middle East are thus also of interest to Singapore, and this is not only from the purely economic perspective of oil supply and prices.

This article therefore seeks to address Hizbullah’s “strategic victory” over Israel, the significance for Lebanon and possible Iranian perspectives before closing with a brief reassessment of recent “Shi’ite crescent” or “Shi’ite danger” theories.

### Hizbullah’s “Strategic Victory”

Israel’s recent invasion of Lebanon and its fight against Hizbullah have not resulted in a victory for the Jewish state. For the first time since the existence of Israel, its armed forces have not achieved their target – the destruction of their enemy’s forces. Hizbullah has emerged stronger than before and the war against

it has cost Israel dearly. In international public opinion, the Israel Defense Forces' (IDF) invasion of Lebanon has resulted in a humanitarian tragedy that has to be considered "rare" even in the context of the history of war-shattered Middle East. Israel's actions have been widely seen as "disproportional".

Perhaps more significant, in the Arab as well as wider Muslim world, the "victory" of Hizbullah over the once considered "invincible" Israeli army has created a certain "optimism" and even "euphoria" that Israel can be overcome on the battlefield. This is something that the conventional armies of the Arab states, including those of the "quasi state" Palestine Liberation Organisation (PLO), had been unable to do so since 1948, the year of the establishment of Israel as a state. In particular, the crushing defeat in 1967, during the "Six-Days-War", had created a paralyzing trauma in the Arab mind. This trauma seems to have now vanished. Well aware of this when he addressed the Syrian Journalists Union in Damascus on 15 Aug 06, Syrian President Bashar al-Assad portrayed Hizbullah's "victory" as a victory of "all Arabs and Muslims".<sup>3</sup>

It is also significant that an ultra-extremist Sunnite terrorist network such as Al-Qaeda had been largely silent when war was still raging in Lebanon, during the fight of the hated Shi'ite Hizbullah against the (equally hated) "Zionist invader". It was only on 27 Jul 06 that Al-Qaeda's number two, Ayman al-Zawahiri, called on Muslims to fight what he called the "Zionist-Crusader war" against the Muslim nation, the *ummah*, referring (indirectly) to the

Hizbullah fighters as "our brothers". Not too long ago, one will recall, in Iraq and elsewhere, Shi'ites were still branded as "infidels" and the "stooges of America and Zionism" by Al-Qaeda and its local offshoots. Some Shi'ite mosques in Pakistan and the worshippers therein have even been machine-gunned by Sunnite extremists. In the long run, however, this kind of recent "differentiation" by Al-Zawahiri may cause some "ideological" problems and "confusion" on the terrorists' "grass-root level" (if we can speak at all of "ideology" or "philosophy" as the guiding forces of a terrorist network).

## The Significance for Lebanon

There exists now a shaky ceasefire that has been violated several times so far, although the exact details of how it was brokered have not been released at the time of writing this article. At any rate, the war has brought no conclusive results for Israel, as Hizbullah has not been defeated on the battlefield. Israel "needs" a victory as its new Premier Olmert had not been able to establish himself and his Kadima party firmly, and hardliners like Likud's Benjamin Netanyahu will be able to take advantage of his "weakness".

With regard to the initial enthusiasm from the mostly Western observers, who have little or no access to the actual situation in Lebanon, for the deployment of the Lebanese army in the Shi'ite-dominated South and Southeast of the country, it would be significant to make them understand that large contingents of the country's armed forces consist of Shi'ites. This circumstance ought to be taken seriously when considering the

prospects for such a “deployment” of Lebanese troops and the denominational loyalties of its members, though it does not mean that a potential Maronite-Christian dominated force would inspire more “confidence” in the Shi’ite South. The increased “Shi’ite factor” in the Lebanese armed forces is mainly the result of developments that took place back in Sep 1991, in the aftermath of the Syrian-controlled end of the Lebanese Civil War back in Oct 1990, when 2,800 members of the Amal militia joined the regular Lebanese army. The Amal Movement (*Harakat Amal*) is the more moderate predecessor of Hizbullah.

Similar to *Amal* in the late 1970s and early 1980s, its somewhat more belligerent quasi-successor Hizbullah can well be considered as the *current* representative of Lebanon’s Shi’ites at large, which forms about 40 percent of the population. Hizbullah is a *social* movement rather than a terrorist organization, thus no “surgical strikes” would be successful. This was painfully experienced by the IDF in the recent conflict. Hizbullah enjoys a firm footing among the local population in the Lebanese South. A “rooting-out” of Hizbullah from its firmly entrenched *Viet Cong* style positions can only be achieved by “ethnic cleansing” of the Shi’ites from the South, which will amount to genocide. It has to be understood that Hizbullah is an integral part of reality in the South. They are no aliens there, unlike the PLO during the horrifying 1982 Israeli invasion of the country. At that time, the PLO has been quite “disliked” by the local Shi’ites, the Amal movement in particular, as their presence in the country used to provoke Israeli military actions in the South. This

“dislike” culminated into what was known as the “War of the Camps”, a sort of sub-conflict within the Lebanese Civil War, in which Palestinian refugee camps were besieged by the Shi’ite Amal militia.

The accounts between Israel and Hizbullah are thus not yet settled. In the short term, there may even be a rekindling of the conflict, a kind of *revanche*. In the worst-case scenario, Syria may be provoked by some “incident” to enter the war in Lebanon. This may also be just an *interwar* period, the prelude to a much more significant showdown. Critics to this view may counter that there are now Lebanese troops as well as UN “peacekeepers” in the South. However, they tend to forget that the majority of the Lebanese troops are mostly of Shi’ite extraction and the “peacekeepers” would be in a precarious situation once hostilities start again. This will also involve the question of “loyalty”, should Hizbullah’s disarmament becomes an issue.

Moreover, Lebanon does indeed need a “holistic” solution. Not one forced upon the country from outside, but rather from within. This “holistic solution” would require the change of its antiquated constitutional and electoral system that is based on disproportional communalism, a system that is in no way representative of the actual situation in the country.

## Syria and the Outcome of the War

Syria, on the other hand, happens to be a country with a large Sunnite majority that is still ruled by a President who belongs to the tiny Alawite Shi’ite minority. Due to this rather precarious

setting, and in particular the inferiority of his forces *vis-à-vis* Israel, President Al-Assad should have no interest in a military escalation. As it is, by “visiting” the presidential residence at the coastal city of Latakia with four IDF fighter jets on 28 Jun 06, Israel had already sent a clear warning to President Al-Assad. The fact that Latakia is situated more than 300 km north of Israel, only about 70 km away from Turkey, is quite revealing of the “capabilities” and state of the Syrian air and naval defenses. A Syrian military involvement in Lebanon would thus ultimately result in the destruction of her forces, the occupation of the country and the establishment of firm control over Iraq’s Western flank by the United States. Although such an outcome would dry out the resistance forces in Iraq and stabilize the country and her government somehow, a further result would nevertheless be the end of Hizbullah and the unrestricted supremacy of Israel over the entire Levant. The solution of the Palestinian issue would then not be a “danger” to be feared anymore. What Sharon did not achieve, Olmert would.

In view of the above, it seems to be of the utmost importance right now for Syria to distance itself from the conflict between Israel and its adversaries in Lebanon on the one hand, and for the Europeans and the United States to refrain from giving *carte blanche* to the Siniora government on the other. As it is, Prime Minister Siniora is already regarded as a “caretaker of the West” by large segments of Lebanese society, not just the Shi’ites. Looking at the massive Dec 2006 demonstrations in Beirut that was aimed at bringing down the Siniora government, one has to take into

account that it was not only organized and attended by Hizbullah and the Shi’ites, but also by several Christian and Sunnite-based groupings. The key of the issue is thus the reform of the Lebanese state and constitution – a heritage of French colonial rule - which favours the rights of minorities, to the disadvantage of the Shi’ite relative majority.

In predominantly Western media, Syria is still widely held responsible for the murder of former Lebanese Prime Minister Rafik Hariri in Feb 2005 and that of Lebanese Christian cabinet minister Pierra Amine Gemayel in Nov 2006. However, no conclusive evidence has surfaced so far. Syrian President Bashar al-Assad has thus far tried all he could to avoid an open conflict with the United States and Israel. In particular, it was the United States that had pressured Damascus to pull out its troops from Lebanon in the aftermath of Hariri’s death. Strangely, it has remained largely unnoticed that Syria has already started to reduce its forces stationed in that country since 2000.



*The site of the bomb blast that killed former Lebanese Prime Minister Hariri.*

Syria’s President may fear that his country might be next on the hit list. Indeed, Syria would be an easy target.

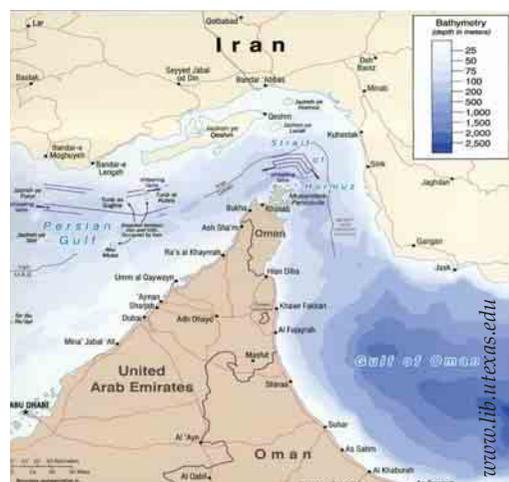
It can be “conveniently” attacked from the Mediterranean, from Israel, and if things do not go as smooth as expected, from Turkey (after all a NATO ally that enjoys a rather strained relationship with Damascus), and not to mention from occupied Iraq. Moreover, Syria has a long desert border with Iraq, and Syria has repeatedly been accused of “not doing enough” to curb “terrorist incursions”. Such a scenario would of course inflame the entire region.

Matters have not been made easier for Syria by the very recent failed attack on the US embassy compound in Damascus. In the media, the perpetrators have been hastily referred to as “Al-Qaeda terrorists”, belonging to a local offshoot referred to as *Jund al-Sham* (Soldiers of Syria). In the aftermath of the attack, Syria (through its embassy in Washington) was quick in expressing its “regret” over the US Middle East policy, which has “fueled extremism, terrorism and anti-US sentiment”. Consequently, Washington should start “looking at the root causes of terrorism and broker a comprehensive peace in the Middle East”.<sup>4</sup> Similar to the Hariri case, the outcome of criminal investigations into the real instigators of the attack would also be of special interest to the political observer.

## Iranian Perspectives

Whether a possible rekindling of the Lebanon conflict would serve as the prelude to a final showdown with Iran remains to be seen. Tehran, Syria’s main ally in the Middle East, and like Damascus, a major sponsor of Hizbullah, may see its only option for survival in a preemptive strike against the coalition forces in occupied Iraq. At the first glance, such a bleak picture might look to some like a figment of

the imagination. However, from the perspective of Iran, its situation appears to be similar to that of Syria. Iran also finds itself encircled by countries that host US military bases, or by countries that are actually occupied by the US and her allies – in the Caucasus, Central Asia, Afghanistan, Iraq, on the Arab side of the Persian Gulf, not to speak of US allies Turkey and Pakistan. As in the case of Syria, Iran may also see creating a *fait-accompli* as its only way out, perhaps by closing the Strait of Hormuz, which would be easier to achieve than an invasion aimed at the “liberation” of Iraq. Aside from Syria, Hizbullah’s “success” against the IDF is also significant to Iran, whose missiles brought about this “success”, and the majority Shi’ites in Iraq. This “success” may cause certain uneasiness among some more conservative regimes in the region, such as Saudi Arabia, Egypt and Jordan. However, as I have argued elsewhere,<sup>5</sup> playing the “Shi’ite card” is only one aspect of the Iranian foreign policy. More significant are Iran’s national and quasi “imperial” ambitions, which are deeply rooted in the country’s past as one of the world’s most ancient civilizations.



*The Strait of Hormuz: The narrow entrance into the Persian Gulf*

In particular, Israel should take seriously the painful lessons it has experienced in the recent war. Its military superiority will not last forever. Al-Assad's speech referred to above should thus be studied more carefully, beyond the usual "anti-Zionist" rhetoric it contains. It will be crucial for the international community to keep in touch with Syria and Iran, and with Hizbullah, as well, for that matter. Neither Tehran nor Damascus would give in to threats. It would be a fatal mistake to wait for (or "sponsor") "popular risings" in either of the two countries; both regimes have profited from the Lebanon "victory".

Now would be the time for Israel to make *real* concessions to its Arab neighbours, such as the restoration of the Golan Heights to Syria and the acceptance on an independent Palestinian State. It should also press for a holistic peace agreement based on the borders of 1967. However, the current situation in the Middle East remains extremely volatile.

## A "Shi'ite Crescent", a "Shi'ite Danger"?

There is another issue that should be of interest when discussing perspectives. According to *The World Factbook*<sup>6</sup> Islam was the second largest religion in 2005. Among them, about 15% or up to 1.5 billion are Shi'ites – the majority of them "Twelvers". Twelver Shi'ite Islam revolves around twelve Imams or leaders of the Islamic community in history. Today, they form the majority not only in Iran (about 90%), the Republic of Azerbaijan (about 75%), and Iraq (about 60-65%), but also in Bahrain (more than 60%), which nevertheless has a Sunnite head of state. In Lebanon, the *Twelvers* constitute more than 40% of the population, the largest single religious group in the country. There are also large minorities in Qatar (about 20%), Afghanistan (about 19%), Pakistan (about 20% of the total population, especially around Lahore), Tajikistan (about 5%), and India (especially in Oudh, Lucknow, and Hyderabad). They are also found in



*Distribution of Islamic communities in the world*

large numbers in Kashmir (in both parts of the Indian and Pakistani-occupied areas) and in the eastern, oil-producing Persian Gulf regions of Saudi Arabia, where they are the majority (11% of the kingdom's total population).

The initially referred to statement by Jordan's King Abdullah aroused the anger of the Shi'ites in the Arab world. According to the king, the region is in "danger" of being dominated by Shi'ism *à la iranienne*, somewhat similar to the rather simplistic "logic" expressed by Pepe Escobar in the Asia Times that "70% of the world's oil reserves are in the Persian Gulf equals to 70% of the Gulf's population is Shi'ite".<sup>7</sup> Remarks such as that of King Abdullah, not to mention Escobar's rather foolish statement, stigmatize an entire religious community.

As I have argued elsewhere,<sup>8</sup> Shi'ism's theological differences with Sunnism, as well as its experiences as a persecuted minority throughout Islamic history, contributed to its character as a rather politically *non-assertive*, although not necessarily pacifist, movement. The post-1979 developments in Iran are exceptional within the course of Shi'ism. Shi'ism, and Twelver Shi'ism in particular, had taken a rather quietist stance in the past and continues to be so under scholars such as Ayatollah Sistani or his predecessor Ayatollah Khomeini. From the perspective of Shi'ite political thought, Iran's current political system of the "Guardianship of the Jurisprudent" (Persian: *velayat-e faqih*) also has no legitimate claim of being the *only* acceptable form of government. As it is, Iran's unsuccessful Constitutional Revolution of 1906, a unique contribution

to modern political discourse and practice that tried to combine parliamentarism with Islamic notions of government, has demonstrated that several alternative options for an appropriate Islamic form of government, based on the requirements of the time do exist. With regard to more contemporary times, the example of Azerbaijan, a former Soviet republic, inhabited predominantly by Shi'ites, has shown that a theocracy *à la Khomeini* does not necessarily follow upon a political vacuum. Azerbaijan followed the Turkish example and is now a secular republic. In view of this, I would argue that Shi'ites in Iraq or in the oil-producing Gulf coast of Saudi Arabia should not be labeled as stooges of Iran. They have their own Arab cultural identity and historical experiences.

Nevertheless, it is true that perhaps for the first time in the course of history, Shi'ites seem to be able to master their own destiny after centuries of suppression or rule by minority regimes. To my mind then, it is vital to keep in touch with Tehran and Damascus. Whether that would be possible under the *present* US administration is rather doubtful. The development of the "nuclear issue" should definitely be monitored. However, the issue is not so much that of the emergence of another "Islamic nuclear power" Iran. The issue is more the Iranian/nationalist rather than Iranian/Shi'ite-Islamic hegemonic approach to the region, an approach that predates even the Islamic period of Iran's history, going back to the pre-Islamic Sassanid dynasty and beyond.<sup>9</sup> It is this "Iranian nationalism" which seems to repel other Gulf countries, and many non-Iranian Shi'ites. Iran should thus be *integrated* rather than

*isolated*, in particular within the regional framework. From their experiences with former British and Czarist Russian attempts to colonize the country, Iranians resent being bullied and desire their country to be treated as a major power itself. Once they have been given respect, the situation should ease.

### “Fear Not the Shias”

With regard to Iraq, it would be vital that the country preserves its unity and territorial integrity as a unified country. Iraq has always been one of the centres of Islamic civilization. It is crucial to get rid of the insurgence as well as the foreign troops in the country. A post-insurgency solution should certainly also involve Iraq’s neighbours, in particular Iran. Iran’s legitimate security concerns are independent from who rules in Tehran. Iran would need security guarantees especially from the United States if it was to play a *constructive* part in what is known in the West as the “nuclear crisis”.

The end of the *de facto* war in Iraq could also have several positive aspects beyond the Persian Gulf region that are not necessarily connected to security. In the Shi’ite seminaries in Najaf and elsewhere, the liberation of Iraq from the yoke of Saddam – and *liberation* it was indeed – has also opened the possibility for a revival of intellectual life, as reflected in classical Islamic scholarship. Shi’ite Islam always had a close affinity to philosophy and rational thought, which often set it apart from the rather legalistic Sunnism. This revival should be open to the challenges and opportunities offered by modernity. As Iraq is a predominantly Arab country,

a general revival of Islamic intellectual thought there could also have positive results in the Sunnite Arab world at large. Progressive Islamic thought and learning, based on the classical heritage, could thus also function as a stimulator for moderation, a stimulator that might be of more relevance to the wider Muslim public than the uncritical introduction of ideas that are yet perceived as alien.

I would like to give the last word to Stephen Schwartz, director of the *Islam and Democracy Program* at the Washington-based non-partisan think-tank *Foundation for the Defense of Democracies*. In a remarkable article entitled “Fear not the Shias”, he argues in favour of a somewhat more supportive wait-and-see attitude with regard to the experiment of a majority-Shi’ite government in Baghdad from the part of the West. He stated that,

“[u]nlike the Saudi Wahhabis, Shia Muslims have never sought to impose their dispensation on the whole of the Islamic world community; nor have they attempted to impose theological conformity within their own ranks. Their tradition recognizes the rights of minorities, because they have always been a minority, and esteems differences in opinion, because their very existence arises from controversy and debate. In Iran, Shia Islam took an anti-Western direction that had more to do with the history of the Iranians and their relations with Britain and the United States than with their understanding of Islam. Elsewhere in the Islamic world – in places like Pakistan, Saudi Arabia, and the Albanian lands – Shias are best known for their commitment to education, enlightenment, the liberation

of women, social justice, progress and, most important, independence of thought, or *ijtihad* [i.e., “independent legal reasoning”, C.M.].”<sup>10</sup>

#### Endnotes

- <sup>1</sup> Robin Wright and Peter Baker, “Iraq, Jordan See Threat To Election From Iran. Leaders Warn Against Forming Religious State,” *Washington Post* (online edition) (December 8, 2004), pA01, available online at <http://www.washingtonpost.com/wp-dyn/articles/A43980-2004Dec7.html> (accessed on September 12, 2006).
- <sup>2</sup> See my forthcoming *Shi’ite Islam in Southeast Asia. Basic Concepts, Cultural and Historical Aspects, Contemporary Implications*, and my forthcoming “Facets of Shi’ite Islam in Contemporary Southeast Asia (I): Malaysia and Singapore,” *IDSS Working Paper* (Singapore, Institute of Defence and Strategic Studies), forthcoming online at [www.idss.edu.sg/publications](http://www.idss.edu.sg/publications).
- <sup>3</sup> Syrian Arab News Agency (SANA), ed., “Speech of President Bashar al-Assad at Journalists Union 4th Conference, August 15, 2006” available online at <http://www.sana.org.sy/eng/21/2006/08/15/pr-57835.htm> (accessed on September 12, 2006).
- <sup>4</sup> Sam F. Ghattas, “Syrians Fight off Attack on U.S. Embassy,” *Associated Press*, September 2006, available online at [http://hosted.ap.org/dynamic/stories/S/SYRIA\\_EMBASSY\\_ATTACK?SITE=AP&SECTION=HOME&TEMPLATE=DEFAULT](http://hosted.ap.org/dynamic/stories/S/SYRIA_EMBASSY_ATTACK?SITE=AP&SECTION=HOME&TEMPLATE=DEFAULT) (accessed on September 13, 2006).
- <sup>5</sup> See my forthcoming “Between “Shi’ite Crescent” and Imperial Ambition: Islam and Nationalism in Iran’s Resurgence as a Regional Power,” *IDSS Commentary* (Singapore, Institute of Defence and Strategic Studies), forthcoming online at [www.idss.edu.sg/publications](http://www.idss.edu.sg/publications).
- <sup>6</sup> Central Intelligence Agency, *The World Factbook*, available online at <http://www.cia.gov/cia/publications/factbook/> (accessed on September 12, 2006).
- <sup>7</sup> See Pepe Escobar, “The Myth of a Shiite Crescent,” available online at [http://www.atimes.com/atimes/Middle\\_East/GI30Ak01.html](http://www.atimes.com/atimes/Middle_East/GI30Ak01.html) (accessed on September 12, 2006), where he also – even more nonsensically – wrote “As an eschatological - and revolutionary – religion [sic], fueled by a mix of romanticism and despair, Shi’ism cannot but provoke fear, especially in hegemonic Sunni Islam”.
- <sup>8</sup> See my “Twelver Shi’ite Islam: Conceptual and Practical Aspects,” *IDSS Working Paper No. 113* Singapore, Institute of Defence and Strategic Studies, (June 2006), available online at [www.idss.edu.sg/publications](http://www.idss.edu.sg/publications) (accessed on September 12, 2006).
- <sup>9</sup> See A. Shahpur Shahbazi, “Sasanian Dynasty” and Daniel T. Potts, “Persian Gulf in Antiquity,” both available online at <http://www.iranica.com/newsite/> (accessed on September 12, 2006).
- <sup>10</sup> S. Schwartz, “Fear not the Shias,” *The Weekly Standard*, Vol. 8, issue 27, (March 23, 2006) available online at <http://www.weeklystandard.com/Content/Public/Articles/000/000/002/361ssuxr.asp> (accessed on September 12, 2006).



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# Armoured Warfare in Urban Operations

by MAJ Patrick Foo Peng-Kang

*“One thing remains clear, that every technical means of combat – tanks included – must be developed to the farthest limit of its potential. It follows that we should not restrict our opportunities out of a regard for tradition...What we carry from the past must be developed farther, and if necessary changed, by the possibilities which now lie before us.”*

*General der Panzertruppen Lutz, 1937<sup>1</sup>*

## INTRODUCTION

The conflicts that erupted since World War Two often involved fighting in urban terrain, as seen in the Korean and Vietnam Wars, Lebanon, Bosnia and Somalia. This article examines the growing worldwide trend of urban fighting, and what it implies to armoured forces if they are to stay relevant and efficient and able to deliver effectively in urban offensive and non-offensive operations.

## EVOLUTION OF ARMoured WARFARE

In the history of warfare, many militaries have tried to look for ways to provide their soldiers with better protection and survivability for them to march into battle, close in and destroy the enemy. Decorations featuring heavy four-wheeled battle carts with spear throwers and javelin quivers were found

on artefacts dating back to 3000 B.C.<sup>2</sup> In 305/304 B.C., Demetrius Poliorcetes of Macedon ordered the construction of huge iron-plated siege engines named *Helepolis* (meaning Taker of Cities), for the siege to the city of Rhodes. Later, the Assyrians created moveable barriers to protect their archers, while the Roman Empire constructed catapults built into shielded towers. The Middle Ages also saw the Poles and Czechs using wheeled metal-plated war-wagons for mounted combat.<sup>3</sup>

All these early ideas and experiments centred on the then common tactic of laying siege to enemy towns and fortresses, and were not concerned with manoeuvre warfare. However, the advent of the Industrial Revolution changed all that. Advances in military technology led to the fielding of the machine gun and hand grenades, which in turn caused catastrophic losses to the Napoleonic massed infantry tactics. As a direct response, the infantry dug into strong defensive positions, culminating in the great stalemate of trench warfare in World War One. The need to break the domination of trenches and machine guns over the battlefields of the Western Front led to the birth of modern armoured warfare when the British combined tractor tracks with weapons mounted in turrets to create the Mark I tank. When a later version of the Mark I was cut in half and had

its hull lengthened by six feet to house a squad of infantry, the first armoured personnel carrier (APC) was created.<sup>4</sup>



*A tank in World War One*

## DIVERSE EMPLOYMENT OF ARMOUR

Despite armour's successes towards the end of World War One, especially the promise of hitherto unsurpassed tactical mobility used in the offensive, military leaders then could not agree on the importance of armoured vehicles and their role in future warfare. Several nations experimented with armoured forces, but only the Germans developed the combined arms division, built around tank regiments. Comprising tanks, motorised infantry, towed artillery, engineers and reconnaissance elements, these combined arms divisions were the most potent offensive formation during the early part of World War Two, and were key to the quick collapse of Poland and France.

Armoured doctrine started to diversify in World War Two with the employment of armoured vehicles in a variety of operational environments. Through the jungle tracks of Malaya (1941), General Yamashita used armoured forces with light infantry to great success. Marshal Erwin Rommel was famed for his deep attacks in the North African desert (1942) and

Marshal Georgii Zhukov crushed much of the Nazi army on the rolling hills and corn fields of the Eastern Front at Kursk (1943).<sup>5</sup> In World War Two, forty percent of battles fought in Europe were in urban areas and armour urban operations emerged, most notably with the Battle of Stalingrad in 1942.<sup>6</sup>

## INCREASING URBANISATION

Since World War Two, other conflicts which spilled over into towns and cities include the Korean and Vietnam Wars, Bosnia, Somalia and Lebanon (in 1982 and most recently 2006). It seems that future conflicts will increasingly feature urban operations as the *modus operandi* due to four factors.<sup>7</sup>

First, there has been rapid and extensive urbanisation at a global level. Forty-eight per cent of the world's population lived in urban areas in 2003. It is projected to exceed the fifty percent mark by 2007 and expected to rise to sixty-one percent by 2030.<sup>8</sup>

Second, due to a dichotomy of military power, an overmatched and technologically inferior enemy will search for a battlefield that forces his opponent to fight in a complex and chaotic urban setting. This provides the best chance of neutralising the latter's advantages in mobility, command and control, intelligence and standoff weapons. It also capitalizes on the tight constraints on conventional forces to limit non-combatant casualties and damage to infrastructure and cultural sites.

Third, there has been an increasing focus on using the military for humanitarian missions. Overpopulated and impoverished Third World cities may encounter famine, disease, natural

disaster or civil unrest that could require military involvement. Such missions could also involve peacekeeping and peace enforcement operations.

Finally, urban operations are necessary as they involve the control of strategic locations. Urban centres are often located at intersections of roads, railways and rivers, and near to industrial zones and transportation hubs. Cities are the social, political and economic hubs of countries. The seizure of key installations, routes or even personnel would frequently involve urban combat.

## LIMITATIONS OF ARMOUR IN URBAN OPERATIONS

Given that the majority of the tanks built in the Cold War era were designed to fight on relatively open terrain with long-range weapons, and not within the confines of an urban terrain, a number of military theorists have forecasted that with increasing urbanisation, the demise of tanks is inevitable. It has been said that tanks are not suitable for the urban fight as the advantages of armour have been negated by the claustrophobic environment in towns and cities. Urban terrain obstructs line-of-sight and allows enemy infantry numerous possibilities for remaining undetected. This results in extremely short-range encounters, increasing the dangers of fratricide from artillery or air support. Within a dense urban setting, the capabilities of high-tech, long-range weapons are nullified. The falling trajectories of conventional artillery and air support weapons may limit their usage within a high-rise urban area. Aircraft flying in support are also subject to low-cost man-portable

surface-to-air missiles (SAMs) and rocket-propelled grenades (RPGs). Manoeuvre within urban settings is also restricted to the road network. Streets divide units and limit frontage. Most importantly, because routes of advance are entirely predictable, the defender can easily position ambushes.<sup>9</sup>

The Russian Army learned this lesson the hard way in Chechnya, where only eighteen of 120 armoured vehicles in the 131<sup>st</sup> Brigade survived the 31<sup>st</sup> December 1994 attack on Grozny.<sup>10</sup> As an antecedent to the 'thunder runs' in Operation Iraqi Freedom, the brigade commander was told to drive straight into the city to take advantage of low resistance. However the Chechens, consisting mostly of ex-Soviet Army personnel, were motivated, well-trained and well-organised and executed coordinated ambushes on the armoured convoys. The Russian disaster was largely the result of poor tactics, a lack of command and control, inadequate training and vehicles that were poorly adapted to fighting in urban alleys.

More recently, the U.S Army deployed Stryker Brigades in Iraq. Stryker Brigades were designed for deployment to any part of the world within ninety-six hours via C-130. Unlike heavy tanks or infantry fighting vehicles (IFV), the Stryker is a medium-weight, eight-wheeled vehicle that carries eleven soldiers and weapons at high speeds and draws on the Army's latest communications and intelligence assets. The Stryker was designed to withstand enemy weapons of up to 14.5mm (heavy machinegun bullets). However, when the RPG emerged as the Iraqi insurgents' weapon of choice,

slat armour resembling a bird cage was mounted around each vehicle to prevent penetration of the hull. According to a 2005 US Army report, this add-on-slat armour adding three tonnes to the vehicle weight and three feet to the width created a host of problems, despite being effective against only half of RPG attacks. Examples of problems created include an increased tendency to overturn, strain on the existing engine and transmission, and a loss of mutual towing capabilities.<sup>11</sup> Thus, as the Stryker was never designed to be a front-line fighting machine, its functional capability and credibility to dominate the urban fight leaves much to be desired.



*A Stryker with slat armour*

The latest Israeli-Hizbullah conflict in Lebanon confirmed that main battle tanks (MBTs) with advanced armour can still be penetrated by the latest generation anti-tank guided missiles (ATGMs). This came as little surprise to many within defence industry circles, who had long known of the penetration capabilities of current state-of-the-art ATGMs.<sup>12</sup> During the 1973 Yom Kippur War, Russian-made “Sagger” ATGMs achieved a sixty percent penetration rate on Israeli Defense Force’s (IDF) US-made MBTs.<sup>13</sup> When the Merkava

Mk 1 MBT was introduced during the 1982 Lebanon War, the penetration rate was reduced to forty-seven percent. The recent conflict witnessed the Hizbullah using third-generation Russian and Iranian ATGMs with tandem warheads to achieve an impressive forty-five percent penetration rate against IDF Merkava Mk 2, 3 and 4 MBTs. However, both active and retired IDF armour officers claimed that this high penetration rate was largely the result of poor tactical employment of the MBTs, in isolated and unsupported small tank formations.

## ARMOUR – KEY TO URBAN OPERATIONS

Despite the perceived constraints of tanks in an urban environment and more than a decade after the end of the Cold War, the demise of armour did not take place as many military theorists had predicted. On the contrary, recent conflicts and peacekeeping/peace-enforcement operations seemed to have reaffirmed the importance of armour in urban operations. In Bosnia (1994), Leopard tanks fielded by Denmark earned the respect of Serb militiamen and were the decisive intimidators in several confrontations.<sup>14</sup> During the siege of Beirut (1982), the tank was judged to be the single most valuable asset for suppressing enemy fire.<sup>15</sup> Stability and support operations have also been more lethal than expected, as exemplified by the need to rush two companies of heavy tanks and three companies of IFVs to Somalia in October 1993 to protect infantry from heavily armed bandits.<sup>16</sup> During the recent Lebanon conflict, often without the conventional armoured vehicles as

targets, the Hizbullah adapted by firing hundreds of ATGMs, but ironically claiming more casualties by firing at buildings occupied by IDF infantry and infantry formations.<sup>17</sup>

In a review of armoured forces in Operation Iraq Freedom, Gordon and Pirnie found that armoured vehicles are highly successful in urban operations for four reasons.<sup>18</sup> Firstly, tanks and IFVs are highly resistant to fire – In Iraq, the British claimed that one Challenger MBT near Basra absorbed fifteen RPG hits without suffering penetration. American tanks and IFVs repeatedly sustained volleys of RPG and IED hits that dismounted soldiers and other light skinned vehicles would not have sustained. Secondly, tanks and IFVs are the logical choice for leading the advance. Armoured vehicles are essential because situational awareness (SA) regarding enemy forces is generally poor below the brigade level. With the impossibility of maintaining full real-time intelligence on the insurgent forces and the added complexity of the insurgency inter-mingling with the civilian population, tanks and IFVs are the weapons of choice for “movement to contact”. It is observed that an inverse relationship between force protection and SA exists; in circumstances where SA is poor, strong armour protection is needed. It is found that the best and often “the only way of countering weapons fired from covered and concealed positions is to absorb the hit, identify the source of the fire, and respond with massive overwhelming firepower”.<sup>19</sup> Thirdly, unlike artillery and aircraft which require a longer response time to engage the enemy, tanks and IFVs

can respond immediately to enemy fire. Infantry with the 3<sup>rd</sup> Infantry Division and 1<sup>st</sup> Marine Division were rarely required to fire their anti-armour weapons because the armoured vehicles were always quick to return fire. Lastly, tanks and IFVs are highly effective in urban operations – In Operation Iraqi Freedom, they led most advances into Iraqi cities and adopted a variety of tactics and task organisations to effectively deal with changing conditions. Purely dismounted infantry or even Strykers could not match the firepower, shock effect, tracked mobility and protection of tanks and IFVs. Low casualty rates can be directly attributed to the usage of these systems.

## EVOLVING TO FIGHT THE UO

Many modern militaries seem to have re-discovered the important role which armoured vehicles play in an urban setting and are busy experimenting with technological enhancements or operational concepts to further push the capability of armour operations in urban terrain.

### Interim Measures

As an interim measure, urban modification kits can be developed to adapt existing tank and IFV fleets for urban operations. Innovations in protection, classified as Active Protection Systems (APS) can be fitted onto existing tanks and IFVs. One such system is the Israeli Trophy APS, which was specifically designed for safe operation in an urban environment, where armoured vehicles work in close proximity to dismounted infantry. This system is able to detect and launch

directed and focused countermeasures to intercept the incoming threat with low collateral damage, and relatively low risk to nearby troops.<sup>20</sup>

Tanks and IFVs can also be fitted with RF-jamming devices. One such device is Warlock, which is designed to send out a broad-spectrum signal that will prematurely detonate, delay or prevent detonation of the trigger/firing mechanism of IEDs. These devices have been found to be fairly effective in Iraq and Israel.<sup>21</sup> Panoramic video camera systems can also be mounted on vehicles. 360-degree omni-directional panoramic cameras, being tested on French Leclerc “Azur” MBTs, enable the driver to drive in reverse without additional guidance.<sup>22</sup> Automatic motion detection capabilities are also built into these video systems, detecting and alerting the crew to potential threats as they emerge. Unique modification kits have also been added to the Israeli Merkava Mk3 and Mk4 MBTs, whereby a firing hatch and observation window is fitted in the rear access door, for a sniper or sharpshooter to cover the rear from within the tank. Selected models have their turrets replaced with armoured boxes with bullet-proof glass. This modification allows Vehicle Commanders to roll into hostile neighbourhoods and yet have 360-degree visibility without exposing themselves to enemy fire.<sup>23</sup>

Battlefield Management Systems (BMS) can dramatically improve the tank and IFV crew’s SA, especially when conditions call for “buttoning up” (operating with closed hatches). BMS

also reduces the possibility of fratricide and allows for more efficient command and control. Such systems are already standard-issue in some of the latest tanks and AFVs – the US FBCB2 can be found in the latest M1A2SEP tanks and M3A3 IFVs, and the Bowman Tank Digitization Program, has been implemented in the British Challenger II.<sup>24</sup> A variety of multi-purpose munitions can be developed specifically for urban operations. Examples include the XM1028 round, which can be fired at buttoned-up friendly vehicles that are surrounded by enemy infantry, without damaging the vehicle, antennas or optics. In situations where restrictive rules of engagement apply, specially developed less-than-lethal ammunition, such as flashbangs or tear gas (CS) canisters can be used.<sup>25</sup>



*Source: Pioneer*  
*With the BMS, commanders can have better command and control of their troops and share information more effectively.*  
*A Battle Management System can dramatically improve Situational Awareness.*

## Evolved Tactics, Techniques and Procedures (TTPs)

Current doctrines on armour operating in urban terrain should be reviewed and revised to allow for flexibility in TTPs. The distinctive terrain in different urban settings, multiplied by the differing capabilities of various threats, makes each urban operation unique.

Armoured forces operating in Al Tharwa (Sadr City) and An Najaf in 2004 during an uprising of Muqtada al Sadr's militia rapidly adapted new TTPs to deal with the emerging threat located in various forms of urban terrain. In the commercial grid of Al Tharwa, the 'box' formation was found to be an effective means of advance. In northern An Najaf, the 'combined arms patrol' was found to be the best means of clearing the irregular patterns of the old city and cemetery blocks. Within the narrow residential road grid of southern An Najaf, the 'lane attack' was developed to maximise the capabilities of the vehicles' armour packages and independent sights and minimise the limitations of weapon elevation and traversal. The armour packages of the M1-series tank and M3A3 IFV ensured the success of these TTPs in attriting enemy forces in Al Tharwa and An Najaf. These vehicles had the armour to render the enemy's primary weapons systems (IED and RPG) irrelevant, and the capability to protect their crew and cargo. However, these same techniques, used with lighter skinned vehicles, would not have survived the initial contact.<sup>26</sup>

Other than tactics, a training gap (with regard to the facilities and doctrines for training the armoured force to fight in urban settings) seems to have emerged. This training gap needs to be addressed systematically, at all levels of planning and execution ranging from tactical to strategic. For example, at the tactical level, armoured crew need to train in urban settings to know the effects of their weapons against urban targets. Tank and IFV live-firing training could include urban targets such as cars, urban fortifications and elevated targets.<sup>27</sup> In

terms of force composition, forces that have already organically task-organised with tanks and IFVs at the company level, and scouts, engineers and artillery at the battalion level are well-poised for urban operations. As part of the military transformation effort, the force of the future requires flexible and yet survivable combined arms units. These units must be able to operate in less-than-optimum conditions, to fight for information and force the enemy to reveal his intentions. They must be able to rapidly oscillate within the full spectrum of operations, ranging from combat operations to peacekeeping. To successfully operate in the complex urban environment, these units must leverage on the mobility, countermobility and survivability skills of engineers, and the vital psychological/human skills of psychological operations (PSYOPS) and civil affairs (CA).<sup>28</sup>

## Long Term Evolutionary Considerations

From a longer term view, lessons could be learnt from the both the Russian Army and the IDF, which have over many years of conflict, constantly adapted to changes in terrain and threat profiles with innovative and practical solutions. In high threat environments, both the Russian Army and the IDF deploy their most heavily armoured vehicles, including their third-generation MBTs and infantry fighting vehicles (IFV) based on MBT hulls. These vehicles were all designed and modified indigenously in response to lessons learned from their previous conflicts.

The Merkava MBT series is a good example of innovative and yet constantly

evolving tank design, where the characteristics of firepower, protection, shock effect, flexibility and mobility are brought to a new level. The unparalleled focus on crew protection and survivability led the Merkava designers to resist conventional design. Instead, the engine is positioned at the front of the tank as a secondary level of armour against frontal fire. Increased flexibility and mobility is achieved by adding a rear door and troop carrying space at the rear of the Merkava, enabling the crew and additional infantry troops to mount and dismount safely from the rear of the tank. This feature also enables the Merkava to be used as an armoured ambulance to recover wounded personnel under direct enemy fire. Despite the bad press received from high rate of penetration by third-generation ATGMs, the Merkava MBTs did actually provide improved protection for their crews. In 1973, the IDF saw an average of two crewmen killed in each penetrated US-made MBT. The introduction of the Merkava Mk 1 in the IDF's 1982 Lebanon campaign reduced this figure to 1.6 crewmen dead per penetrated MBT.<sup>29</sup> The latest conflict utilising newer versions of the Merkava have seen this figure drop to one dead per penetration. It is most certain that more analysis from this and future conflicts will result in more evolutionary changes to Israeli armoured vehicles.



*An Israeli Merkava tank*

Following their Grozy debacle, the Russian Army found that it was their ZSU-23-4 'Shilka' self-propelled quadruple 23mm air-defense cannons that proved to be very effective in suppressing ambushing enemies in complex urban terrain. With their high rate of fire and angle of elevation, the 'Shilka' could engage higher floors of multi-storey buildings with an aggressive volume of fire. However, the 'Shilka' was not adequately protected with heavy armour to survive heavy arms fire. This led to the production of a brand new class of vehicle known as the Tank Assistance Combat Vehicle (TACV), which the Russians claim can improve combat efficiency by thirty percent, by engaging all secondary and close-combat targets, allowing the MBTs to focus on other targets.<sup>30</sup> Known by its designation, BMP-T, it is based on the T-72 MBT chassis and is fully protected by an armour suite identical to that of an MBT, enabling it to move as part of the armour formation into hostile territory. Instead of a main gun, it is armed with a firepower array specifically designed for urban and close combat that includes two 30mm cannons, a coaxial 7.62mm machine gun, four AT-9 ATGM and/or Igla SAMs and two 30mm automatic grenade launchers. The cannons and grenade launchers can be operated independently, and have a high elevation of forty-five degrees, enabling it to engage separate targets, and targets at rooftops and high floors.

For tanks and IFVs, the future ahead holds out a variety of desired capabilities. A dominance of platforms with modular designs may emerge. Turrets, cupolas, weapon stations and even armour plating will be designed so that they can be swapped between missions.

Weapon stations specifically designed for urban operations are expected to sport features such as improved elevation and depression, and automatic slew-to-cue capabilities. Modularity will allow the commander to customise his capabilities to suit the requirements, and will facilitate combat damage repair. In the long term, modularity will ensure that tanks and IFVs will remain relevant in any operation, despite changes in tactics or technology.<sup>31</sup>

## CONCLUSION

Armour has historically been a force that evolves to meet new threats and tactics head-on. Trends indicate that the likelihood of urban operations is increasing in the future. Evidence has shown that, with simple modifications, armoured forces can still excel in urban operations, as part of a combined arms team that includes infantry, engineers, artillery, signals, air support, civil affairs (CA) and psychological operations (PSYOPS).

An institutional look must be taken on what it takes for armoured forces to be relevant, efficient and effective in urban operations as well as in other types of terrain. This requires examination and adaptation of existing doctrine, operational tactics, technology, logistics and training. A new balance has to be struck and a new configuration formulated to meet the requirements of urban and other terrain conditions. From developments shown in the recent past, it is clear that the paradigm shift has already begun, and the new realities of increasing urban operations cannot be ignored. ☹

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# Evolution of Modelling and Simulation in the Singapore Armed Forces

*by Mr Victor Tay Su-Han*

## ABSTRACT

The Singapore Armed Forces (SAF) has been capitalising on Modelling and Simulation (M&S) technologies for its simulation and training systems since the early 1980s. The primary focus in the initial years was on the training of soldiers, operators, gunners, pilots and commanders as individuals, or as members of combat teams.

Over the years, the SAF has forged ahead, harnessing M&S for areas beyond training, including operational mission planning and rehearsals, decision support, as well as test and evaluation. In recent times, M&S has also become an essential technology and tool for military experimentation.

This article traces the evolution of M&S in the SAF, and provides a view of changing M&S landscape with each successive wave of technology advancement. It also provides an assessment and forecast of nature M&S systems in the future.

## INTRODUCTION

The impetus for using M&S systems in many armies has traditionally been driven by the need to overcome various constraints, such as the lack of training areas, rising costs in

conducting actual training and the fact that equipment for training are sometimes unavailable. For the SAF, the situation is no different.

In fact, the SAF faces even more acute constraints in resource-scarce Singapore. After all, the ‘little red dot’ measures just 699 square kilometres<sup>1</sup>, faces falling birth rates<sup>2</sup> and has to grapple with issues affecting the region. These have included the Asian financial crisis, the “dot com” bust and the SARS epidemic.

So what better way to overcome these constraints than to employ M&S technologies to conduct training in virtual space? With M&S technologies advancing by leaps and bounds over the last decade, such a solution is not only increasingly viable as a key strategy for the SAF; it has also become strategically advantageous, enabling the SAF to turn constraints into strengths.

Besides simply increasing the opportunities for training and enhancing its quality and realism, the SAF has also harnessed the power of M&S for purposes beyond training. Specifically, the technology has been capitalised on for operations such as mission planning and rehearsals, and decision support, and for test and evaluation purposes.

More recently, arising from the need to transform the SAF to meet new challenges in the battlefield of the future, M&S has also become an essential driver and indispensable technology for military experimentation in the support of force transformation.

This article traces the evolution of M&S in the SAF in three waves of development since the 1980s.

### THE FIRST WAVE – The Embryonic Years (1980s to early 1990s) Early Achievements

The SAF’s first foray into M&S began in the early 1980s. This era of standalone simulations was fuelled by the emergence of graphics and Image Generator (IG) technologies, which developed in tandem with the advancement in computer and display technologies.

The maturity of two-dimensional (2D) graphics enabled the development of the shore-based Tactical Training Centre for the Republic of Singapore Navy (RSN). Tactical scenarios were simulated and presented in monochrome 2D graphical symbology to train ship commanders in various tactical decision-making situations.

Soon after, 3D IGs began to emerge. For the first time, the real world could be replicated graphically in a synthetic 3D environment to a degree of realism acceptable for training.

This quickly led to the development and delivery of various types of flight simulators for the Republic of Singapore Air Force (RSAF) to train pilots for its fleet of A4S and F5Es, as well as the AS332 and AS550 helicopters.

For the Army, the Artillery Fire Control Training System (AFCTS) was the first training system. Delivered in 1983<sup>3</sup>, the AFCTS was used to train forward observers in call-for-fire and artillery ranging procedures. The system comprised a projection system made up of eleven slide projectors to simulate and display the delivery and impact of artillery fire.

The Army’s first simulator to exploit 3D graphics in a significant way was the Armour Tactical Trainer (ATT). It was delivered in 1989 to train armour commanders and gunners of the AMX-thirteen tank in gunnery as well as crew co-ordination skills. Historically, the ATT marked the beginning of a new era in 3D simulators for the Army.

### Technology Driver – Graphics and Image Generator Technologies

The principal technology driver of this first wave of M&S systems was the emergence of Graphics and IG technologies (Figure 1).



Figure 1. Typical 3D image generated by IG

IGs then were ‘custom-made’ and proprietary in nature. The run-time graphics software for scene management

and displays were uniquely developed in-house by the few major simulation system vendors or by niche IG manufacturers.

One popular model used, for instance, was General Electric’s (now Lockheed Martin) CompuScene IG. This IG, which was utilised in the ATT system, was huge, filling almost an entire room (Figure 2).



Figure 2. Proprietary IG used in the ATT

### Characterising the First Wave

The first wave can be characterised by the deployment of simulators, which were generally standalone and single-purpose. Most were focused on honing the psychomotor skills of individual operators such as gunners and pilots prior to ‘live’ training.

### THE SECOND WAVE – The Fledgling Years (Mid 1990s to 2000)

The M&S industry matured considerably in the 1990s - the second wave. Spurred by the advent of broadband networking, ‘Distributed Networked Simulation’ was the rallying call, and the focus shifted rapidly from standalone training to team training and joint or integrated warfare training.

The global simulation industry responded with great enthusiasm. New technologies and concepts soon emerged, enabling geographically-separated simulators to be networked for joint training in common synthetic environments, as if they were a single simulator. It was this era that gave birth to distributed simulation protocols. In addition, Computer-Generated Force (CGF) technology progressed, facilitating intelligent automated behaviour of simulated entities that reduced the need for large teams of exercise support personnel to ‘move the pieces’.

### Vision for SAF Simulation 2000

Recognising the immense potential of M&S, the SAF formulated and launched a major programme called the Vision for SAF Simulation 2000 (VSS2000) in 1995 to capitalise on the rapid M&S technology advancement.

VSS2000 envisaged the strategic use of SAF simulators in three dimensions, i.e. Joint Training, Operations, and Test and Evaluation (T&E) (Figure 3). The main emphasis was on joint training through integration at both the systems level, i.e. simulation-simulation and simulation-operational systems integration, and the Services level.



Figure 3. VSS2000 Thrusts

This ambitious programme resulted in a series of major M&S implementations in the SAF from the mid 1990s. In fact, the VSS2000 roadmap saw the realisation of some ‘first-of-its-kind’ training systems then, along with several innovative M&S concepts.

### Notable Achievements

The Army operationalised a constructive wargaming system called SIMulation for LAnd Battle (SIMLAB) (Figure 4), which facilitated HQ command and staff training at different command levels, from Battalion to Division. Besides command-team training, the system also proved to be a useful tool for exploratory studies of different force structures, and for evaluation of new platforms and weapon systems.



Figure 4. SIMLAB

The other notable simulators that facilitated integrated team training in the Army are the Driver Training Simulation System (DTSS) and the Armour Gunnery Tactical Simulator (AGTS). Both were fielded in the late 1990s.

The DTSS (Figure 5) is a full motion-based driving simulator comprising eight Land Rover stations and eight Iveco Truck stations. It enables SAF drivers of these vehicles to learn and master driving skills on various road conditions, which include some of Singapore’s local estates

and terrain such as Ang Mo Kio, Bukit Batok and Pulau Tekong. In addition, all sixteen stations are networked to provide capability for convoy training in a common virtual environment.



Figure 5. Driver Training Simulation System

The AGTS is another unique team-based simulation system. Besides training soldiers in individual gunnery skills, its six visual crewstations are integrated to enable joint tactical training at the combat team level. The system also pioneered several new concepts. For example, the simulator can be easily and speedily reconfigured to support up to four different armour platforms (including the SM1 and Bionix) through a unique “roll-in/roll-out, plug-and-play” concept. Thus, depending on specific exercise requirements, the desired mix of armour platforms can be ‘plugged’ into the visual system cubicles (Figure 6) for integrated training.



Figure 6. AGTS Crewstation rolled into a Visual System Cubicle

Another technological achievement of the AGTS is its ability to simulate highly intelligent friendly and enemy forces, which act and react autonomously according to pre-defined tactics. Powered by state-of-the-art CGF technology, the system is able to simulate not only platforms such as tanks and helicopters, but also dismounted infantry soldiers. This greatly reduces the need for additional manned stations and personnel to support training and exercises.

Technologically, the fielding of the AGTS was a watershed for Army simulations as it encapsulated many of the key M&S technologies of this era: intelligent CGF, networked training, common virtual environments, reconfigurable, plug-and-play concepts, and off-the-shelf IGs.

For the RSAF, several technological milestones were also realised during this period. From the A4SU Full Mission Simulator (FMS) with a full-dome display (Figure 7) to the Air Traffic Control Simulator with a 360-degree full field-of-view panoramic 3D display system (Figure 8), these simulators are a far cry from the days of “cut-out” cockpits and toy aircraft on model runways.



Figure 7. A4SU FMS



Figure 8. Air Traffic Control Simulator

In another major milestone, the RSAF also took delivery of a distributed Command and Control (C2) simulator – the first two-sided wargaming tool which enabled the RSAF to conduct vertically-integrated C2 training from headquarters and command centres down to the air bases. Notably, this was also the first simulator to be fully integrated with real C2 systems. This was significant, as one of the key thrusts of VSS2000 was to realise the ‘train-as-you-fight’ paradigm where training is conducted using actual operational equipment.

The advent of the Global Positioning System (GPS) in the 1990s allowed for live training at the force-on-force tactical level. This is known as ‘instrumentation’ in M&S parlance. The RSAF implemented the world’s first ‘rangeless’ Air Combat Manoeuvring Instrumentation (ACMI) system. By capitalising on GPS and an indigenous datalink, the ACMI erased the boundaries imposed by a range-based system (Figure 9). ACMI also pioneered the ‘embedded simulation’ concept for the SAF, where weapon effects simulation was embedded on the actual aircraft. This allowed pilots in real flight to engage one another virtually, allowing the training of tactical engagements to be performed realistically yet safely.

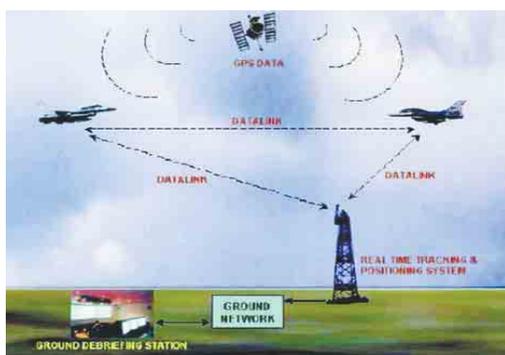


Figure 9. ACMI Conceptual View

With the success of ACMI, the technology was quickly adapted for naval platforms for the RSN. The system, called the Fleet Instrumented Training System (FISTS), provided ‘embedded simulation’ capability with onboard operational systems so that simulated training could be carried out even as the ships sailed out to sea.

With “Integration by Design” as the hallmark of VSS2000, FISTS was also integrated with ACMI to provide the first-of-its-kind integrated training between the RSAF and the RSN (Figure 10), taking embedded simulation and joint training to the next level.

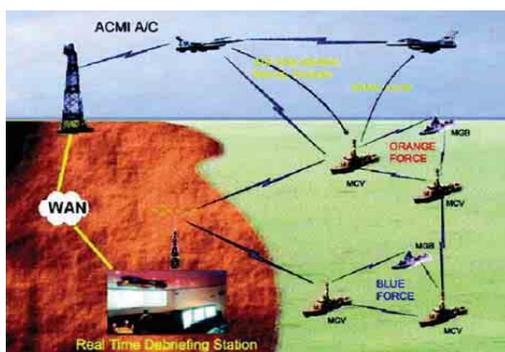


Figure 10. ACMI-FISTS Conceptual View

### **Technology Driver – Networking Technologies**

The second wave was fuelled by advances in Simulation Networking

Technologies. This took the form of two main developments in Distributed Interactive Simulation (DIS) and High Level Architecture (HLA).

The origins of DIS can be traced back to 1983, when the US Defense Advanced Research Projects Agency (DARPA) sponsored the SIMulation NETworking (SIMNET) programme to create a new technology to expand single-task trainers into networked team trainers. DIS established a common data exchange environment by formalising protocols and standards to support the interoperability of heterogeneous, geographically-distributed simulations (Defense Modelling and Simulation Office, 1994).

DIS was the de facto networking standard in the M&S community until the mid 1990s, when a new standard called HLA emerged. Besides adopting an object-oriented methodology and publish-subscribe mechanism, HLA provided an overall framework to facilitate the architectures, as well as to further promote the reuse of existing simulation assets. In 1996, the US Department of Defense mandated HLA as the new simulation networking standard (Undersecretary of Defense for Acquisition and Technology Memorandum, 1996). Subsequently, HLA was also mandated under VSS2000 in order to exploit emerging commercial off-the-shelf (COTS) simulation technologies better.

Separately, the advances in Graphics Technologies from the first wave continued unabated, albeit with a shift in focus. Proprietary IGs, for all their processing power and might,

soon became expensive for decreasing budgets. They lost favour, and their cause was not helped by the emergence of workstation-based IGs. In particular, Silicon Graphics soon became the darling of the simulation industry with its brand of COTS IG workstations (Figure 11). From the mid to late 1990s, SGI was the dominant IG supplier not only for defence simulation applications, but also the entertainment and scientific communities at large. The SAF was a keen user of SGI's IG technology during this period, with close to ten simulators employing SGI solutions.



Figure 11. SGI Onyx(r) Visualisation Workstation (Image courtesy of Silicon Graphics)

## Characterising the Second Wave

The second wave saw the transition from standalone simulation to distributed, networked simulation in common synthetic environments, aided by advances in networking technologies. During this period, the SAF also implemented many flagship simulation systems, and pioneered new M&S concepts such as 'plug-and-play', 'simulation-C2 interoperability', and 'embedded simulation'.

## THE THIRD WAVE – Soaring to Greater Heights

In the new millennium, the SAF is now on the threshold of another wave of M&S evolution.

### VSS21

The SAF and DSTA unveiled VSS21, a new M&S masterplan in Jan 2001.

VSS21 continues to be anchored on the three thrusts established in VSS2000 (Figure 12). However, the key objective of VSS21 is to exploit M&S for the purpose of force development and modernisation through Experimentation under the Test and Evaluation (T&E) dimension.



Figure 12. VSS21 Thrusts

M&S-based experimentation will serve as an objective platform to provide the digital probing ground for testing and experimentation of new warfighting concepts to meet the requirements of the 21<sup>st</sup> century.

New concepts and technologies can be appropriately ‘modelled’ and represented in simulation for experiments configured and conducted in a ‘Synthetic Theatre of War’. Such capability also permits inexpensive evaluation of innovative concepts and technologies to determine their operational utility and payoffs prior to development, fielding and implementation.

Notwithstanding the emphasis on the T&E dimension, VSS21 will also see the large-scale implementation of the concepts pioneered under VSS2000. In addition, technology envelopes will continue to be pushed with every M&S implementation, and several initiatives are already underway.

## New Initiatives

Underlining the importance of M&S-based experimentation, the SAF set up the SAF Centre for Military Experimentation (SCME) in November 2003. Dubbed the ‘key to the SAF of the future’ by the Minister for Defence Teo Chee Hean (The Straits Times, 2003), the SCME will leverage M&S technologies and tools to conduct experiments on new warfighting concepts and innovative technologies capabilities.

In the instrumentation domain, with the ACMI and FISTS already operational, efforts are now centred on fielding the Battlefield Instrumentation system for the Army as well as the possible instrumentation of the RSAF’s

Air Defence assets. The ultimate goal is to integrate all these systems to realise the objective of conducting tri-service and inter-service training. These instrumentation systems will allow the SAF to capture events and data in the battlefield and provide a good mechanism, in the form of after-action reviews, for improving doctrinal procedures and operational processes.

Another flagship of VSS21 will be the Air Mission Trainer (AMT). A network of low-cost pilot fly-boxes and mini-domes, the AMT will further elevate the RSAF’s training realism. Not only will pilots be able to rehearse their combat missions to simulate the conditions they will face, they will also be able to fight while they train in simulated conditions. The AMT will also provide the mechanism supporting a fully-integrated environment which can accommodate the full spectrum of training - from the individual level up to campaign level mission rehearsal, through electronic links to the operational C2 systems.

Yet another flagship system belonging to the Army will also be implemented under VSS21. The Infantry Gunnery Tactical Simulator will be a new generation, immersive virtual simulation system which will train battalion commanders and their principal staff officers in battlefield planning, co-ordination and execution skills.

## Technology Trends

Graphics Technology – Graphics technologies will continue to grow at a relentless pace. For example, SGI, for all its good work in the 1990s, has already been outpaced in recent years by the emergence of a new class of commodity

PC-based graphics, commonly referred to as PC-IGs, and the accelerated advances in 3D graphics processor technology.

Even then, new signs have already emerged and the IG technology is again on the brink of another change - from PC-IG ‘boxes’ to PC-graphics cards! Again, in line with the ‘faster, cheaper, better, and COTS’ mantra, the SAF and DSTA have already begun moving towards PC-IGs, and where possible, PC graphics cards see (Figure 13).



Figure 13. PC-based IG and PC Graphics Card (Images Courtesy of Quantum 3D(r) and nVidia(r))

One of the direct benefits of the move towards PC-based IGs is the attendant reduction in cost, size and weight of systems. For example, the visual capability provided by a compact PC-based IG today would have required

a six-foot tall rack of equipment a few years back. The fall in price is equally dramatic. While a compact, state-of-the-art PC-based IG can be purchased for US\$25,000 or less, the traditional IGs of yesteryears would have cost US\$250,000 or more (The Straits Times, 2003).

Composable Simulations – In the new era, not only will there be greater proliferation of M&S, there will also be ready access to M&S as a service. This will be achieved primarily through composable M&S architecture and standards to promote the reuse of M&S models and components. The impetus is to allow M&S synthetic battlespaces to be configured rapidly in a Lego-like fashion for the purpose of experimentation and wargaming.

We have seen various initiatives in the US such as the Defense Modeling & Simulation Office’s Composable Mission Space Environment (CMSE)<sup>4</sup>, the Models Driven Architecture (MDA)<sup>5</sup> and the Extensible M&S Framework (XMSF).<sup>6</sup> DSTA also embarked on JEWEL (Joint M&S Environment for Wargaming and Experimentation Labs) as the framework and means to attain composable simulations for the SAF (Figure 14).

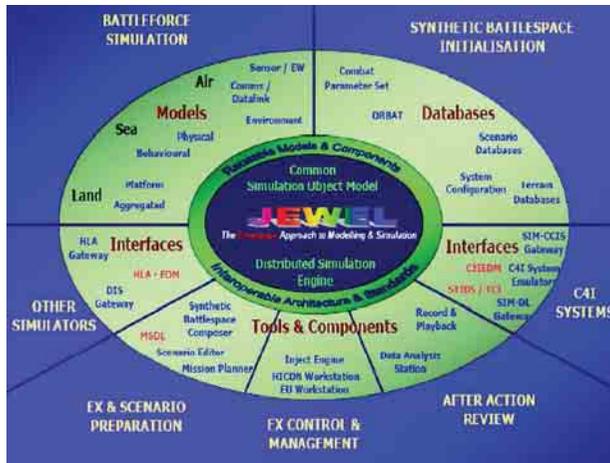


Figure 14. JEWEL framework

Convergence of Computer Game Technologies and Military Simulation – Although military simulation and computer games appear to have a lot in common, they have traditionally been developed very differently.

On one end of the spectrum is military simulation where the focus is on complex and realistic high fidelity simulation to attain maximum learning transfer.

On the other end are low-cost games with lower fidelity but highly compelling content (though with PC graphics cards becoming more powerful, PC games have demonstrated an ever-increasing degree of realism). The focus is on fun and entertainment through engaging creative content.

The new M&Sera will see applications bridging the gap, together with the infusion of computer game technologies into military simulation, to attain the balance of training value and fun.

Not only will such hybrid solutions continue to provide realistic training as desired, they will also engage our soldiers in the emotive domain where interest, thrill, excitement are key

elements. This is what we call Experiential Simulation. Studies have shown that such applications can enhance learning transfer (Wigforss, 2002).

Recognising this potential, DSTA has begun to harness innovative technologies from the entertainment industry as a supplement to conventional military training methods. For example, DSTA, together with the Army, has adapted a military-themed COTS game called Operation Flashpoint (OFP) for both training and experimentation (Figure 15). The 3D models depicting our soldiers, vehicles as well as local terrain, were developed to customise OFP for the SAF. The results and feedback from the soldiers have been positive (Fong, 2005).

In another development, DSTA and the Army also collaborated with the Institute for Creative Technologies to custom build two new games, Full Spectrum Command and Full Spectrum Leader (Figure 16). Targeted at company commanders and platoon commanders respectively, these games aim to train cognitive skills, tactical decision making, resource management and adaptive thinking, through realistic yet fun and



Figure 15. Operation Flashpoint customised for SAF

entertaining game-play. Both games are currently being evaluated for their training effectiveness.

*(Ed note: This article was first published in DSTA Horizons, 2006.)*



Figure 16. Full Spectrum Leader

Other technologies from the computer game industry such as creative storytelling techniques and multi-player online games will also be researched and adapted, if possible, for suitable military application.

## COMING OF AGE

M&S in the SAF has evolved tremendously over a short span of time. From pioneering implementation by pushing the edge through two decades of innovation, the SAF now stands on the brink of another evolution in the new millennium. In short, M&S in the SAF has matured and looks set to be the key enabling technology for the 3<sup>rd</sup> Generation SAF and its transformation efforts. 

## Endnotes

- 1 The area of Singapore is generated from the Lot Base System based on the Cadastral maps as at 8 January 2005. ([www.singstat.gov.sg](http://www.singstat.gov.sg))
- 2 In 2002, there were 40,864 births, down from 41,451 births in 2001. There were 31,171 births in the first nine months of 2003, versus 33,618 in the same period last year. (The Straits Times Interactive, Government Exploring 'Total Solution' to Baby Shortfall, 15 December 2003)
- 3 Artillery on the Web ([www.mindef.gov.sg/army](http://www.mindef.gov.sg/army))
- 4 The goal of CMSE is to identify issues related to composability to target the related efforts and research that will lay the groundwork for increased reuse and improved ability to compose simulations more rapidly, flexibly, and efficiently. ([www.sisostds.org](http://www.sisostds.org))
- 5 MDA defines an approach for designing and building component-based systems that remain decoupled from the languages, platforms and middleware environments that are eventually used to implement the system. The resulting components would be compliant to interfacing standards and reusable across multiple execution platforms (for example, Simulation Engines).([www.sisostds.org](http://www.sisostds.org))
- 6 The XMSF is the initiative in advanced distributed simulation to exploit emerging web standards and web services model. XMSF will comprise a composable set of standards, profiles and recommended practices for web-based modelling and simulation. XMSF, embracing commercial web technologies as a shared-communications platform, can fully leverage mainstream practices for enterprise-wide software development. ([www.movesinstitute.org](http://www.movesinstitute.org))



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# The Laments of Cassandra<sup>1</sup>

## Reflections on Warning Intelligence in the Information Eden

by CPT Guo Jing Hua

### A Changing World

*'Beware the Ides of March!'*  
*The augur Spurrina to Julius Caesar*<sup>2</sup>

Foreknowledge, the quest of Warning, has always been the cardinal *raison d'être* of an intelligence service from peace to war and the twilight between. The relevance and importance of this art resides in the inevitability of surprise as a fundamental technique in war and peace, both of the weak and the strong. Pearl Harbour, the Yom Kippur War and the Tet Offensive, are among the celebrated examples of surprise. Why should surprise remain such a favoured technique? Surprise suspends, at the moment of strike, what leading theorist of strategic surprise Michael Handel describes as the dialectic nature of war.<sup>3</sup> The psychological shock of a strategic surprise lends temporary paralysis in a victim and significantly reduces the friction of war for the aggressor. Surprise by the weak, manifested in Pearl Harbour and the inherent nature of terrorism, allows the concentration of strength by the weak at vulnerabilities of the strong. These principles remain steadfastly true from the plains of Marathon to the sands of Iraq.

However, though warning intelligence remains of paramount importance, the nature of the threat

has changed, being driven by the technological revolutions of the past two decades and the new geopolitical paradigms heralded by first, the fall of the Berlin Wall, and then the flames of the Twin Towers. The convergence of networking, computerisation and telecommunications among other myriad technologies has led to unprecedented explosion in the quantity, quality, and speed of transmission and reach of information. The consequences have been to vastly increase the richness and scope of the warning indicators, but at a price of information overload and other pathologies. Warning time has been compressed as the speed of warfighting accelerates and new battlefields such as cyberspace have been spawned, expanding the boundaries of warning.<sup>4</sup>

Nationalism, ethnic and religious hatred, long suppressed beneath the veneer of the Cold War, have emerged, and given rise to asymmetric threats such as amorphous terrorist groups with global agendas. This, coupled with the demise of stabilising monoliths such as the Soviet Union, has increased the complexity of warning. The impenetrability and apparent irrationality of these threats have posed new obstacles in collection, analysis and understanding of warning, compared to the relative simplicity of Westphalian nation states. Further compounding the difficulties is the

synergy between these non-state actors and technology, in which technology is exploited to perpetuate unimaginable acts of violence. This has vastly expanded the universe of possibilities for warning to guard against.

Clearly, the playing field has changed but how should intelligence services adapt to this brave new world? Technology is often part of the process but by itself is not a panacea or even part of the problem. The possible solutions lie in the confluence of technology and psychology. With this dynamic being fundamental to the success of the warning mission, it is perhaps timely to ponder on the interaction of technology and the human mind, as well as their consequences for the warning process.

## **The Tail Wagging the Dog – Asking the Right Questions**

The collection of information is the first step in warning. The fruits of the technological revolution are most sharply embodied by the technologies employed in collection. Unmanned Aerial Vehicles (UAV) such as the Global Hawk, the fabled monitoring system Echelon<sup>5</sup> and advanced reconnaissance satellites are among the manifestations of this revolution. The design of a comprehensive collection system is crucial for the pervasive battlespace awareness craved for by both warfighters and intelligence officers. Great care must be exercised in devising a collection system, for the nature of such a system can skewer the output, unleashing a cascade of negative downstream effects. Prior to embarking on a costly collection effort, it is imperative to determine if the right questions are being asked, avoiding

the pitfalls of having a systems-driven collection strategy in which what should be collected is prejudiced by what one is adept at. Modern technical means of collection such as signal intelligence (SIGINT) and imagery intelligence (IMINT) are capable of generating prodigious amounts of information, malleable to automated processing and analysis. It is historically considered “cleaner” and hence more reliable than the vagaries associated with non-technical intelligence, especially human intelligence (HUMINT). HUMINT is often regarded as an orphan of the technological revolution and clouded by the idiosyncrasies, motivations and other follies of both sources and analysts.<sup>6</sup> The temptation is hence great to utilise an expensively constructed whiz-bang collection system for all and sundry purpose, justifying the enormous cost. Alas, woe is to the intelligence officer who fails to understand the nature of his quarry in harvesting information. For example, a sophisticated technical collection effort is unlikely to be as effective in a counter insurgency campaign as HUMINT.<sup>7</sup> Irrelevant information is worse than useless. It can be positively harmful with the woes of information overload already extensively dissected. Irrelevant information compounds the signal to noise problem afflicting intelligence due to prodigious collection outputs, and can even be inadvertently misleading, contributing to the adversarial deception plan as the Americans found to their cost in the Tet Offensive.<sup>8</sup> However even the most comprehensive of collection systems is not omniscient, for the chaotic nature of human interactions makes intelligence only that of ever increasing probabilities, never certainty.

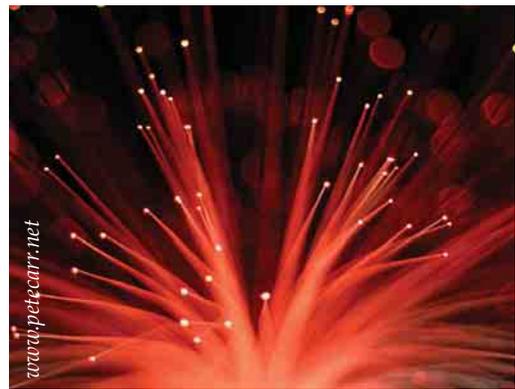
Increasing collection output past a certain threshold only increases the chaff and triggers the onset of the law of diminishing returns. Hence, it would be useful to think about the limits of uncertainty that can be tolerated.<sup>9</sup> The information glut runs the risk of increasing the informational threshold for a judgment with the danger of analytical paralysis due to excessively narrow tolerance for uncertainty. This is analogous to the feeling of isolation and depression that people experienced in networked societies when denied access to the Internet or their mobile phones.



*Imagery Intelligence: fruits of the technological revolution*

The Jekyll-and-Hyde nature of technology must be considered. Singular reliance on technology has traditionally been exploited for deception and the new technologies permeating intelligence have opened up new arenas for such. The over reliance and confidence in technical means such as satellite IMINT for information on the Indian nuclear program is one of the causes of strategic surprise experienced by the US from the Indian nuclear tests in 1998.<sup>10</sup> A more dramatic example of this vulnerability is the success of the SIGINT deception plan in Operation Fortitude as part of the Normandy

landings in 1944.<sup>11</sup> Just as technology has opened new avenues of collection, it has also challenged collection. The impenetrability of modern encryption technology, the anonymity of internet communication such as Internet Relay Chat (IRC), instant messengers and profusion of near-untappable fibre optic cables are manifestation of technology's double-edged sword.<sup>12</sup> As the efficacy of technical collection increased, the danger arises that intelligence might even kill the goose that lays the golden egg. Facing superior collection capabilities, adversaries might practice technological regression to avoid detection such as employing human messengers.<sup>13</sup> This shuts down the pipeline of information generated by electronic communications, at a cost of reduced operation tempo tolerable in time-insensitive operations such as terrorist operations with long planning timelines.<sup>14</sup>



*A double-edged sword: Fibre optic cables provide near-untappable communication*

In determining the correct orientation of the collection strategy, it is imperative to distinguish between capability *and* intention, the *how* and the *why*, typically reflected in the distinction between military and political intelligence.<sup>15, 16</sup> War and politics are inextricably linked and generally, military decisions and

actions must be preceded by political decisions and indications. Modern collection systems are relatively adept at collection on capabilities with fields such as measurement and signature intelligence (MASINT) and electronic intelligence (ELINT) being exclusively military oriented and others, such as SIGINT, having a strong military orientation.<sup>17</sup> The bias towards collection on capability is further reinforced by the enormous amount of technological signatures such as radio traffic and radar emissions among others associated with modern warfighting, making them a honey pot for collection. In comparison, political intelligence often has a stronger HUMINT orientation, with all its associated drawbacks discussed earlier. A further traditional disadvantage to collection on intention is the need for multi-agency coordination due to the close synchronization of both political and military indicators necessary to generate awareness. The inherent tensions due to the different perspectives, borne out of different orientation and institutional parochialism, give collection and analysis of intention an additional complexity. This is evidenced by the acrimony between the Central Intelligence Agency (CIA) and Military Advisory Command Vietnam (MACV) in the prelude to the Tet Offensive, or historical tensions between the MOSSAD and AMAN in the Israeli intelligence community.<sup>18, 19</sup> All these factors, together with the warfighters' tremendous thirst for information, conspire to skewer collection efforts towards military intelligence. A symptom of this trend is the predominance of US Department of Defense (DOD) intelligence agencies within the US intelligence community, giving the US DOD a controlling influence in intelligence budget and policy.<sup>20, 21</sup>

## Mirror, Mirror on the Wall...

The Achilles' heel of the warning process has historically occurred in analysis. Deciphering the chaos begets by the information revolution and even generating self-awareness continues to pose formidable challenges as shown by the recurring episodes of blue-on-blue incidents in relatively well-networked forces.<sup>22</sup> What more that of trying to peer into the mind of the enemy. Perfect objectivity in analysis is illusory with ambiguity permeating every piece of intelligence, its worth oscillating with the subjective idiosyncrasies of individual analysts. The Clauswitzian interaction of two independent wills defies the most sophisticated of technology to make certain predictions, though trends and patterns can be discerned. Mirror imaging, self-deception, egotism and group think is among the human fallacies plaguing intelligence analysis. Intelligence literature is resplendent with studies of such leading to catastrophic warning failures such as the Conception estranging the Israelis prior to the Yom Kippur War<sup>23</sup> or the American dismissal of the possibilities of Chinese intervention in Korea.<sup>24</sup> Often, indications were abundant and almost utopian but for distortion or neglect of information to fit the mental straitjackets of politicians, military officers and intelligence analysts. In such an environment, improved collection with enhanced information flow is unlikely to improve the quality of warning. Perversely, additional information runs the risk of being twisted to reinforce existing preconceptions, generating a catastrophic runaway positive feedback loop. It must also never be forgotten that intelligence deals with human beings and not models, individuals who can

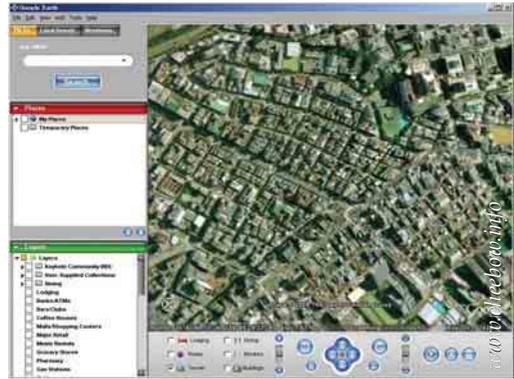
miscalculate, can have a wide spectrum of motivations and idiosyncrasies. An impossible or irrational action from own perspectives may look entirely different from an adversarial perspective due to his ill appreciation of his own capabilities or different cultural and other societal contexts. For example, the concept of suicide attacks, from the Japanese *kamikaze* to the bombers of the Twin Towers on 9/11, remains profoundly alien to the Western mind.<sup>25</sup> These constitute the “unknown unknowns” of the intelligence equation, giving rise to the paradox of experiencing surprise through superior “understanding” of the enemy. The risk of this form of warning failure is especially real when an acute dichotomy exists between the Intelligence, Surveillance and Reconnaissance (ISR) capabilities of two adversaries such as between a network centric and an industrial age belligerent. The asymmetric nature of the equilibrium presents conceptual difficulties in warning for the informational superior belligerent, as manifested in the cruel warning failure of the American/South Vietnamese intelligence in the Tet Offensive.<sup>26</sup> The quantum leap in imagination required to perceive events from the diametrical perspective *AND* to integrate their possible miscalculations into warning forecasts remains perhaps an unbridgeable chasm.

If collection is arduous, the analysis of intentions threatens to present insurmountable challenges. The fusion of both political and military intelligence is critical for assessing intention.<sup>27</sup> Strong intention, weak capabilities and weak intentions, strong capabilities are pregnant with different portents.<sup>28</sup> The challenges of HUMINT

have been discussed in the preceding paragraph. However, HUMINT remains of tremendous relevance in indications and warning for if authenticated, it provides the clearest insights into the adversarial mind and often is the main source of intelligence in areas impenetrable to technical means.<sup>29</sup> Despite the fact that India had a known nuclear capability and the vast resources of the US intelligence community, the intentions by India to conduct the underground nuclear test in 1998 was undetected by US intelligence and took the US completely by surprise.<sup>30</sup> Further compounding the analytical pitfalls, the relative ambiguity and paucity of information concerning intention (*vis-à-vis* capability) also reinforces the intelligence pathologies of mirror imaging and wishful thinking among analysts, officers and politicians.<sup>31</sup> Technology may promise relief in analysis through improved database management and analysis via artificial intelligence or the US intelligence intranet Intelink, better translation capability such as the US Army Pathfinder text analysis systems among others.<sup>32</sup> Nonetheless, humans remain at the core of analysis with knowledge of cultures, languages and history among the essential prerequisites for success.<sup>33</sup> This is further bolstered by new analytical methodologies and training seeking to tame the hydra.<sup>34</sup> The need for multi-agencies collaboration brings with it tensions as described earlier. This makes the production of joint intelligence products an arduous process of determining the lowest common denominations, often relegating the most controversial but prophetic analysis to mere footnotes or to oblivion.<sup>35</sup>

## The OSINT Siren

The reporting of CNN's Peter Arnett from Baghdad during the 1991 Gulf War heralded the dawn of a golden age of open source intelligence (OSINT). OSINT encompasses a wide spectrum of public information sources, ranging from traditional newspapers and journals to high resolution commercial satellite imagery. The Internet has fuelled this explosion with the phenomena such as blogging and Google Earth among the potential information mines for warning to exploit.<sup>36</sup> The growth of OSINT has paralleled the technological upheaval sweeping through Intelligence, such as the proliferation of high-resolution satellite imagery among commercial news services.<sup>37</sup> Real time, global coverage, accessibility and comprehensiveness are among the promises of OSINT. The impact of OSINT on warning has been tremendous, providing political and military leaders with alternative, potentially high quality perspectives, often in real time. For warning, it opens up a new horizon of indicators and acts as a counter weight to the information and analysis traditionally provided by Intelligence. Decision makers are free to make their own judgments, free of any potential institutional bias in the information fed to them by intelligence (albeit tinted by the prejudices of the originators).<sup>38</sup> OSINT also shortens the warning cycle required by warning intelligence to remain relevant in the face of the real time OSINT onslaught. It is perhaps far more accessible to watch the unfolding of a crisis in real time on CNN than to track it through slow, dull and lifeless intelligence reports. Such is the seductiveness of OSINT that more and more policymakers are turning to OSINT sources for their informational needs.<sup>39</sup>



*Google Earth: an example of OSINT*

For all their promises, OSINT brings with it its own perils to the warning process. The sheer quantity of OSINT contributes to the signal to noise problem while the veracity issue in OSINT presents an acute problem. The growth of the Internet, the global tentacles of news corporations and other manifestations of the OSINT revolution present new avenues for disinformation and deception by an adversary.<sup>40</sup> OSINT is especially vulnerable to such as seen from the exploitation of the media for deception by Coalition forces in Desert Storm.<sup>41</sup> Therefore, a need to verify the authenticity of OSINT exists but the tremendous amount of information and their authentication threatens to overwhelm the intelligence process. The commercial imperatives driving the media constituting a significant portion of OSINT should also be considered. Coverage of an event or an area with a poor market audience is likely to be minimal or non-existent. Witness the humanitarian tragedies the world forgets from Mogadishu to Kabul.<sup>42</sup> Even if information is available, the same human fallacies in intelligence afflict the collection and analysis process in OSINT as well. The market-driven temporal and spatial coverage of commercial OSINT may not be in tandem with a nation's strategic

needs for information, leading to a requirement for intelligence as the filter or the primary source of information on the target. Furthermore, OSINT is built on a foundation of free information, a premise that is rarely applicable in authoritarian societies which are often the targets of Western intelligence, or Asian societies with its more pronounced penchant for secrecy. Even for liberal democracies, there are spheres with public demands and recognition of the need for secrecy, such as defence. The US Freedom of Information Act is not all-invoking. Contrary to the utopian view of the supremacy of OSINT held by its champions, OSINT is an invaluable information resource but there exists a need for covert means of collection for warning. In this Internet age, intelligence remains as relevant as ever.

### The Decentralisation of Warning

The advent of networked warfighting brings with it an insatiable appetite for information. Precision guidance, compressed sensor to shooter targeting cycle and other gospels of networked warfighting are built on the assumption of free and untrammelled access to information.<sup>43</sup> Realising this assumption calls for the introduction of revolutionary ISR technologies to field commands, investing in them tremendous intelligence capabilities. Intelligence has even sprouted fangs, as illustrated by the use of armed Predators by the CIA for assassinations.<sup>44</sup> This trend towards the operationalisation of intelligence is manifested in the creation of dedicated ISR field units such as the SAF 1<sup>st</sup> Military Intelligence Battalion

and the US Army Reconnaissance, Surveillance, Targeting and Acquisition (RSTA) Squadrons.<sup>45, 46</sup> The US Army RSTA Squadrons are equipped with extensive ISR equipments ranging from tactical UAV to tactical SIGINT systems such as PROPHET as well as tactical HUMINT teams.<sup>47</sup> The introduction of sophisticated ISR technologies to field commands and the potential for real time delivery of strategic intelligence from national-level intelligence assets such as reconnaissance satellites have blurred the distinction between tactical and strategic intelligence.<sup>48</sup> The US National Intelligence Support Teams (NIST), embedded within field commands, serve as conduits of strategic intelligence, sometimes raw, to warfighters.<sup>49</sup> This flattening of the intelligence hierarchy has diminished the traditional monopoly of the intelligence services, with more of the collection and analysis function being performed by the field commands with ever improving organic intelligence capabilities. A corresponding trend can be observed in civilian society with the profusion of OSINT allowing more policymakers to serve as their own intelligence analyst as discussed previously.<sup>50</sup>



Source: Pioneer  
*Men of SAF's 1st Military Intelligence Battalion*

However, this loss of monopoly does not reduce the relevance of intelligence services in the warning function. As the cornucopia of battlefield intelligence increased, the need for surge analytical capability to handle the enormous information flow has to be met by the intelligence services and their output coordinated by intelligence services and integrated into the warning apparatus. The broad, long range nature of warning intelligence conflicts with the focused, immediate demands of targeting intelligence, often one of the key tasks of tactical intelligence. Intelligence services must be aware that the field intelligence units are oriented towards supporting the tactical requirements of warfighters, and be vigilant against possible parochialism, relegating the complex and essentially defensive warning role to a secondary one. Expanding the linkage between intelligence and operation and further integration of warfighters into the warning mechanism increases the diversity of opinion and allows for a more balanced assessment, but caution should be exercised against an operation-driven intelligence for warning. In seeking to be a “team player”, warning intelligence faces the risks of neglect of its warning function or increased susceptibility to sculpt warning in the mould of the warfighters’ idiosyncrasies.<sup>51</sup> The same perils also hide within the clarion call for closer intelligence-policy coordination. The dangers of such intimacy are illustrated by charges of the politicisation of intelligence to support the case for weapons of mass destruction (WMD) in the US as a pretext for the 2003 Gulf War or the suppression of crucial warning indicators by Stalin prior to the outbreak of Barbarossa in 1941.<sup>52,53</sup>

All this seems to suggest that warning should insulate itself from the relentless push towards intelligence-operations or the corresponding intelligence-policy fusion to retain its relative objectivity. In a world of Predators where Intelligence has become a hunter, Warning must remain a silent gatherer.<sup>54</sup>

The information Eden has also made possible the growth of high-quality nongovernmental research organisations such as The Jane Information Group, Oxford Analytica, International Crisis Group or government-affiliated research institutes such as the Nanyang Technological University-Institute of Defence and Strategic Studies and the Rand Corporation. The increasing expertise of these research bodies and quality of their research, brought forth by the OSINT explosion, lead to the possibility of outsourcing part of basic intelligence to them, allowing more resources to be devoted to other more critical areas. A possible current model may be the close privileged relationship between the US Government and the RAND Corporation.<sup>55</sup> A further step may even be their integration into the more sensitive warning apparatus on a full time or *ad hoc* basis.<sup>56</sup> The increasing relevance of non-asymmetric threats such as terrorism has also called for additional expertise beyond that of the intelligence establishments such as historians and religious scholars, notwithstanding the increased security concerns. An Islamic religious scholar or historian is probably more attuned to any nuances in the allegorical warnings often issued by Islamist terrorists and their significance than a normal intelligence analyst. Local law enforcement agencies, with their closer community involvement, are crucial sentinels of terrorist attacks.<sup>57</sup> The

heightened danger posed by the abuse of the breakthroughs in technology, such as molecular biology and nanotechnology, among others also leads to requirement for specialist knowledge in order to develop and recognise the appropriate indicators in warning, creating yet more impetus for the diversification of the intelligence community.

## It's the People Stupid!

Every major intelligence failure is inevitably followed by the *de rigueur* governmental inquiries and screams for reforms: the Congressional investigations of the 9/11 terrorist attacks<sup>58</sup>, the Agranat Commission after the Yom Kippur War are among the more celebrated ones.<sup>59</sup> The recommendations are always strikingly similar: Organisational reforms to promote the flow of information through the system or to minimise institutional prejudices, increase in the intelligence budgets and improvements in the quality of analysis by enhancing the quality of the analysts among others. The reforms all strived to avoid another Pearl Harbour, but sadly, history repeats itself. A string of warning failures led from Pearl Harbour to the World Trade Centre of New York (twice!). Israel's surprise at the Palestinian Intifada *springs* from the same wishful thinking and self-deception of Yom Kippur.<sup>60</sup> Clearly something fundamental has not changed amidst all the rhetoric and papers expended. More and better information has enabled us to perform better warning though technology hides dangers within. Diversity has also been brought to warning, challenging Intelligence's traditional role but also increasing her relevance. Through all this, the human mind lies at the heart of warning and here springs its Achilles'

heel. A study of warning failures leads to the conclusion that the organisational models proposed in the different reforms all have their own pathologies and the inescapable solution, to paraphrase a Clintonian aphorism, *it's the people stupid!*<sup>61</sup> Clearly, Warning cries out for creative and unorthodox mavericks. It is a statement that is blindingly obvious but yet the history of treatment of such innovators serves only to reinforce the disdain shown to this.<sup>62</sup> Rhetoric is cheap but to change organisations and therefore people to accommodate such individuals remain a monumental task. However, a positive example of an intelligence agency recognising this and working to tailor fulfilling careers to suit these individuals is the CIA and her creation of a Senior Analytical Service.<sup>63</sup> Under this scheme, talented analysts are allowed to remain as analysts throughout their career and avoid the chores and "dirtiness" of management, but yet with remunerations and privileges rising in tandem with their management peers. Without the right people welding the sword of technology, the golden age promised by the intelligence revolution will remain unfulfilled but even then, the numerous weak links in this interplay of Man and Machine portends, however much the vigilance, the inevitable recurrence of warning failures. Perhaps the frank words of Roberta Wohlstetter in her seminal work, *Pearl Harbor: Warning and Decision* describe this most presciently, "If the study of Pearl Harbor has anything to offer for the future, it is this: we have to accept the fact of uncertainty and learn to live with it."<sup>64</sup> 

(Ed note: This essay was the Second prize winner of the 2005 CDF Essay Competition.)

## Endnotes

- <sup>1</sup> Cassandra, from Homer's *Iliad*, was a Trojan princess during the Trojan War with the gift of prophecy, but suffered from the curse of no one believing her prophecies. She warned the Trojans of the secret of the Trojan Horse but was ignored. *Homer: The Iliad, translated by E.V.Rieu* (Penguin Books, London, England, 2003), p1xix.
- <sup>2</sup> This was to warn Caesar of her prophecy that he would be assassinated on the Roman festival of the Ides of March on 14th March 44 BCE. See Meier, *Caesar* (BasicBooks/HarperCollins, New York, 1995), p486.
- <sup>3</sup> Wirtz, *Paradoxes of strategic intelligence: essays in honor of Michael I. Handel* Handel, Betts and Mahnken, Eds. (Frank Cass, London; Portland, OR, 2003), p103.
- <sup>4</sup> Kristof, "Beat terrorists in cyberspace," *New York Times*, reprinted in *Straits Times* (21 Dec 2005).
- <sup>5</sup> See Campbell, *Interception Capabilities 2000*. Report to the Director General for Research of the European Parliament (Scientific and Technical Options Assessment Programme Office, The European Parliament, 2000) Available online at [http://www.iwar.org.uk/sigint/resources/ic2000/interception\\_capabilities\\_2000.htm](http://www.iwar.org.uk/sigint/resources/ic2000/interception_capabilities_2000.htm) (last accessed Sep 2005).
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- <sup>7</sup> The human dimension of insurgency and the primacy of HUMINT in warning for counter insurgency can be observed by their importance in Afghanistan and Iraq. See Hoffman, *Insurgency and counter insurgency in Iraq* (National Security Research Division, The Rand Corporation, Santa Monica, CA, 2004) Available online at [www.rand.org/pubs/occasional\\_papers/2005/RAND\\_OP127.pdf](http://www.rand.org/pubs/occasional_papers/2005/RAND_OP127.pdf) (last accessed Nov 2005).
- <sup>8</sup> An example is the increased visibility of the North Vietnamese Army (NVA) units massing at the Laos-South Vietnam border compared to the National Liberation Front units prior to the Tet Offensive due to their higher SIGINT traffic generated. This distracted the American's attention away from the NLF forces concentrating around the urban centres in preparation for the Tet Offensive. See Wirtz, *The Tet offensive: intelligence failure in war*, Cornell studies in security affairs (Cornell University Press, Ithaca, 1991), p274.
- <sup>9</sup> Ferris, *Understanding Intelligence in the Twenty First Century* Scott and Jackson, Eds. (Routledge, New York, NY, 2004), pp69-71.
- <sup>10</sup> The Indians scheduled their preparation for the nuclear test at Pokhran around the overpass of the US reconnaissance satellites. Preparations were subdued when the satellites were due to over fly the site. See Diamond, "India able to evade satellites," *Associated Press*, 17 May 1998. Available online at <http://www.fas.org/irp/news/1998/05/05170059.htm> (last accessed Sep 2005).
- <sup>11</sup> The creation of a fictitious First US Army Group (FUSAG) in the north east of England and the associated huge spurious signal traffic contributed to diverting the Germans' attention towards the Pas de Calais region as the probable landing site. This was effective due to the German's heavy reliance on SIGINT and the ability of the Allies to close the feedback loop with the success of the Double Cross counter-intelligence system. See Hesketh, *Fortitude: The D-Day Deception Campaign* (St Ermin's Press, London, UK, 1999).
- <sup>12</sup> Corera, "A web wise terror network," *BBC News*, 6 Oct 2004. Available online at [http://news.bbc.co.uk/2/hi/in\\_depth/3716908.stm](http://news.bbc.co.uk/2/hi/in_depth/3716908.stm) (last accessed Oct 2005).
- <sup>13</sup> *ibid.* The use of human couriers to avoid the interception of electronic communication is a standard practice among terrorist organization such as the Jemiaah Islamiyah. Such technological regression can also be observed in Osama Bin Laden abandoning the use of satellite phone as being insecure.
- <sup>14</sup> National Commission on Terrorist Attacks upon the United States, *The 9/11 Commission report: final report of the National Commission on Terrorist attacks upon the United States* (Norton, New York, ed. Authorized, 2004), p215-253. The planning for the Sept 11 Twin Tower bombing took more than a year of planning and preparation.
- <sup>15</sup> Grabo, *Anticipating surprise: analysis for strategic warning* (University Press of America, Lanham, MD, ed. 1st, 2004), pp17-24.
- <sup>16</sup> Handel, *Paradoxes of strategic intelligence: essays in honor of Michael I. Handel* Handel, Betts and Mahnken, Eds. (Frank Cass, London; Portland, OR, 2003), pp12-14.
- <sup>17</sup> For a fuller description of the different intelligence collection techniques, see Shulsky and Schmitt, *Silent warfare: understanding the world of intelligence* (Brassey's, Washington, D.C., ed. 3<sup>rd</sup>, 2002), pp11-33.

- <sup>18</sup> The dispute stems from differing interpretations of the nature and progress of the Vietnam War, the NVA/NLF Tet strategy as well as their order of battle. See Blood, *The Tet Effect. Intelligence and the Public Perception of War* (Routledge, New York, 2005), pp112-116.
- <sup>19</sup> MOSSAD is the Israeli Secret Intelligence Service and AMAN is the Israel Defence Force Intelligence Branch. For a description of the historical rivalry between AMAN and MOSSAD from the foundation of the State of Israel to the invasion of Lebanon, see Raviv and Melman, *Every spy a prince: the complete history of Israel's intelligence community* (Houghton Mifflin, Boston, 1990).
- <sup>20</sup> The National Security Agency (NSA), Defense Intelligence Agency (DIA) and National Geospatial Intelligence Agency (NGA) are among the major agencies under DOD control. See Best Jr, *Intelligence Community Reorganisation: Potential Effects on DOD Intelligence Agencies* (Foreign Affairs, Defense, and Trade Division, Congressional Research Service, 2004) Available online at [www.fas.org/irp/crs/RL32515.pdf](http://www.fas.org/irp/crs/RL32515.pdf) (last accessed Sep 2005).
- <sup>21</sup> This was also pointed out by the Congressional Investigation into the Sept 11 attack. National Commission on Terrorist Attacks upon the United States, *The 9/11 Commission report: final report of the National Commission on Terrorist Attacks upon the United States* (Norton, New York, ed. Authorized, 2004), p357.
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- <sup>23</sup> Black and Morris, *Israel's secret wars: a history of Israel's intelligence services* (Grove Weidenfeld, New York, ed. 1<sup>st</sup> American, 1991), pp290-291.
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- <sup>26</sup> The US/South Vietnamese intelligence correctly discerned that the general apathy of the South Vietnamese urban population would render the "General Uprising" pillar of the communist Tet strategy as unrealistic. This led them to disregard pertinent indicators for the Tet Offensive as mere communist rhetoric or as part of a deception plan. see Wirtz, *The Tet offensive: intelligence failure in war*, Cornell studies in security affairs (Cornell University Press, Ithaca, 1991), pp124-128.
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- <sup>28</sup> An example of attacks arising from strong intentions but weak capabilities was the 1944 German Ardennes offensive. The Allies correctly analysed that the *Wehrmacht* was incapable of launching a successful offensive but failed to make a leap of imagination in understanding Hitler's rationale in ordering the offensive. See Eisenhower, *The bitter woods* (Da Capo Press, New York, ed. 1st Da Capo Press, 1995), pp167-172.
- <sup>29</sup> The importance and difficulty of penetrating closed terrorist organization was described in Hoffman, *Insurgency and counter insurgency in Iraq* (National Security Research Division, The Rand Corporation, Santa Monica, CA, 2004).
- <sup>30</sup> "CNN caught off guard on India nuclear test," *CNN*, May 12, 1998. Available online at <http://www.cnn.com/WORLD/asiapcf/9805/12/india.cia/> (last accessed Sep 2005).
- <sup>31</sup> For example, there was minimal dispute over the capabilities and war plans of the Arabs prior to the outbreak of the Yom Kippur War due to excellent intelligence. The true failure occurred in interpreting the will of the Arabs to go to war. See Herzog, *The war of atonement* (Greenhill Books; Stackpole Books, London, Pennsylvania, 1998).
- <sup>32</sup> See Jackson, *Artificial Intelligence's Role in Advancing the National Imagery and Mapping Agency (NIMA)* (U.S. Army War College, Carlisle Barracks, PA, 2002). Available online at [http://www.iwar.org.uk/sigint/resources/ai/Jackson\\_P\\_D\\_02.pdf](http://www.iwar.org.uk/sigint/resources/ai/Jackson_P_D_02.pdf) (last accessed Nov 2005) and Chizek, *Military Transformation: Intelligence, Surveillance and Reconnaissance* (Foreign Affairs, Defense, and Trade Division, Congressional Research Service, 2003) Available online at <http://www.iwar.org.uk/rma/resources/crs/RL31425.pdf> (last accessed Sep 2005).
- <sup>33</sup> *The National Intelligence Strategy of the United States of America* (Office of the Director of National Intelligence, Oct 2005), p10. Available online at <http://www.odni.gov/NISOctober2005.pdf> (last accessed Oct 2005).
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- <sup>47</sup> Chizek, *Military Transformation: Intelligence, Surveillance and Reconnaissance* (Foreign Affairs, Defense, and Trade Division, Congressional Research Service, 2003), p12.
- <sup>48</sup> For a comprehensive description of the integration of national level intelligence assets and support to US military operations, see *Joint Publication 2-01: Joint and National Intelligence Support to Military Operations* (Joint Chiefs of Staff, 2004) Available online at <http://www.iwar.org.uk/sigint/resources/joint-pub/JP-2-0.pdf> (last accessed Sep 2005).
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- <sup>60</sup> Raviv and Melman, *Every spy a prince: the complete history of Israel's intelligence community* (Houghton Mifflin, Boston, 1990).
- <sup>61</sup> For a further examination of advantages and disadvantages of the different organisational reforms, see Kam, *Surprise Attack: The Victim's Perspective* (Harvard University Press, Cambridge, Massachusetts; London, England, 1988), pp221-229.
- <sup>62</sup> Witness the disgraceful treatment meted out to LCDR Joseph Rochefort, the intelligence officer responsible for the victory of Midway, reduced to commanding a floating dock and denied of official recognition of his triumphs. Budiansky, *Battle of wits: the complete story of codebreaking in World War II* (Free Press, New York, 2000) pp22-24.
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# Social Capital: Cultivating this Vital Element for the Third Generation SAF

*by CPT Fan Sui Siong, Kelvin*



## Introduction

When the SAF was conceived in the 1960s, it was meant to be a joint military force. However, the need to build up its nascent domain competencies meant that the SAF had to develop initially along the Service lines of the Army, Air Force and Navy. Today, with more mature competencies, coupled with the needs to optimize resources and address the widened spectrum of security threats, the SAF has begun its transformation into an integrated and networked Third Generation (3<sup>rd</sup> Gen) SAF.

The Congruence Model, a useful organizational development tool, suggests that for the SAF to successfully

transform for the next generation, its four key organizational building blocks of critical tasks, people, organizational structure and culture must be aligned and in congruence. The SAF has embarked on several initiatives to better define the SAF's critical tasks, equip its people and reorganise its organizational structure. However, this essay contends that the building block of culture has been under-played in the overall transformation strategy and that there is a need to better cultivate, what management gurus like Putnam would term, social capital.

The article will be outlined in four parts. The first part will define the Congruence Model and the notion of

social capital. Taking its cue from the definitions, the second part will explore the importance of social capital for the 3<sup>rd</sup> Gen SAF. The third part highlights the challenges of cultivating social capital in the SAF while the fourth part concludes and outlines policy recommendations as to how social capital should be built up to facilitate the 3<sup>rd</sup> Gen transformation.

## Part I: The Congruence Model and Social Capital

The Congruence Model, developed by Nadler, Tushman and O’Reilly, is a strategic planning and organizational development tool that helps identify performance gaps, enabling leaders to take corrective actions and bring their organizations to the next level. The general theory states that after determining the overall objectives and strategy for an organization, the leaders must consider the four key organizational building blocks and the inter-relationships between them to find “incongruence” or misfits which will prevent the strategy from succeeding. These building blocks are the critical tasks required for success, the people and skill level, the organizational structure and the culture of the organization (see diagram 1 for an adaptation of Nadler, Tushman and O’Reilly’s Congruence Model). Only when all four building blocks are “in congruence” will the organization have the ability to successful achieve its strategic intent.

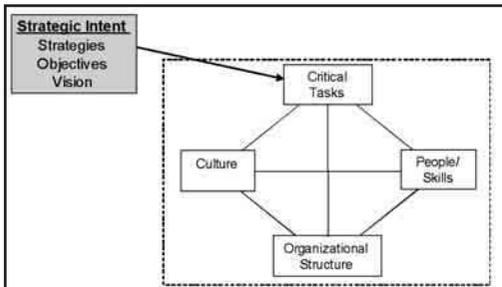


Diagram 1. Congruence model

The Congruence Model is highly applicable for the 3<sup>rd</sup> Gen SAF transformation. To better position itself for future demands, the SAF’s strategic intent is to transform into an integrated, flexible and dynamic fighting force, leveraging on advanced technology, innovative concepts and professional people. This translates into several critical tasks. Firstly, the increasing prevalence of non-environmental bound operations necessitates the 3<sup>rd</sup> Gen SAF to offer integrated responses involving assets and expertise from all three Services. Secondly, the SAF needs to render itself more flexible so as to address the widened spectrum of threats ranging from peacekeeping, humanitarian and conventional operations. Thirdly, the SAF will need to be more dynamic so as to address time-critical threats and respond quickly to crises and changes in our geo-political climate.

Reviewing the links between the critical tasks and the other three key organizational building blocks, one is left with the following questions and issues:

- **Task-People/Skills Alignment:**  
Are the NSmen and regulars trained in an integrated (e.g. tri-Service, cross-vocations, combined arms) manner? Do they have the skills and capabilities to handle different scenarios at a short notice?
- **Task-Organizational Structure Alignment**  
Is the organizational structure able to address non-environmental bound operations, given that it is currently organized by type (or Services) rather than tasks (or missions)? Can the SAF

respond flexibly and quickly with a Joint solution and the unified support of the various Services?

- **Task-Culture Alignment:**

Is there a spirit of trust, co-operation and common understanding, which are necessary for integrated operations, amongst the SAF units/Services? Is there a culture of knowledge sharing and innovation? Is there a shared vision or are there shared values that keep the SAF personnel committed to their jobs?

Several of these issues have been addressed at different stages in recent years. However, the task-culture alignment has been under-played in the overall plan, particularly on the issues of trust, co-operation, innovation and job commitment. This is understandable given the elusiveness of defining culture. Nonetheless, culture is a very important building block of any military seeking to be an integrated, flexible and dynamic force. To this end, this article attempts to use the notion of social capital, as popularized by Putnam, to align the task-culture gap.<sup>1</sup> At the end of the article, we will demonstrate that social capital, as an integral part of culture, is crucial for the 3<sup>rd</sup> Gen SAF and must be cultivated.

The notion of social capital was first discussed by Lyda Judson Hanifan who used the term to describe good will, fellowship, sympathy and social intercourse among those that ‘make up a social unit’. Other notable contributions have come from Jane Jacobs (1961) in relation to urban life and neighbourliness, Pierre Bourdieu (1983) with regard to social theory, and James S. Coleman (1988) in his discussions of the social context of

education. However, it was Putnam in 1993 who popularized the concept of social capital through its application to the American community. Since then, the importance of social capital has been much bandied about with the World Bank arguing that “increasing evidence shows that social cohesion is critical for societies to prosper economically and for development to be sustainable” (The World Bank 1999).

How is social capital defined? Political scientist and sociologist Francis Fukuyama (1999) defines social capital as an “instantiated informal norm that promotes cooperation between two or more individuals”. Putnam (2000) also defines social capital as the connections among individuals – the social networks and the norms of reciprocity and trustworthiness that arise from them”. The World Bank (1999)’s broader definition of social capital defines it as “not just the sum of the institutions which underpin a society – it is the glue that holds them together”.



*Social Capital: the connections among individuals*

In essence, social capital can be defined as the norms, shared values and common understanding that foster trust, co-operation and institutions for collective action. Firstly, social capital

allows a group of individuals with the same norms to establish a shared understanding and to establish trust. Secondly, the trust established gives individuals the psychological safety net to co-operate with others, without running into the prisoner's dilemma problem.<sup>2</sup> Lastly, it allows institutions to be formed on the basis of shared behavior and for collective action<sup>3</sup> to be taken.

## Part II: Importance of Social Capital to the 3<sup>rd</sup> Gen SAF

Security threats today are wider and less predictable than before. To address these threats effectively, the SAF must operate as a networked system and leverage on superior concepts, advanced technology and professional people.

The discipline of Systems Thinking suggests that for the SAF to operate effectively as a system, it must have the appropriate components and connections. The hardware components of the 3<sup>rd</sup> Gen SAF are already in place or will be in the near future - the Air Force's F15s will be delivered soon, the Navy's advanced Frigates are already plying our waters and the Army's Advanced Combat Man System is currently under experimentation.

However, having the components necessary for the 3<sup>rd</sup> Gen SAF is insufficient. More importantly, the connectors to network the components together as a system are vital. Integrated Knowledge-based Command & Control (IKC2) systems such as datalink provide the hardware connectors but the software connector crucial for the 3<sup>rd</sup> Gen SAF is that of social capital. Social

capital, by fostering trust, co-operation and collective action, is vital as a means of "lubricating" operations, reducing the transaction costs of peacetime developmental functions, enhancing innovation and retaining talent.

- **Social Capital "Lubricates" Integrated Operations**

Clausewitz highlighted that the success of military operations are often hampered by "friction" such as the terrain and weather, which could be overcome by "lubricants" such as combat experience and the commander's will. Modern military forces such as the US Marine Corps also note the importance of the leader's will and experience in their doctrines, but place more weight upon using trust to overcome factors such as a lack of a clearly defined goal, lack of coordination, unclear or complicated plans, complex task organizations or command relationships and complicated technologies.

The 3<sup>rd</sup> Gen SAF will have to contend, increasingly, with non-environmental bound operations (e.g. Peace Support Operations and counter-terrorism) which require integrated responses involving assets and expertise from various Services. Social capital plays a big role reducing the potential conflicts of integrated operations. For example, an Air Force commander could be the task force commander of a peace support operation involving Army, Air Force and Navy assets. Norms and common understanding of each Service's doctrines and their conduct of operations will be necessary to prevent fratricide and friction and to ensure the success of the mission. Shared values would also go some distance in reducing

morale problems which may arise due to the unfamiliarity of being under the command and control of someone from a different Service.

- **Social Capital Reduces Transaction Costs**

People who do not trust one another will end up cooperating only under a system of formal rules and regulations, which have to be negotiated and enforced through layers of bureaucracy. Rules and bureaucracy, serving as a substitute for trust, entails what economists call “transaction costs.” An important function of social capital is therefore to reduce the transaction costs in the peacetime development of the SAF with regards to formal coordination mechanisms like contractual paperwork, hierarchies and bureaucratic rules.

Integrated operations can only be successfully executed if they were well developed during peacetime. However its legacy of strong Services developing largely independently of each other has resulted in a SAF with strong component Services, but without the necessary connections of norms, common understanding and shared values to facilitate peacetime development in an integrated manner. Reorganising the peacetime C2 structure to effect a stronger Joint and to optimize on peacetime developmental overheads could also yield great benefits. However, Service parochialism and the psychological need to protect turf boundaries, as with almost every organization, hampers restructuring. Nonetheless, studies have shown that transaction costs associated with

restructuring can be minimized if there is strong social capital, where there is trust and the willingness to co-operate and collaborate for the greater good.

- **Social Capital Enhances Innovation**

Innovation through R&D and Experimentation will provide the 3<sup>rd</sup> Gen SAF with a self-sustaining capability edge over her potential adversaries. Cohen and Prusak (2001) demonstrate convincingly in their well-documented book how social capital facilitates knowledge sharing, innovation and increased productivity. Israel is one such example showing how rich social capital between the military and the defence industry (due largely to many ex-military personnel finding jobs in the defence industry) can result in a flourishing defence industry through knowledge spillovers.

Innovation generally follows a four step process – the generation and selection of ideas, the experimentation and development of the idea, post-experimental refinement and lastly implementation. Throughout this process, social capital lays the foundation for collaboration as one is more likely to co-operate and share new ideas if one is certain that the other parties share the same objectives and operate by the same principles of fairness and teamwork. The best ideas generated and selected for further development are often those which are selected after much debate and discussion within a diverse team. Rich social networks are also essential for finding solutions to cross-unit or multi-departmental problems.

- **Social Capital Retains Talent**

People and talent rank high in the needs of the 3<sup>rd</sup> Gen SAF. Prusak has stressed the importance of social capital for the retention of the highly talented. Cohen also suggests that money isn't the only effective lure for new talent or retainer of current employees. Both writers stress that if talent can just be bought, it will be, but if you create high social capital in your organizations, money alone won't be able to suck the talented people out.

This sounds plausible if one considers the hierarchy of human needs, as laid out by Abraham Maslow. Beyond the very basic needs of air, water, food, and sex, Maslow laid out five broader layers: the physiological needs, the needs for safety and security, the needs for love and belonging, the needs for esteem, and the need to actualize the self, in that order. Past a certain point and once the physiological needs and the needs for safety and security are taken care of, people do not necessarily work just for money. Instead, they work for a sense of belonging, for a sense of recognition and identity. Social capital creates a culture of inter-dependency, a sense of community and a pleasant work environment which acts as a powerful deterrent to job-hopping.

### **Part III: Challenges to Social Capital in the 3<sup>rd</sup> Gen SAF**

The 3<sup>rd</sup> Gen SAF, like many organizations, must recognize the importance of rich social networks and capital as well as its challenges. Specifically, the cultivation of social capital is often undermined by volatility, virtuality and legacy.

- **Volatility**

The "Keep SAF Young" policy ensures a dynamic workforce and a fast-paced career for SAF personnel. However, the often quoted side-effect of this policy is that it results in rapid turnover of SAF personnel, especially those in the officer corps. Specifically, a typical SAF officer would spend about two years in an appointment before changing to another position. This constant churning grooms the officer for higher positions but makes it difficult to build up durable social networks and trust.<sup>4</sup>

- **Virtuality**

While IKC2, computers and datalink provide the 3<sup>rd</sup> Gen SAF with the means to be more efficient and effective, it will also foster a greater degree of virtuality which can undermine the cultivation of social capital, if it removes human interaction totally. Technology such as e-mails, telephones and SMSes are already becoming the norm in replacing face-to-face communications. In the future, soldiers might receive their missions orders virtually through their handheld PDAs, negating the need for face-to-face meetings with commanders. The convenience of conducting meetings and briefings virtually between geographically dispersed parties (e.g. tele-conferencing) might also lead to a decline in human contact.

However, the human psyche is such that trust, rapport and camaraderie are more easily fostered when there is human contact and face-to-face social exchanges. Technology which allows virtuality can undermine the growth of social capital and should therefore be used to complement and not remove human interaction.

- **Legacy**

The legacy of strong Services developing largely independently of each other has resulted in a SAF with strong competent Services, but without truly common norms, values and understanding. Despite attempts to create a more integrated and Joint SAF, Service parochialism still exist strongly, as manifested in different uniforms, organizational structures and training. The growth of social capital between the Services can only truly flourish when more effort is focused on bridging such “walls”.

## **Part IV: Cultivating Social Capital**

Social capital differs from other forms of human capital insofar as it is usually created and transmitted through cultural mechanisms like religion, tradition, or historical habit. Unlike other military hardware, social capital cannot be bought or manufactured or developed through R&D. However, there are some levers which the SAF can use to cultivate social capital.

- **Social Space & Time**

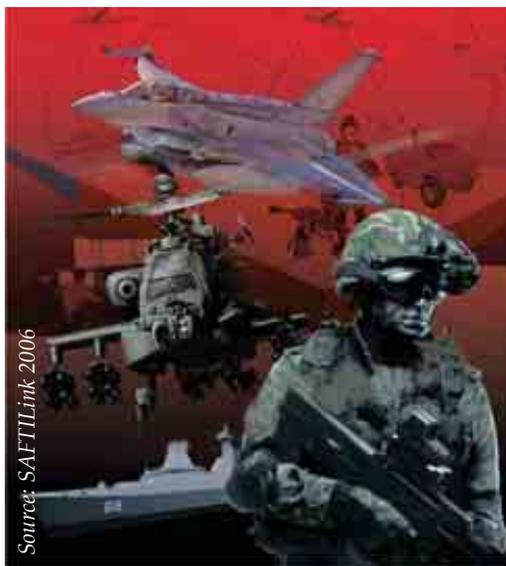
Putnam suggests that social capital can be cultivated by increasing social space and time. More specifically, social capital thrives in environments which provide sufficient opportunities and make it conducive for people to meet and co-operate with each other. The concept of speed-dating, where individuals are given ample opportunities to meet a variety of people in a friendly environment, as practiced by some of our Social Development Unit activities, is one such manifestation of

enhanced social space and time. Another example is that of the open-office work concept as demonstrated by Washington Mutual in the USA. They created what they called open-office “villages” which featured lower partition walls and emphasized less individual space but more common space. This encourages people to have impromptu meetings in the common meeting areas and exchange information over complimentary coffee and tea in the common cafe. No longer separated from their teams by large office walls, managers can also easily see their employees and walk over and talk to them. A representative from Washington Mutual mentioned that with the “village” concept, “the energy level is higher and communication is better because people can see each other more easily.”

In the SAF, the idea of an open-office concept has many detractors. Often quoted arguments revolve round the concerns of security and privacy. These concerns are indeed valid and there does not seem to be a strong argument for the SAF to adopt a totally wall-less and partition-less set-up. However, the need for greater integration and co-operation for the 3<sup>rd</sup> Gen SAF is a convincing argument for some parts of the SAF to shift emphasis away from the high partition walls, individual office space and lack of common areas. A compromise therefore are for lower partition walls which are high enough to accord privacy when people are seated but low enough to facilitate face-to-face conversation when standing. Doing so might allow the 3<sup>rd</sup> Gen SAF to enjoy enhanced “energy” and benefits similar to Washington Mutual’s experience.

- **Joint Outlook**

As mentioned, social capital is normally a by-product of religion, which is beyond the control of organizations. However, an organization can mimic the properties of a religion by developing a common vision or mission statement which unites and aligns the various entities within the organization. There is a mission statement for the SAF but is there a common unifying vision for the SAF as a whole? The answer is no. Instead, each Service has their own vision. As a result, each Service develops its own culture, beliefs and “religion”. We postulate that a more Joint outlook will mitigate the stove-pipes between the Services and establish a common SAF-wide “religion”, thus ensuring that everyone in the SAF, regardless of Service, will share the same mission and values as well as allowing for better understanding and co-operation for integrated operations.



*Towards an integrated SAF*

What does this Joint outlook entail? Does it extend to the extreme of removing the Services and having only

Joint warriors? We feel that Services are still vital in ensuring foundational competencies and allowing a more effective span-of-control. However, a more Joint outlook can be adopted in the area of education and training.

Putnam has mentioned that the area where governments probably have the greatest direct ability to generate social capital is education which fosters social rules and norms. Similarly, militaries like the SAF can influence the generation of social capital through greater emphasis on Joint education and training. Ironically, as we move towards a more Joint SAF, there seems to be a reduction in the time spent on Joint training (for example, the Tri-Service component in OCS has been reduced from ten weeks to four weeks). This is unhealthy for social capital as trust and common understanding are directly correlated with time spent together. More Joint training time is therefore necessary for the meaningful cultivation of social capital for the 3<sup>rd</sup> Gen SAF.

- **People Focus**

An important role of leadership is to reinforce the common core values and create a close-knit sense of team, which is essential in developing implicit trust and understanding within the organization. Policy makers must also understand that social capital, as the name implies, is about people. There is no point in repeatedly implementing measures without constantly assessing the feedback from the people and letting them know that they are being heard and taken care of. As a policy instrument, a survey can therefore help policy makers decide the level of intervention required. At United Parcel Services, an annual employee relations index tracks

employee opinions on issues including fairness of opportunity and trust as well as signals the firm's commitment to those values. The SAF must therefore maintain its focus on people as well as undertake such surveys to generate trust and team spirit.

## Conclusion

Summing up, the SAF is well on its way in transforming into an integrated and networked 3<sup>rd</sup> Gen military. While the hardware components are easily obtained, the vital connectors of culture, trust, shared values and common understanding are more elusive. There is therefore a need for a more conscious focus on the cultivation of social capital. ☺

*(Ed note: This essay was a merit award winner of the 2005 CDF Essay Competition.)*

## Endnotes

- <sup>1</sup> According to Cohen and Prusak, it is social capital-the stock of trust, social networks and sense of community found inside every organization-and not people, processes and technology that will make the difference for organizations trying to take their work to the next level.
- <sup>2</sup> Cohen and Prusak (2001) mentioned that "social capital consists of the stock of active connections among people: the trust, mutual understanding, and shared values and behaviors that bind the members of human networks and communities and make cooperative action possible".
- <sup>3</sup> Haddad suggested that social capital allows "dilemmas of collective action to be resolved". The sense of community fostered within an institution allows action to be taken on behalf of the group which may not be bound by contracts or legal agreements.
- <sup>4</sup> As Prusak mentioned, "trust is a big function of reciprocal relationships over time. Generally, you trust a person over time."



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# Performance of Densely Compacted Ceramic Composites Against Small Calibre Kinetic Energy Penetrators

*by MAJ Neo Hock Huat, Melvin*

## INTRODUCTION

The development of lightweight and inexpensive ceramic armour and its inclusion into the design of contemporary armoured vehicles is considered a necessity for armoured vehicle manufacturers and users alike. This is due to the requirement of complying with a desired weight limit of the armoured vehicle while incorporating a high level of protection. The three main categories of protection are ballistic or kinetic energy protection, shaped charge or chemical energy protection, and mine blast protection.

Ballistic protection is a cardinal requirement for all armoured vehicles and personnel subject to ballistic threats. Military ballistic protection can be classified into flexible lightweight and stiff massive armour. Ceramic armour systems typically consist of a monolithic ceramic body backed with a relatively ductile but high tensile strength material such as reinforcing fibres or soft metals. Due to their brittle nature, the hard ceramic face is cracked and broken upon impact with a high-velocity projectile, and the backing material absorbs the residual fractured ceramic elements and projectile. Massive armour typically

consists of high hardness steel or other metals (e.g. titanium, aluminium) multilayered with reinforcing material such as ceramics or polymers.

## OBJECTIVES

This project investigates the ballistic performance of particulate silicon carbide (SiC) and SiC-Cement (fabricated under compression of up to 440MPa) against a 7.62mm AP equivalent projectile. It is an extension of a similar study conducted by Yap (2004)<sup>1</sup>, performed on cementitious panels, where a silicon carbide-aluminium sandwich panel with mass effectiveness of close to 1.0 was achieved.

The principal parameters modified in this study were:

- i. Type of matrix.
- ii. Compaction pressure.
- iii. Aggregate size and void ratio.
- iv. Velocity of the projectile.

## 1. Penetration Mechanics

Kinetic energy penetrators transmit a high amount of kinetic energy to a relatively small surface area at the impact point on the armour surface.

This leads to high stresses at the impact point which exceeds the strength of the armour material. As the armour material fails, kinetic energy from the penetrator is converted into heat and is utilised in the decomposition of the material. This reduces the residual kinetic energy available for further penetration, and ultimately the penetrator is stopped when the kinetic energy of the penetrator is insufficient to overcome the compressive strength of the armour material.

### 1.1 Impact and Shockwave Propagation

When a high-speed penetrator strikes a target, high-amplitude, high-velocity compressive stress waves (commonly referred to as shock waves) propagate through the target. When the compressive wave reaches the distal surface of the target, it is reflected back as a tensile wave due to impedance mismatch between the target and the free surface, creating a region of large tensile stresses. This tensile stress wave propagates back to the strike face of the target, causing further damage to the armour material by spalling, and will sometimes fracture the penetrator which is typically brittle (Figure 1).

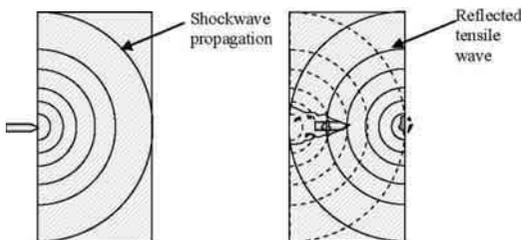


Figure 1: Penetration of kinetic energy projectile

### 1.2. Factors Affecting Target Penetration

It follows that both target and penetrator properties have a profound effect on determining the depth of penetration of a target for a given penetrator. High values of bulk and shear moduli are needed to provide a large resistance to deformation and counteract volumetric changes upon impact. The high ratio of target thickness to penetrator thickness is desired in order to retard the penetrator and allow time for the reflected tensile wave to damage the penetrator. High compressive strength makes the target more resistant to hydrodynamic penetration, allowing it to erode the tip of a pointed projectile and hence reducing the stress on the target.

For penetrator properties, impact velocity will determine the amount of kinetic energy and hence compressive stress transmitted to the target. A high slenderness ratio is desired as this increases the compressive stress at the target upon impact. A projectile too slender will be unstable in flight and impact. Tip geometry, high material strength and hardness affect the compressive stresses transmitted and the amount of deformation the penetrator undergoes upon impact.

### 1.3 Protection Mechanism of Metals

Many metals make great blast and penetration resistant materials. Metals are used because of their

inherent strength and toughness and energy absorption capability. Ductility provides an indication of a material's resistance to penetration of a projectile and its ability to absorb energy from a blast. Figure 2 presents a comparison of the ballistic performance for various types of steel.

### 1.4 Rolled Homogeneous Armour (RHA)

RHA is the traditional material used for Armoured Fighting Vehicles. It belongs to a family of high-quality steel alloys which is a homogeneous plate that has the same hardness and structure throughout. Its production involves a rolling process to bring it to the correct thickness and induce desirable metallurgical properties. RHA is the standard by which all

armour types are judged. Armour performance is generally quantified in terms of mass effectiveness ( $E_m$ ), which is the ratio of the areal density of conventional steel armor (RHA) required to defeat a given threat, to that of the armor in question.

### 1.5 Protection Mechanism of Ceramics

Conventional massive armour defeats an incoming projectile by reducing its kinetic energy through ductile deformation. In composite or ceramic based armour, a different process is employed. The armour surface causes significant deformation to the projectile and reduces its kinetic energy as the bullet is fragmented on impact. The residual energy of the comminuted bullet and ceramic fragments is absorbed by plastic or elastic deformation within the backing of the armour tile.

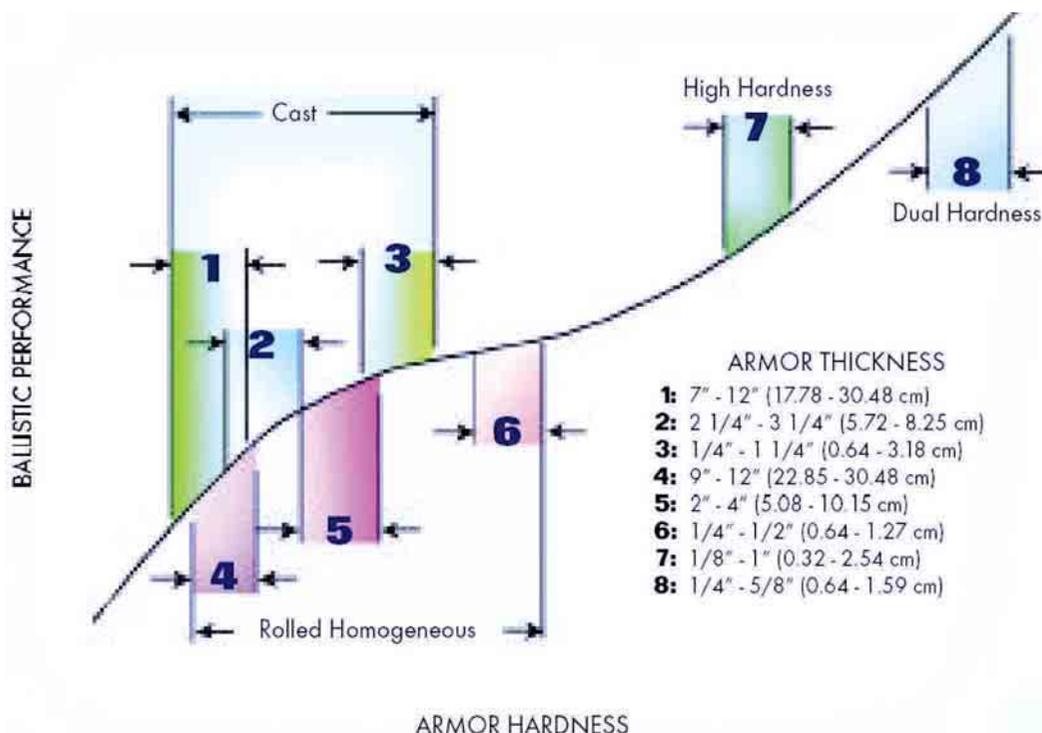


Figure 2: Ballistic performance of various steels<sup>2</sup>

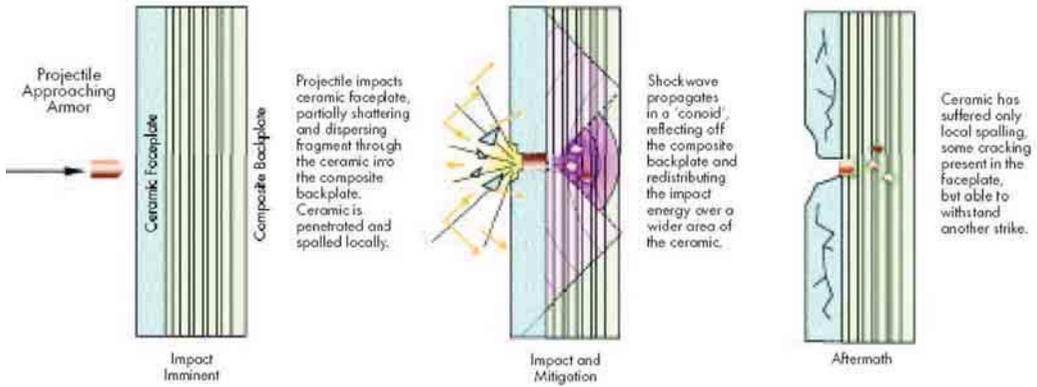


Figure 3. Protection mechanism of ceramic armour<sup>3</sup>

## 1.6 Particulate Metal Matrix Composites (MMC)

Fabrication of these composites involves mainly aluminium alloy matrices, but there have also been activities concerning titanium-, steel-, and magnesium-based systems. The particulate material employed is

most commonly SiC or Al<sub>2</sub>O<sub>3</sub>, but many others have been investigated. These include TiB<sub>2</sub>, B<sub>4</sub>C, SiO<sub>2</sub>, TiC, WC, BN, ZrO<sub>2</sub>. In general, the attributes ideally exhibited by particulates for MMC reinforcement are high stiffness, low density, high hardness, adequate toughness, and good availability/low cost.

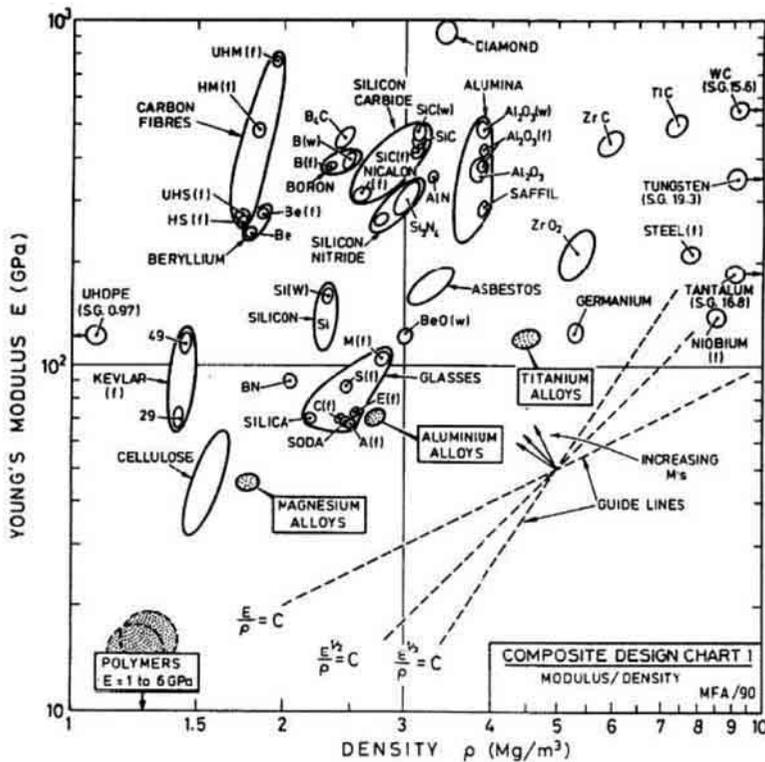


Figure 4: Comparison of Young's Modulus vs, density for various reinforcement materials

In order to get an overview of how the materials compare with each other, a map (Ashby, 1993) such as that shown in Figure 4 can be constructed. This depicts the combinations of stiffness and density offered by various potential reinforcements, together with those of some metallic matrices. The dotted lines represent gradients corresponding to constant values of the ratio between the stiffness (raised to different powers) and the density. For a given ratio (relative importance of stiffness and density), a reinforcement lying far towards the upper left from the line on which the matrix lies will be efficient, whereas one lying close to that line will provide little benefit. It can be seen that, on this basis, SiC and Al<sub>2</sub>O<sub>3</sub> are attractive candidates for reinforcement.<sup>4</sup> B<sub>4</sub>C gives a higher ratio but its suitability is hampered somewhat by its high cost.

## 2. Experimental Concept

Silicon carbide possesses the properties that are desirable for a resistive material. Its high hardness and relatively low density make it a suitable candidate for inclusion in armour systems. However, its low ductility makes it inappropriate for use as a monolithic layer. As mentioned in section 2.3.1, SiC is instead used as a reinforcing element in a ductile matrix. As an extension to the findings by Yap (2004)<sup>5</sup>, the depth of penetration (DOP) for 3-5mm SiC at elevated compressive stress of 440MPa was proposed. This value was sufficient to cause

pulverisation of the SiC particles. Comparison of performance would also be made to SiC/Cement and SiC/Epoxy composites.

Ballistic impact testing comprised firing 5mm diameter tungsten carbide projectiles from a gas gun at velocities of 600-700m/s. This is equivalent to NATO Standardisation Agreement (STANAG) Level 3 protection at 300m instead of 20m. The ballistic limit velocity of 15mm Rolled Homogeneous Armour at 380 Brinell hardness was used as a benchmark for impact testing. The DOP of the test specimens were measured and used to calculate the mass efficiencies of the various specimens.

### 2.1 Depth of Penetration Testing

The DOP or thick-backing technique is a commonly used procedure that allows the ballistic evaluation and ranking of armour ceramics independent of armour configuration. The test projectile is fired into a ceramic tile backed by a semi-infinite block of reference backing material, typically RHA. The residual penetration into the backing material is measured and compared to the penetration of the projectile into a monolithic block of the backing material.

Departing from the traditional oblong shapes that are typical of ballistic test specimens, a cylindrical design was adopted for this project. This ensured a more uniform distribution of the lateral stresses transmitted to the confinement surface. More

significantly, it accommodated the high compressive stress of 440MPa that was required.

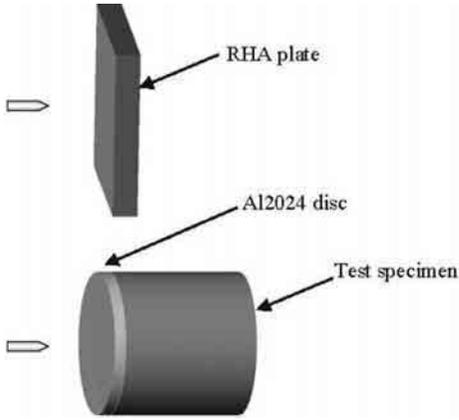


Figure 5. Schematic of DOP Testing

The basis of comparison would be the ballistic limit velocity of the RHA, which was used to determine the velocity at which the test specimen projectiles are fired. The mass effectiveness of the test specimen would be determined by the following equation, where the numerator is the areal density of the RHA, and the denominator is the areal density of the 6.35mm Al2024 disc plus the areal density penetrated into the test specimen, measured by the DOP of the specimen. All impact angles were set to 0° NATO (perpendicular to the strike face).

$$E_m = \frac{\rho_{RHA} t_{RHA}}{\rho_{Al2024} t_{Al2024} + \rho_{spec} DOP_{spec}} \quad (1)$$

where  $\rho_{RHA}$ : density of RHA,  $t_{RHA}$ : thickness of RHA  
 $\rho_{Al2024}$ : density of Al2024,  $t_{Al2024}$ : thickness of Al2024  
 $\rho_{spec}$ : density of test specimen,  $DOP_{spec}$ : DOP of test specimen

## 2.2 Theoretical Analysis

In line with the early penetration theory proposed by Poncelet (1829)<sup>6</sup>, we can express the resisting force of

a target material as a combination of the static resisting force and a frictional force generated when the penetrator moves through the target. This is illustrated in the following figure:

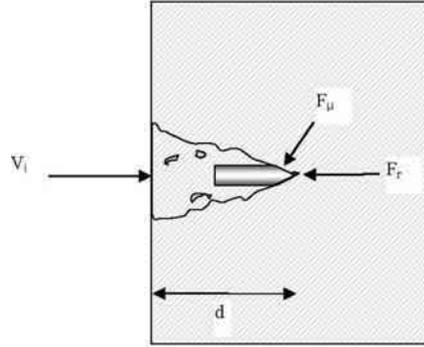


Figure 6: Penetrator impact parameters

Assuming that the penetrator follows a straight line penetration into the target, and taking the summation of forces at the instant when the penetrator is stopped by the target,

$$F_r + F_\mu = \frac{mV_i^2}{2d} \quad (2)$$

where  $F_r$ : resistive force of the target  
 $F_\mu$ : frictional force between target and penetrator  
 $m$ : mass of projectile  
 $V_i$ : impact velocity of the projectile  
 $d$ : depth of penetration into target



Figure 7: Frictional forces acting on penetrator

The target-penetrator frictional force is dependent on the coefficient of kinetic friction between the projectile conical surface and the target,  $\mu_k$ ; the

conical angle  $\alpha$ ; the normal reaction force acting on an infinitesimal conical surface of the penetrator  $N$ .

$$f_{\mu} = \mu_k N \cos \frac{\alpha}{2} \quad (3)$$

Summing the forces over the surface area of the cone with cone radius  $r$  and slant height  $s$ :

$$F_{\mu} = \int f_{\mu} dA = \int f_{\mu} \pi s dr \quad (4)$$

From the above, it can be seen that the resistive force of a material to penetration is dependent on the kinetic friction between the penetrator and the material, diameter of the penetrator, the conical angle of the penetrator, the mass and velocity of the penetrator. The material hardness and tensile strength are also critical factors.

For a given penetrator with a particular mass, geometry and velocity, we can examine the resistance of a material to penetration by varying its coefficient of kinetic friction (by varying its material composition), hardness and tensile strength. However, high hardness materials would be inherently brittle, hence measures must be taken to ensure a degree of ductility of the material to provide for resistance to multiple impacts.

### 2.3 Fabrication of Test Specimens

All test specimens were fabricated by compression using 10MN or 2000kN Instron® servo-hydraulic actuators up to a load of 2000kN. The equipment set-up is illustrated below.

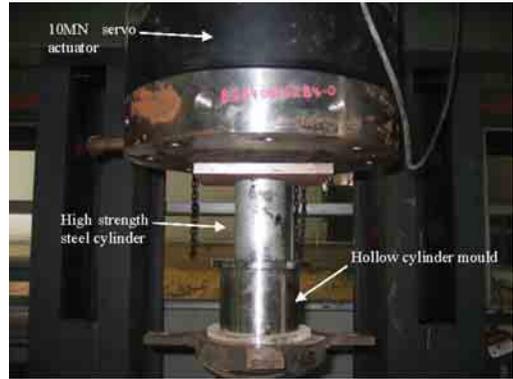


Figure 8: Compression of test specimens

#### 2.3.1 3-5mm SiC

In order to determine the extent of reduction of volume as well as the particulate size after compression, 100% 3-5mm SiC was used. A hollow cylinder mould was used for compression and was filled to the brim with 3-5mm SiC, and placed on a vibrating table for an average of 3 min to reduce the void space between the particles. The samples were then compressed to 2000kN, corresponding to a compressive load of 440MPa. Six samples were fabricated, three of which underwent ballistic impact tests to determine their depth of penetration as well as to determine the change in particle size ratio after impact.



Figure 9: 305mm SiC compressed to 440MPa

Post compression observations showed that there was significant breakdown of particles into sub-millimetre sizes, implying that the void spaces between the 3-5mm particles were filled by the pulverised SiC. As expected, the compressive stress was insufficient to cause adhesion between the particles, and they were easily displaced. Calculations indicated a minimum void ratio of 0.86 for uncompressed SiC and 0.31 for 3-5mm SiC compressed to 440MPa.

### 2.3.2 3-5mm SiC/Cement Composite

In order to further reduce the void spaces in between the SiC particles, and to act as a binding agent to obtain a solid specimen, cement was added to the SiC. 3-5mm SiC was mixed with Portland cement (10% by weight), silica fume (1% by weight) and distilled water (4% by weight). The mixture was compressed in a hollow cylinder mould using the same procedure described in 2.3.1. It was observed that the high compressive stress caused water seepage from the mould. This would have reduced the available water for curing. The samples were cured for 28 days, in accordance with findings from Yap (2004).<sup>7</sup> Three samples were subjected to ballistic impact testing.

## 3. Impact Test Results and Analysis

Impact tests were carried out on the RHA reference plate, compressed specimens of 100% 3-5mm SiC, and SiC/Cement. The results showed a trend of improving ballistic performance with a lowering of the void ratio in the composites. This was in line with earlier postulations. However, comparisons between the SiC/Cement, SiC/Al and SiC/Epoxy composites could not be accomplished.

### 3.1 RHA calibration firing results

#### 3.1.1 Observations

Four shots were fired at the reference RHA plate to determine the ballistic limit velocity. The first two shots were fired with the gas chamber at 100bar while the next two were fired at 120bar. The first two shots did not perforate the RHA plate; the penetrator of the third shot was embedded in the RHA plate with the tip perforating the rear of the plate; the final shot perforated the RHA plate completely, with the front portion of the penetrator breaking off and the remaining part embedded in the plate.

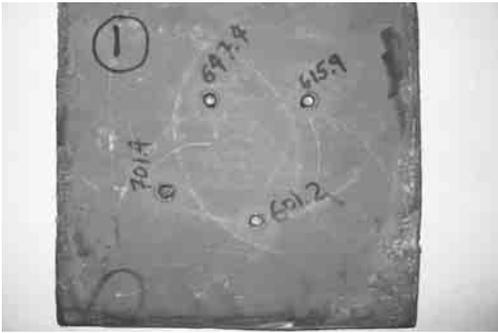


Figure 10a. RHA reference firing



Figure 10b. Shots 1 & 2 (rear)



Figure 10c. Shots 3 (rear)



Figure 10d. Shots 3 (rear)



Figure 10e. Shots 4 (strike face)



Figure 10f. Shots 4 (rear)

### 3.1.2 Analysis

The calibration firing results were tabulated as follows:

**Table 1: RHA calibration firing results**

Specimen	Shot	Time ( $\mu$ s)	Velocity (m/s)	Kinetic Energy(J)	Observation
15mm Armour Plate RHA (BHN380)	1	168	601.2	1143.96	Bulging, No Perforation
	2	164	615.9	1200.59	Bulging, No Perforation
	3	156	647.4	1326.54	Tip Perforation
	4	144	701.4	1557.06	Perforation

It was determined that the ballistic limit velocity of RHA against this projectile was 647m/s. Compared to the reference firing tests on high strength steel done by Yap (2004)<sup>8</sup>, the ballistic limit velocity value of RHA was 11% higher than high strength steel. Compared to a steel core projectile, the kinetic energy required to perforate an equivalent thickness of RHA is about 30% lower.

### 3.2 Test Results for 3-5mm SiC at 440MPa

#### 3.2.1 Observations

Three specimens of compressed SiC were subjected to impact testing. There was no obvious indentation on the Al disc, indicating that there was marginal or no shifting of the SiC particles in the immediate impact area. This was a trait to be seen for all subsequent test specimens, and was due to the high compressive stress of the SiC contained within.



Figure 11. Projectile impact on 3-5mm SiC test specimen

The Al disc was machined off to determine the condition of the penetrator after impact, and

the SiC particles were removed for sieve analysis. It was noted that there was no appreciable reduction in the thickness of the Al disc after compression.

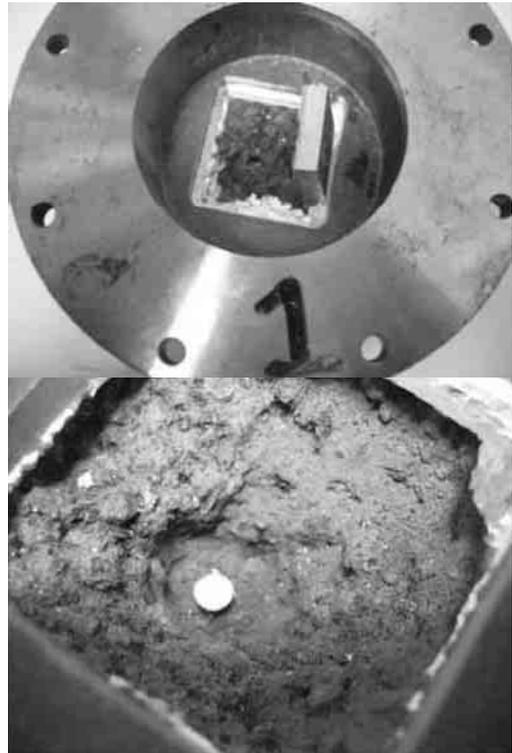


Figure 12. Projectile embedded in SiC test specimen 3-5

It was observed that two of the penetrators were broken and eroded, while the third did not break. All three penetrators showed signs of tip and body erosion, implying that the 3-5mm SiC particles managed to abrade the WC projectile. However, the projectile tips were not blunted, unlike that seen for the RHA firing. It was deduced that the WC penetrator undergoes a self-sharpening effect in SiC.



Figure 13. Post-impact penetrators

### 3.2.2 Analysis

The results of the impact tests done on the compressed SiC specimens are presented below:

Table 2: 3-5cmm SiC firing results

Composition	3-5mm SiC 440MPa		
Specimen	1	2	3
Time ( $\mu$ s)	154	155	156
Velocity (m/s)	668	652	647
Kinetic Energy(J)	1412.30	1345.45	1324.90
Depth of Penetration (mm)	58.95	46.45	44.45

The DOP for 3-5mm SiC at 440MPa was 15% less than that for Grade 70 concrete. However, there was no significant difference when compared to 40% 0-1mm + 60% 3-5mm SiC at 37.5MPa. The calculated Em value for this composite was 0.83.

Table 3: Em calculations for 3-5mm SiC at 440MPa

Em Calculator			
<u>Conditions</u>			
Impact velocity at 647m/s			
90 deg impact angle			
density RHA	7.85	g/cm <sup>3</sup>	
thickness RHA	15	mm	
density RHA	2.77	g/cm <sup>3</sup>	
thickness RHA	6.35	mm	
density specimen*	2.8	g/cm <sup>3</sup>	
DOP specimen	44.5	mm	
Mass effectiveness Em =	$\frac{(\text{density RHA} \times \text{thickness RHA})}{(\text{density AI} \times \text{thickness AI} + \text{density specimen} \times \text{DOP specimen})}$		
	= 0.83		
* specimen density is less than density of pure SiC due to voids (30% void ratio)			

### 3.3 Sieve Analysis for 3-5mm SiC at 440MPa

A sieve analysis was conducted on all six samples. Three were subjected to impact tests. As seen from the following figures, compression at

440MPa led to a higher ratio of sub-millimetre particles as compared to compression at 37.5MPa. The particle size ratio for 3-5mm SiC compressed to 440MPa is similar to a 40% 0-1mm + 60% 3-5mm SiC compressed at 37.5MPa.

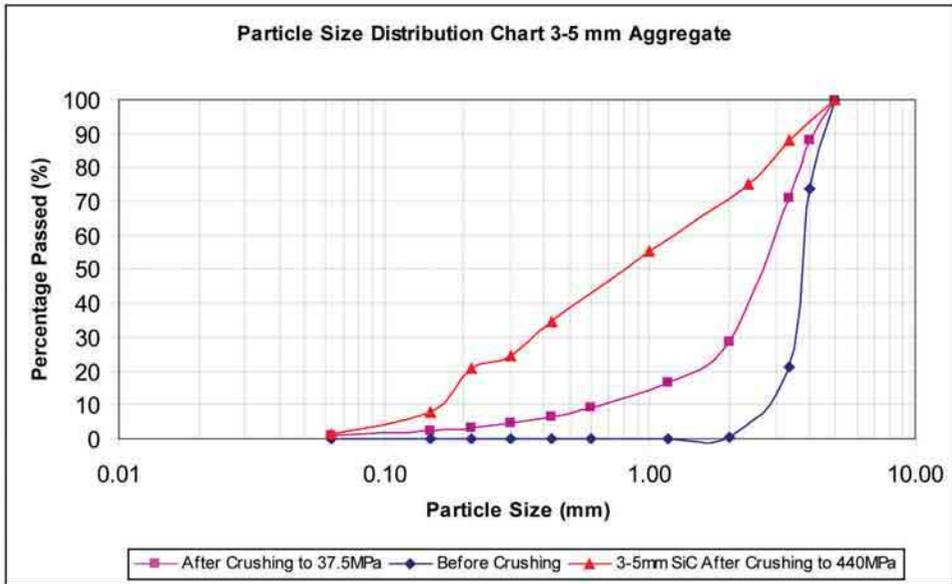


Figure 14. Comparison of particle size distribution (3-5mm SiC)

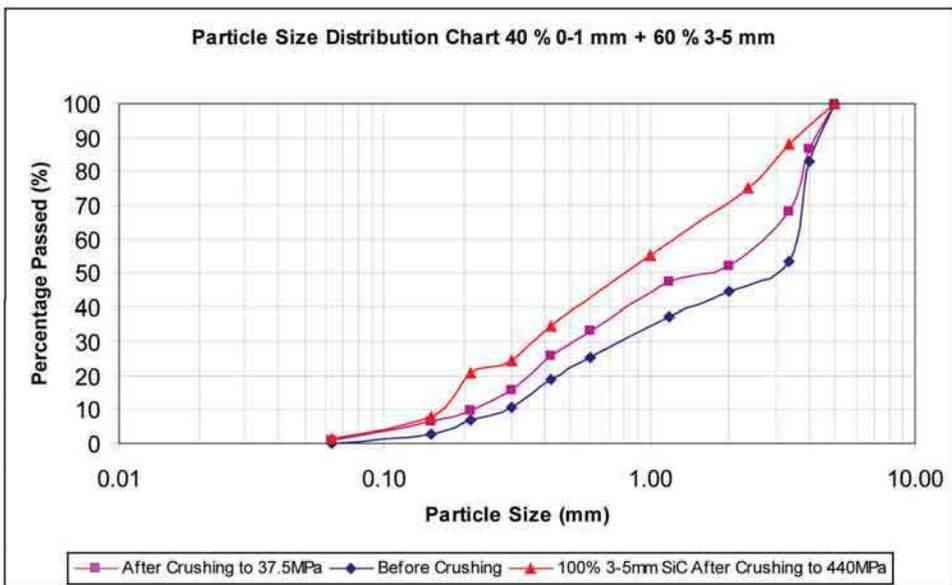


Figure 15. Comparison of particle size distribution (3-5mm SiC and 40% 0-1mm + 60% 3-5mm SiC)

Comparison of results without and after firing indicated negligible change in the composition of the SiC particle sizes. It was concluded that the kinetic

energy transmitted to the compacted SiC particles by the projectile was insufficient to cause significant additional pulverisation of the particles.

**Table 4: Sieve analysis data for 3-5mm SiC without and after firing**

3-5mm SiC compressed at 440MPa						
Sieve Size (mm)	No Firing			After firing		
	Mass retained (g)	Mass passed (g)	Percentage finer (%)	Mass retained (g)	Mass passed (g)	Percentage finer (%)
5.00	0.00	1499.75	100.00	0.00	2201.17	100.00
3.35	183.02	1316.73	87.80	238.10	1963.07	89.18
2.36	192.03	1124.70	74.99	268.63	1694.44	76.98
1.00	293.42	831.28	55.43	439.86	1254.58	57.00
0.43	309.80	521.48	34.77	629.66	624.92	28.39
0.30	153.71	367.77	24.52	95.76	529.16	24.04
0.21	58.50	309.27	20.62	82.59	446.57	20.29
0.15	194.28	114.99	7.67	273.86	172.71	7.85
0.06	93.90	21.09	1.41	127.02	45.69	2.08
Pan	21.09	0.00	0.00	45.69	0.00	0.00
Total	1499.75			2201.17		

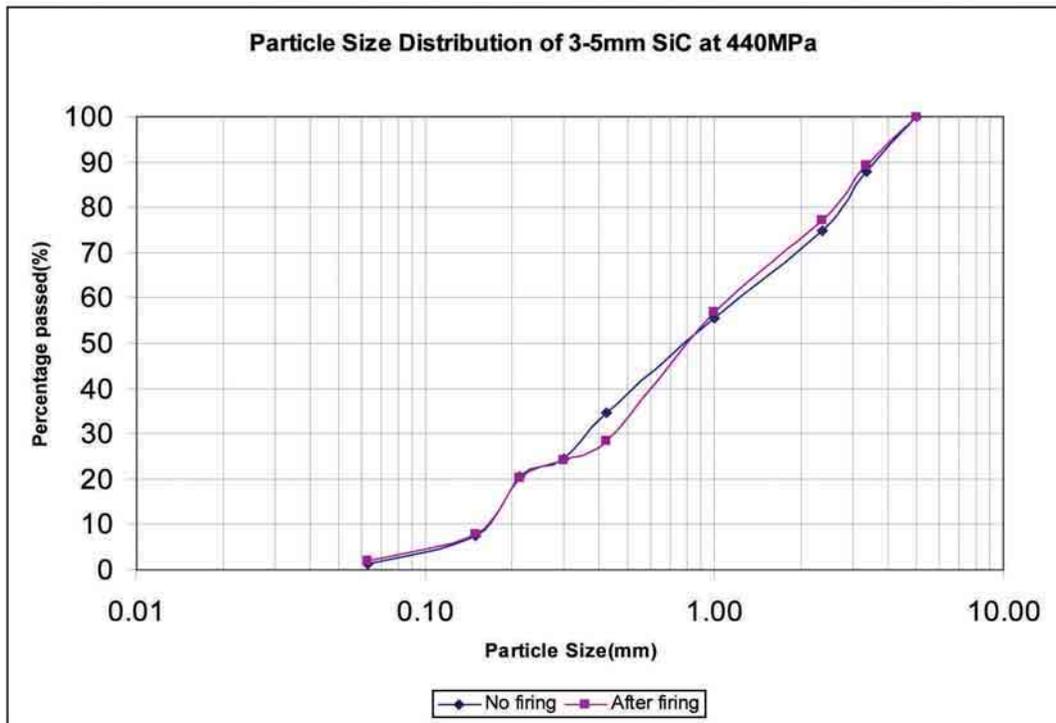


Figure 16. Comparison of particle size distribution without and after ballistic impact (3-5mm SiC)

### 3.4 Test Results for 3-5mm SiC/Cement Specimen

The DOP values for the SiC/Cement specimens are presented below:

**Table 5: SiC/Cement firing results**

Composition	3-5mm SiC 440MPa		
	Specimen	1	2
Time ( $\mu$ s)	156	154	144
Velocity (m/s)	647	656	701
Kinetic Energy(J)	1324.90	1362.01	1555.28
Depth of Penetration (mm)	33.50	33.75	41.20

It was noted that there was a 25% decrease in DOP at nominal impact velocity of 647m/s. This was significant enough to infer that addition of cement would provide better ballistic performance. The calculated Em value was 1.03.

**Table 6: Em calculations for 3-5mm SiC/Cement at 440MPa**

Em Calculator			
<u>Conditions</u>			
Impact velocity at 647m/s			
90 deg impact angle			
density RHA	7.85	g/cm <sup>3</sup>	
thickness RHA	15	mm	
density AI2024	2.77	g/cm <sup>3</sup>	
thickness AI2024	6.35	mm	
density specimen*	2.9	g/cm <sup>3</sup>	
DOP specimen	33.5	mm	
Mass effectiveness Em =	$(\text{density RHA} \times \text{thickness RHA})$		
	$(\text{density AI} \times \text{thickness AI} + \text{density specimen} \times \text{DOP specimen})$		
	= 1.03		
* specimen density is less than density of pure SiC due to voids (<30% void ratio)			

## CONCLUSIONS

The results showed a trend of improving ballistic performance with a lowering of the void ratio in the composites. This was in line with earlier postulations. Significantly, compression to 440MPa reduced the void ratio in the 3-5mm SiC mix by 90%. However, it was insufficient to ensure adhesion between SiC particles; the minimum obtainable void ratio was 0.31. Inclusion of cement into the SiC mix proved effective in reducing the void ratio without significantly increasing density. It also reduced the DOP in SiC by up to 25%, and achieved an Em of 1.03.

It was also observed that the WC projectiles experienced a self-sharpening effect on the projectile tip after penetration into 3-5mm SiC, but are blunted after penetration into RHA. In addition, the hardness of particulate 3-5mm SiC is insufficient to fragment WC projectiles, but instead had an eroding effect on the projectile. The kinetic energy transmitted to the compacted SiC particles by projectile impact was also insufficient to cause significant additional pulverisation of the particles. The cause of projectile fracture was postulated to be due to shockwave reflection.

## RECOMMENDATIONS

Fabrication and impact testing of SiC/ Epoxy composites should be conducted to examine the effect of a matrix with intermediate ductility and lower weight. A combination of sintering under lower compression stresses would be necessary for fabrication of larger panels for practical applications. 

(Ed note: This article is an extract from MAJ Neo's thesis.)

### Endnotes

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- 6 Lee et al., *First Year Progress Report on "Development of Advanced Protective Materials and Systems Against Close-in Blast and Penetration"*, Centre for Protective Technology, National University of Singapore (2003), p25.
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- 8 Ibid., p69.



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might deter any potential cooperative efforts. By international maritime law, the neighbouring maritime states (such as China, Vietnam and the Philippines) collectively claim the perimeter areas of the sea but there remains a substantial central portion that belongs to the international community. Hence, the global commons may be overlooked; the crux remains that maritime security cooperation in this region is necessary especially against terrorism and the seemingly thin cooperation in the South China Sea makes this waterway a potential regional flashpoint.

Terrorists can target vessels that use this regional sea-lanes and jeopardise the economy of East Asian states and the fledgling regional economy. At this juncture, it is vital to note the difference between pirates and terrorists. Pirates existed as early as the birth of maritime trade. It is the sea-equivalent of robbers which existed as early as man experienced greed and poverty. However, terrorists act for religious hatred and/or political grievances, which cannot be easily appeased by monetary gains. Their intent is to disrupt and destroy and these actions will undermine the well-being of the East Asian regional economy and its individual states. Hence, it is worthy to explore areas of maritime cooperation in patrolling the seas.

Another aspect of maritime security cooperation in the South China Sea would be port security. If an attack on Limburg ship in Yemen in 6 Oct 2002 cost 3000 job losses and governmental losses of USD 415 million per month<sup>2</sup>, any suicide attacks on critical ports itself could easily impose a greater economic

damage in terms of infrastructure and investor confidence. Here, the author postulates that the Chinese ports in Pearl River Delta, neighbouring the South China Sea, may be potential targets to such attacks. According to Pereire<sup>3</sup>, a terrorist attack on China is highly possible given the East Turkestan Islamic Movement (ETIM) in the Xinjiang province which borders Afghanistan. The increasingly global and networked nature of the Jihad movement, since 9/11, suggests that the terrorists' area of operations need not necessarily be in Xinjiang. It may be a joint operation between ETIM and other fraternal organisations such as Al Qaeda, Abu Sayyaf and Moro Islamic Liberation Front (MILF) which have the capability to conduct maritime terrorism<sup>4</sup> and who operate in the region. This scenario is particularly plausible when Al Qaeda has expressed its shift in strategy towards targeting economic targets<sup>5</sup>. South China (e.g. Pearl River Delta) is hence a plausible target due to the congregation of several of China's Special Economic Zones (SEZs).

This is also where maritime states, in general, might want to re-look into what constitutes naval intelligence against terrorism before proceeding to intelligence cooperation. MAJ Chua wrote on the need to share intelligence across states. However, the technological sources of MASINT, IMINT, ELINT and SIGINT might be inadequate against such maritime terrorists who might operate on a wooden sampan loaded with high explosives in order to keep a low profile and escape detection. In theory, HUMINT sources would be relevant to reveal the true intent of the terrorists, which is important since, as LTC Joshua Ho<sup>6</sup>

commented, piracy may well form the background noise from which maritime terrorist attacks materialise. However, this is easier said than done with the unreliability inherent in this traditional method of intelligence.

In conclusion, there remains many possibilities for further maritime security cooperation in the South China Sea and the ASEAN Plus Three's 'Regional Cooperation Agreement on Combating Piracy and Armed Robbery against ships in Asia' (ReCAAP), Five Power Defence Agreement's (FPDA) anti-terror drill in Bersama Lima (2004), amongst others, are examples of successful maritime security cooperation in Asia after 9/11. The author opines that further maritime security cooperation in the South China Sea seems more plausible in the near future, given the recent discussions in the ASEAN Summit in Nanning (Oct 2006) on ASEAN-China economic cooperation. There would be problems and contradictions amongst affected states that would constitute another future challenge to

maritime security cooperation against terrorism in the South China Sea, but at least there remains two mutually-reinforcing impetus for cooperation – trade and terrorism. 

*by LTA Phua Chao Rong, Charles  
(Platoon Commander, HQ Armour)*

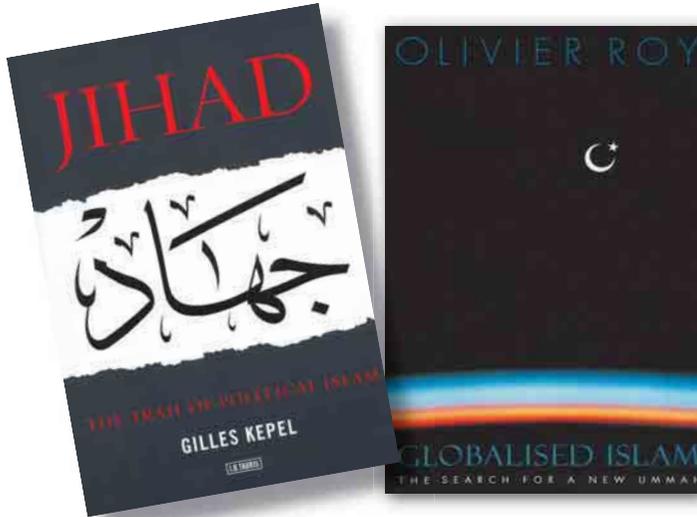
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## BOOK REVIEW

# The Roots of Radicalism

by Mr Toh Ee Loong



Gilles Kepel, *Jihad: The Trail of Political Islam* (London: I.B. Tauris, 2002).

Olivier Roy, *Globalised Islam: The Search for a New Ummah* (London: Hurst & Company, 2004).

September 11 has seen a considerable increase in interest and writing on Islam particularly with respect to Al Qaeda's interpretation of this great world religion as a mobilizing and legitimating instrument in its terrorist campaign. While many writers have not made the crass error of identifying Islam as the cause of terrorism, it is still not uncommon to come across theories that try to explain the unique characteristics of Al Qaeda-style terrorism with reference to Islamic theology, particularly the doctrines of Wahbahism or Salafism. Terms like "Islamic terrorism", "Islamism",

"fundamentalist", "jihadist" and so on remain contentious and contested. Furthermore, although experts, like Rohan Gunaratna, have called for a more holistic strategy to fight terrorism which is "multi-pronged, multi-dimensional, multi-agency, multi-jurisdictional and multi-national", the issue remains defined almost exclusively as a security problem.

Gilles Kepel's *Jihad* and Olivier Roy's *Globalised Islam* offer a perspective of the issue with a wider historical, socio-political approach. They argue that the "culturalist" approach of US-based doyens like Samuel Huntington and

Bernard Lewis which many security-centric writers tend to draw on give a misleadingly monolithic, essentialist and Middle East-centric image of Muslim polities and politics. They argue that this approach over-emphasizes continuities, takes Islamist rhetoric at its (neo)traditionalist face value and fails to even acknowledge the sheer novelty of many Islamist ideas. Kepel and Roy challenge the notion of the clash of civilizations and other simplistic notions like 'increased religiosity = increased militancy' by delving into case studies of the histories and politics of Muslim majority states and Muslim minorities in Europe respectively.

Both Frenchmen boast formidable credentials. Kepel became Research Director at Centre d'Etudes et de Recherches International after holding the Visiting Professorships at New York University in 1994 and Columbia University in 1995 and 1996 while Roy is Research Director at the French National Centre for Scientific Research. Both also teach at the elite Institut d'Etudes Politiques de Paris. A fluent Arabic speaker, Kepel lived with fundamentalist families in order to do anthropological field work for his 1994 book, *The Revenge of God*. Roy, a fluent Farsi speaker, spent time with the mujahideen on the Pakistani-Afghan border and served as Organization for Security and Co-operation in Europe (OSCE) representative to Tajikistan from 1993 to 1994.

Jihad traces the rise and decline of Islamist efforts to gain state power over 25 years and surveys their struggle in Muslim states such as Egypt, Malaysia, Pakistan, Iran, Afghanistan, Algeria,

the Sudan, Bosnia, Jordan and Turkey. It is their general failure that has led to the most militant splinter groups engaging in a last gasp campaign of nihilistic terrorism which he compares to the dying days of the radical Marxist terrorists groups such as the Baader-Meinhof Gang, Japanese Red Army and Italian Red Brigade.

Kepel's thesis argues that post-colonial ruling classes in Muslim majority states have been largely successful in preventing radical Islamic intellectuals from mobilizing the coalition of young urban poor and devout middle class needed to bring about radical political change. Islamism is not seen as religion attempting to take over the state but as a political solution to bad governance. In the vein of Kepel's two PhDs in political science and sociology, he argues that Islamism was an alternative political ideology of mobilization in response to the twin crises of Arab nationalism in the wake of repeated defeats by Israel and post-colonial socio-economic discontent stemming from the exclusion of the young urban poor and devout bourgeois from the division of colonial spoils, political power and economic opportunity.

But as the agenda of the young urban poor was often too radical for the politically conservative devout bourgeoisie to stomach – the former seeking to destroy a corrupt and failed system while the latter wanted re-emphasis of Islamic values in daily life. Islamic intellectuals would be the key agent to unite and mobilize the two groups in the pursuit of political power. It would be necessary for intellectuals like Hassan al-Banna and Sayyid Qutb of Egypt, Mawlana Mawdudi

of Pakistan, Ali Shariati and Ruhollah Khomeini of Iran to create a political vocabulary and movement based on Islam that inspired the revolutionary zeal of the young urban poor while reassuring the conservative and devout sensibilities of the bourgeoisie.

Kepel shows that many Islamic intellectuals were often too easily co-opted by the state and thus lose credibility with their constituencies. Or that the solidarity between the urban poor and the middle classes quickly melted away when the latter took fright at the social and political radicalism of the former as well as the savage government repression in reaction to that radicalism. The Iranian Revolution of 1979 is treated by Kepel as the exception that proves the rule - the Shia and Persian character of Iran's revolution limited its appeal as a positive model for Islamists in other Muslim majority states and has not been successfully exported. He also gives most of the credit for its success to personal and contingent factors such as massive miscalculations by the Shah and the political genius of Ayatollah Khomeini.

While many Islamists have since moved away from subversive confrontation with their ruling classes and opted for various forms of peaceful democratic competition, the most radical of them have given into despair and seek to destroy (rather than capture or reform) the impious states and their supporters without even the pretence of an alternative political program or system of governance. Kepel argues that Al Qaeda's nihilistic campaign of violence and terror will only serve to horrify and alienate the middle

classes of the Muslim world and so cut it off from its most important base of potential support.

When Jihad was first published in English in 2002, just a few months after September 11, Kepel's conclusion that those attacks were "a desperate symbol of the isolation, fragmentation and decline of the Islamist movement, not a sign of its strength and irrepressible might" (p375) was widely seized upon as Old World complacency and criticized for underplaying the threat of Al Qaeda and its affiliates as well as underestimating the mobilising potential of violence itself. In fact one such critical reviewer, *The Economist* (1 Jun 2002), recently reported (26 Nov 2005) that attitudes in many Muslim majority countries have strongly shifted against Al Qaeda and its affiliates over the period of 2002/3 to 2005 and that this shift of opinion was largely internally generated.

In addition, Kepel does not deny the possibility of more violence in the future or the need to counter it. His contribution is to remind us of the importance on the larger historical and political picture (and its constituent parts) - pointing to Islamism declining as a radical movement. Islamist parties, like Egypt's Muslim Brotherhood, Turkey's AK, Malaysia's PAS and so on, are increasingly basing (or have always based) their agendas on national and local issues, participating in democratic processes and valuing political bargaining while distancing themselves from militancy. In the vein of Clausewitz's dictum that war is a continuation of policy by other means, the resort to violence is often an

indication of the lack of effective means of political participation. This view is echoed by academics such as Dr Greg Barton who studied the evolution of Islamist parties in Indonesia as well as the Financial Times of London (28 Dec 2005, editorial) which argued that “the participation of Islamists in the political process remains the best hope of moderating their often radical views.”

Jihad shares many common assumptions with Roy’s earlier and less wide-reaching book, *The Failure of Political Islam* (1994). Islamism or political Islam is defined as “the contemporary movement that conceives of Islam as a political ideology” (p16) but they argue that Islamism no longer seeks to radically restructure the state or the international system; it is less a geostrategic factor than a societal phenomenon. However, Roy posits that the crisis remains due to the persistence of poor governance in many Muslim-majority nation-states, manifesting as ethnic and tribal strife, population growth outstrips economic growth, rural-urban tensions flare, the educated unable to find employment – all of which are in turn compounded by the failure of the models of nationalism and secularism.

The second book being reviewed, *Globalised Islam*, was launched in Singapore on 21 Jun 2005 by the Asia Europe Foundation (AEF) and the Institute of South East Asian Studies (ISEAS) with the support of the French Embassy. In it, Roy builds on his previous book by examining the schism between mainstream Islamism movements and transnational neofundamentalism. He argues that the most acute crisis is not a clash of civilizations between Islam and

the West but an intra-Islamic struggle between the deculturalizing forces of neofundamentalism and traditional Islam which is rooted in local cultural and social practice. Instead of seeing (neo)fundamentalism as merely a traditional reaction against globalization, Roy sees neofundamentalism as a puritanical reaction against tradition and is “both a product and an agent of globalization” (p25).

While Benjamin Barber has similarly argued that it is not just simply Jihad vs. McWorld (1995) but also Jihad via McWorld (one of Dr Gunaratna’s favourite examples being Osama bin Laden’s satellite phone having been purchased from New York City), Roy takes it a step further by arguing that neofundamentalism also positively welcomes the opportunities of globalization and its icons, like the internet, to build a pristine future (rather than reviving a past Golden Age) that is unsullied by the accretions of history, territorial allegiances or local customs.

Not merely a reaction to the corrosive deculturalisation of McWorld, the neofundamentalist agenda does not only adroitly use the technologies of the godless infidels but seeks to use a similar modus operandi to dissolve the connection of individuals to their states, nations, cultures and traditions. Instead, individuals are plugged into this new and imaginary global ummah which transcends the very notion of culture and feeds new forms of radicalism, from Al Qaeda-style terrorism to rejection of integrating into states where Muslims are a minority.

Roy assails the simplistic view that “liberal Islam = moderate = good; traditionalist Islam = reactionary / radical = bad”. Seen from his perspective, the intra-Islamic struggle is not so much a battle between liberal Islam (which Roy dismisses as politically and socially insignificant, pp29-33) and traditionalist Islam but as a struggle between Muslims who want to retain their local and national identities as well as their syncretic traditions and customs versus neofundamentalists who condemn all of that are impure and unIslamic. A case in point is Roy’s contrast of how “born again” neofundamentalists are comfortable with using the modern mass media or halal versions of burgers and cola but are much more vociferous when attacking traditional practices like kite-flying, traditional music and dance or Sufi mysticism.

In conclusion, a major takeaway from Kepel is the sheer marginality of terrorism when compared to wider politics of Muslim states and communities thus national co-operation and engagement

must not be merely limited to security and intelligence exchanges. Another is his cautiously optimistic view that Islamist parties can be moderated by allowing them to participate in democratic politics and that Islamists coming to power through the ballot box should not necessarily be seen as a threat. With respect to Roy’s arguments, one could draw the inference that the preservation and encouragement of authentically traditional and local Islamic education and culture can, in fact, buttress Muslims’ sense of national identity against neofundamentalist radicalisation. In the interests of brevity, this review has simplified many of the points and arguments of both books which contain many more controversial observations and insights from a refreshingly different perspective. In the tradition of French public intellectuals, Kepel and Roy write about Muslim politics in a way that conveys the richness and complexity of the subject while still remaining engaging and readable to the educated layman. 🇲🇵



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## FEATURED AUTHOR



### Gilles Kepel

Gilles Kepel is Professor and Chair of Middle East Studies at the Institut d' Études Politiques in Paris. Arguably among the world's most influential and opinionated experts on the current Middle East situation, Kepel has written works on radical Islam, and recently penned the critically acclaimed *Jihad: The Trail of Political Islam*. A graduate of the Institut d' Études Politiques in Paris, Kepel holds degrees in Arabic, English and philosophy. He was a Visiting Professor at New York University in 1994 and at Columbia University from 1995 to 1996. In addition, Kepel has also received doctorates in political science and in sociology.

Kepel is the man behind some of today's most respected and awarded books, including *The Revenge of God*, *The War for Muslim Minds*, *Muslim Extremism in Egypt: The Prophet and Pharaoh* and the above mentioned *Jihad: The Trail of Political Islam*. Zygmunt Bauman, Professor of Sociology at the University of Leeds, commented that while "most of us notice but freak

and isolated sparks, Kepel discovers a smouldering bonfire", perhaps praising Kepel's innate ability to see events in a bigger, more holistic perspective. Kepel's sheer influence and expertise in the Middle East situation is effectively condensed into *The Revenge of God*, and is most appropriately and succinctly summed up by Graham Howes, sociologist of religion at the University of Cambridge, "(this book) is for anyone seeking to understand those puzzling and parallel movements within contemporary religion that seem to be setting out to reconquer today's world". Aligned with the analogy of a ball of yarn, Kepel gingerly untangles the mess, and while most of us become clouded by the monstrosity of conflict, Kepel calmly steps over the debris and extrapolates a trend, one that is often global in scale and impact.

The catastrophic events of 9/11 forever altered the political landscape as we once knew it. In *The War for Muslim Minds: Islam and the West*, Kepel keeps his attention and focus on the Middle

East as a nexus of potential widespread conflict, and how terrorism in the region acts as both a spark and catalyst for an impending explosion. In an interview with UCLA International Institute, Kepel boldly claims that the Jihadists are slowly but surely losing their hold on the Muslim masses. According to Kepel, Ayman al-Zawahiri, Osama bin Laden's principal deputy, proposed "the use of select groups of highly educated operatives who are indoctrinated enough not to question orders." Mohammad Atta, suicide pilot of the first plane to crash into the World Trade Center towers, fitted the description perfectly. Kepel sees the trend of sensationalistic suicide operations as but a veil to disguise the lack of mass support from the terrorists' homebase. Hence, the light at the end of the tunnel is civil society condemning violence, but Kepel is quick to emphasise that it is of supreme importance for an American leadership to tactfully address the Muslim civil society, for the establishment of long term peace.

Another noteworthy point in *The War for Muslim Minds: Islam and the West*, is Kepel's prediction that the next crucial battle in the war for Muslim minds will not be fought in troubled lands like Iraq or Palestine, but in closely knit communities in Europe and all over the world. He points out that if these Muslim populations can be fully integrated and steered towards prosperity in this globalised era, they may very well become "the Islamic vanguard of the next decade". The introduction of the concepts of wealth and capitalism is likely to be the way out of the dead-end politics that has, to say the very least, crippled the troubled lands, as the definition of peace and success in today's globalised

world is invariably intertwined with a blossoming economy. Thus, unlike many others, Kepel is not ruling out the possibility of an integration between the extreme Islamists and first world ideologies, and instead sees this as a potentially huge step towards improving the world's current political dynamics.

In *Jihad: The Trail of Political Islam*, Kepel travelled extensively throughout the Muslim world in a quest to collect key findings, documents and archived information inaccessible to most, all in the name of providing as holistic an understanding of the Islamist movements of past, present and future as possible. Fouad Ajami, author of *Dream Palace of the Arabs: A Generation's Odyssey* and Director of Middle East Studies at SAIS, Johns Hopkins University, praised the book as being "a landmark book, a work of breadth and scope and scholarship, and genuine imaginative powers. It should be the standard work on political Islam". Perhaps the most impressive aspect of the book is how Kepel, almost as if assuming the role of a guide, takes his readers on an epic journey that spans four decades, tracing the significant developments and pitfalls of the Islamic world. Kepel's superbly accessible style of writing makes this book not merely for scholars, but for anyone with a passion for contemporary religion and its role in today's evolving, organic era.

In line with his belief that the Jihadists are losing their war, Kepel concludes in *Jihad: The Trail of Political Islam* that the Islamist movement will face an uphill task "reversing its trail of decline". He sees the most monstrous of terrorist attacks in history, the 9/11 tragedy, not

as an ominous symbol of worse things to come, but as an act of calculated, sensationalistic desperation. Despite weeks of disarray and uncertainty following 9/11, the United States bounced back stronger than ever, wiping out the Taliban regime within a hundred days and demolishing bin Laden's secret cells. Kepel is careful to warn, however, that the Israeli-Palestinian conflict is a ticking time bomb waiting to go off, "as long as the issues in the Middle East are dealt with as they were in the wake of 9/11". But Kepel shrewdly points out that using violence as a tool has proven to be nothing more than provoking the beast, as the repercussions of terror attacks have always been greater than the attack itself, effectively destroying any capacity of the terrorists to seize any form of political influence or power. Also, the Islamist movement has been undeniably divided by two camps of thought: One favouring a reconciliation with the democrats and another ruthlessly clinging on to the promise of Jihad. This divide is perhaps indication enough of the increasingly diverging Islam body, a poignant signal that the Jihadists are indeed losing the war.

The *Revenge of God* is a compelling masterpiece that studies the role of three religious beliefs in the modern world – Islam, Christianity and Judaism. Kepel argues that although the three religions appear vastly different from one another, there are in fact fundamental similarities between them. For example, he shrewdly observes that each of the three fundamentalisms include "a 'militant' membership of the young, educated and modern people". Each also pursue a strategy "from above", that is, taking control of political power, and one "from below", preaching to the

general society and convincing them to work towards its own ends. Kepel's use of the "dual perspective" when it comes to studying the trends and history of the three religions has proven to be supremely useful. Firstly, labels are given to the chaos and disorder ensuing in the world, and secondly, plans are conceived to change the present social order and bring them in line with doctrines from the Old Testament, the Koran, or the Gospels. Hence, this "dual perspective" allows us to better understand the rationale behind religious movements against AIDs, the energy crisis, world poverty and so on, as these crises are often presented in apocalyptic terms.

The breadth and scope of Kepel's works is bettered only by their timeless relevance and sheer accuracy, giving anyone from politicians to the common man a thoroughly researched and substantiated glimpse into the possible future. They can sometimes be startling and even controversial, but his works promise nothing sort of an eye-opening, perspective-changing experience. What sets Kepel apart from the others is his unwavering devotion towards his passion of the Muslim world, endlessly seeking first-hand documents, papers and sources to provide as comprehensive a scope of the Islamist movements as possible. As the world constantly seeks to better equip itself against the threat of terrorism, Kepel keeps us grounded by helping us make better sense of the fundamental nature of Jihad, and what can be done to counter this ominous and impending doom. To sum up, Gilles Kepel is worthy to be featured in *POINTER*, as he is the epitome of the scholarly academic whose works extend beyond theory, to become immensely helpful in practice as well. 🇲🇵

# PERSONALITY PROFILE

## General Abdul Haris Nasution



### Introduction

Abdul Haris Nasution (1918-2000) is one of Indonesia's most celebrated military leaders and foremost military theorist. He was a general and a hero of the struggle for Indonesian independence; he had also led the army's counter-offensive against the Indonesian Communists after the aborted Coup of 1965. He was the author of *Fundamentals of Guerilla Warfare*, which was first published in 1953. As a soldier and statesman, Nasution would be fondly remembered as he did not support total military control over national politics. He believed that the military should play an important but not dominant role in government which he did throughout his career as a professional soldier and later as a politician and legislator. In his

long and distinguished career, he held many important appointments, such as Deputy Commander of the Indonesian Army, second only to the charismatic General Sudirman during the struggle for Indonesian independence in the late 1940s, Indonesian Army's Chief of Staff for two stints in 1950 and 1955. He was also appointed as Minister of Defence and Security by President Sukarno in 1959.

In this short article, the focus would be on his three main contributions, namely: His successful guerilla war campaign against the Dutch in 1948-49 which gave Indonesia her independence due in no small part to his brilliant tactics. Secondly, his welding of disparate and disjointed guerilla units into a united and coherent national military force. Lastly, his respect for the political system and reluctance to stage a power grab for his own interest even though he was well placed to do so during the chaotic early 1960s. He remained a loyal public servant and professional military officer of the highest calibre.

### Early Life

Nasution was born on 3 December 1918 in the village of Huta Pungkut, Sumatra. His father was a farmer and member of Sarekat Islam, a pro-Independence movement in the Dutch colony. The Nasutions were fairly well-to-do, owning rice fields, cattle and they also resold locally produced rubber at provincial centres. However, they were

hit hard by the Great Depression and it was only through considerable sacrifice that they managed to allow a studious Nasution to complete his education. Nasution was an avid reader from a young age and to no one's surprise, he chose teaching as his first career. He developed a deep interest in the subject of history during his time in teaching school. He was selected by the Dutch colonial authorities to continue his education at Sekolah Raja and later at Hogere Inlandse Kweekschool (HIK) in Bandung. He graduated from HIK in 1938 and had teaching stints in schools in Bengkulu and Palembang.

While Nasution was in Bandung, he developed strong nationalist feelings like many of his peers and became involved in politics. Nasution believed that the Dutch would never leave the East Indies voluntarily and decided to play his part in the armed struggle for independence. After the fall of the Netherlands to Nazi Germany in 1940, he seized the opportunity that was rarely offered to native Indonesians by the colonial authorities in those days and volunteered to join the colonial military as a cadet officer. He underwent a stringent selection process and became one of only seven Indonesians selected to enter the Royal Military Academy in Bandung, West Java.

In early 1942, the Dutch East Indies fell to the Japanese. Nasution served as a civil servant in Bandung during the Japanese Occupation from 1942 to 1945. Nasution was convinced from the beginning that the Japanese would eventually be defeated and saw this transitional period as an excellent opportunity for the Indonesian people to plan and prepare for independence. Nasution together with other like-minded nationalist leaders set about infiltrating various Japanese-sponsored

organisations to prepare for eventual independence under the guise of cooperating with the Japanese. As the tide of the Second World War gradually turned against the Japanese from 1943, the Indonesian nationalists were able to extract increasing amount of concessions from the Japanese in return for their support and help in the war effort against the Allied powers.

## The Struggle for Independence

In 1945, the Japanese suddenly capitulated after the devastating effect of the American atomic bombs on the Japanese cities of Hiroshima and Nagasaki. This rapid development caught the Indonesian nationalist leaders by surprise. The charismatic Sukarno and his able deputy, Mohammad Hatta read the proclamation of Indonesia's independence to the world on 17 August 1945. Nasution joined the fledgling Indonesian Army, then known as the People's Security Army (TKR). He was appointed as the Regional Commander of the Siliwangi Division, in charge of the defence of West Java in May 1946. As Commander of the Siliwangi Division, Nasution devoted a lot of effort to weld the poorly trained and ill-disciplined rag-rag band of armed freedom fighters that have come under his charge, into a well-trained and disciplined fighting force which would become the backbone of the newly established Indonesian military.

Two years later, Nasution was promoted to Deputy Commander of the TKR although he only held the rank of Colonel. He had become the second highest ranking soldier in the TKR, reporting only to the popular General Sudirman. Undoubtedly, one of Nasution's major contributions to his nation was his role in devising and implementing the guerilla

tactics employed successfully by the Indonesians in 1948-49, which played a big role in allowing the Indonesians to gain independence from their erstwhile colonial masters, the Dutch.

In his position as the Deputy Commander of the TKR, Nasution presented his proposal for fighting a guerilla war against the Dutch, who were bent on recovering their prized colony and preventing the independence of Indonesia. These guerilla war tactics forced the Dutch colonial forces into a protracted war and greatly worsened Netherlands's budget deficit, which in turn led the Dutch to become even more dependent on foreign aid. The tide in the struggle for Indonesian independence turned against the Dutch in 1949. The continued resistance by the Indonesian army contributed to the increasing international pressure on the Dutch to cede control of their former colony. By December 1949, the Dutch reluctantly agreed to recognize the independence of Indonesia. In the final analysis, the Dutch military was not defeated by the largely disjointed and ill-trained fledgling Indonesian army. They were forced to succumb to a growing chorus in the international community to allow self-government and decolonization to take place. Thus, when the Americans threatened to stop foreign aid to the Dutch government as promised under the Marshall Plan, the Dutch were forced to grant Indonesia independence. Some historians have since commented that the successful implementation of the guerilla war tactic was the straw that broke the camel's back for the Dutch.

During his years out of uniform in the early 1950s, he penned his thoughts and experience on guerilla warfare and published a book entitled, *Fundamentals of Guerilla Warfare* in 1953. This book

quickly became a must-read tome for those interested in guerilla and anti-guerilla warfare. Nasution had taken his first step towards fulfilling his childhood dream of becoming the "Liddell Hart" of Indonesia.

## National Military Leader and Statesman

Nasution's second major contribution to his nation was his role in welding bands of ill-disciplined and disjointed armed freedom fighters into an united and effective national army. Historians have given him great credit for his role in training and managing the Siliwangi Division under his control into becoming the military anchor of the Sukarno-Hatta government of the 1950s. His maiden task as Army Chief of Staff was to assemble a coherent and united Indonesian National army from the disjointed motley of armed soldiers. This was no mean feat and it proved to be a complex, highly charged and long drawn affair. His initial attempts to rationalize the armed forces were stalled due largely to political interference from political parties. However, his career took a dramatic turn in 1952 when he was sacked from the military.

In 1955 after three years in the wilderness, Nasution was once again appointed as Army Chief of Staff. He started to implement three main reforms on the army. Firstly, the formulation of a tour of duty system to increase professionalism as well as reduce regional or provincial loyalties among the officers. Secondly, he standardized methods of training to enforce uniformity. Lastly, and most controversially, he decided to increase the political clout of the army to prevent the military from relying on civilian decisions as in the case of his sacking in 1952.

Nasution found a firm supporter in President Sukarno when the President introduced the concept of Guided Democracy to all Indonesians in 1957. Both Sukarno's and the Army's influence and authority increased as a result. The Army began to assert itself in national politics and participated in civilian matters such as in the field of the economy. In 1958, Nasution would articulate the basis of the *Dwifungsi* doctrine, which Suharto and the Indonesian Army would adopt in the 1970s.

The third main contribution of General Nasution was his adherence to the rule of law and respect for the constitutional process, even when he could have grasped power for himself in the mid 1960s. By 1962, Sukarno distanced himself from the army and moved to align himself closer to the Communist party known as PKI. Nasution was wary of the PKI but had his power vastly curtailed by Sukarno's reorganization of ABRI in July 1962. In October 1965, a kidnapping attempt of top Indonesian generals coupled with the failed attempt to kidnap Nasution, left him in a strong position to grab power for himself as many army officers turned to him for leadership during this extremely tense period in Indonesian history. Nasution hesitated and over the following few weeks lost political momentum to the rapidly ascending Suharto.

After President Suharto consolidated political power in 1968, he swiftly moved to neutralise and sideline Nasution from the levers of power as Suharto saw Nasution as a potential political rival. In 1971, Nasution was discharged from military service at an early age of 53 and he was removed as a legislator the following year. Nasution became a political critic of Suharto's New Order regime, but he was unable to threaten the stability of the regime. Nasution

gradually faded from the Indonesian political scene from the 1980s.

A reconciliation between Suharto and Nasution took place in the mid 1990s - when Suharto was promoting greater political openness - with Nasution being invited to the Presidential Palace for a couple of meetings with President Suharto. In 1997, Nasution was given the honorary rank of Jenderal Besar during the anniversary of the Indonesian military (then known as ABRI), a rank only conferred to General Sudirman and Suharto. General Nasution passed away on 5 September 2000 after he suffered a fatal stroke.

## Conclusion

General Nasution had a very unusual and eventful career that saw him rising from the position of an elementary school teacher in Sumatra to that of a national leader within the span of a few years. Nasution contributed greatly to his homeland's independence and early development. Among his contributions are: his role as the main architect for the guerilla war strategy that was deployed against the Dutch in 1948-49; his role in shaping the Indonesian army into a centrally controlled, cohesive, and disciplined armed force, and; his statesmanship in respecting the constitutional processes and reluctance to use military force to settle political disagreements. Nasution will be always remembered as a principled politician who valued the rule of law and a military leader and strategist who contributed greatly to the formation of the modern Indonesian army. 🇮🇩

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