

The Hegemony of an Idea
The Sources of the SAF's Fascination with Technology
and the Revolution in Military Affairs

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Abstract

Arguably already the most modern military in Southeast Asia, the Singapore Armed Forces (SAF) hopes to transform itself into a “technologically advanced” military capable of a “full-spectrum of operations” this century.

This paper traces the origins of the SAF's fascination with technology by identifying its wellspring and the agents that have deepened it.

Four main explanations for the SAF's fascination are offered. First, the SAF sees technology as a vital force-multiplier in battle, thus mitigating Singapore's perceived strategic vulnerability. Second, the SAF is a product of Singapore society writ large which itself is attracted to the latest technology has to offer. Third, the SAF's technocratic leadership has made its professional essence inherently pro-technological. Finally, the SAF is intimately influenced externally by the Singaporean “military-industrial-administrative complex,” providing both non-military direction and support for its acquisition and development of cutting-edge military technology.

Introduction

The fascination with technology in Singapore's Ministry of Defence (MINDEF) and the Singapore Armed Forces (SAF) is hegemonic. As articulated by then Minister for Defence Dr. Tony Tan in 2000 at the launch of Singapore's defence technology research and development clearing house, the Defence Science and Technology Agency (DSTA), "defence technology is a critical component of MINDEF and a strong and operationally ready SAF. [Singapore has to] ride the new wave of [the] Revolution in Military Affairs [RMA]."¹ More generally, the term "Third Generation" (3G)², short-hand for the SAF's efforts at RMA-styled "transformation", can often be found either as a prefix or as a qualifier in SAF publicity. This observation begs two questions: firstly, why is MINDEF so fascinated with technology? Secondly, how has it managed to pursue this agenda to the present day with almost no opposition when even the United States has begun to question its investments in the latest military technology?

This paper attempts to search for the wellspring of the SAF's preoccupation with "transformation." Four main explanations can be surmised. The first is advanced defence technology, as a dramatic force multiplier, mitigates strategic vulnerability. This "chronic sense" of vulnerability stems from Singapore's small size (in geographic size and population) and delicate strategic environment.³ The importance of this reasoning, which has now become an integral part of Singapore's strategic logic and culture, cannot be discounted. It coloured, if not dominated, the perception of the first generation of policy-makers, all of whom lived through the turbulent, strife-ridden pre-independence years. These leaders were generally educated overseas in professional fields in Western institutions, and therefore viewed technology as a modernizing force that would help young Singapore leapfrog ahead of its peers, most crucially in defence.⁴ In fact, some of the "old guard" still retain influence in Government.⁵

The other three reasons are intrinsically linked to the first. Through its National Service policy, the SAF draws most of its strength from part-time soldiers who serve full-time for two years before being cycled back into civilian society with annual National Service training obligations of several weeks. Thus, the division between the identities of "soldier" and "civilian", if one can be made out in the first place, is not clear. Additionally, typical of most Asian urban societies, technology is viewed by Singaporeans as a symbol of modernity and progress. Its successful application and development is in fact a key reason for the country's rapid economic development. A love for technology therefore is built into the national psyche, a fascination which is clearly palpable in the island state.

¹ Tony Tan Keng Yam, "Launch of the Defence Science and Technology Agency - Speech by Dr Tony Tan Keng Yam, Deputy Prime Minister and Minister for Defence, at the DSTA Inauguration Ceremony at the Auditorium, Singapore International Convention and Exhibition Centre, on 29 March 2000," http://www.dsta.gov.sg/index.php?option=com_content&task=view&id=1743&Itemid=401 [Last accessed July 8, 2009].

² The SAF has traced its development over three "generations". The first was when it was predominantly infantry-oriented, and the second was when it incorporated combined-arms divisions. It presently sees itself at the beginning of the third generation of development as it aspires to be a fully-networked, integrated, advanced fighting force.

³ Tan Tai Yong, "Singapore: Civil-Military Fusion", in *Coercion and Governance: The Declining Political Role of the Military in Asia*, ed. Muthiah Alagappa (Stanford: Stanford University Press, 2001), 276.

⁴ Singapore's first Prime Minister, Lee Kuan Yew, and Minister for Foreign Affairs, S. Rajaratnam, both studied law at Cambridge University and King's College in the United Kingdom respectively. Its first Minister for Defence, Goh Keng Swee, was conferred a PhD in Economics by the London School of Economics, United Kingdom. Dr. Goh in particular was a great supporter of technology as an accelerant to national development.

⁵ Lee Kuan Yew still sits in the Singapore Cabinet as its Minister Mentor.

Staffed by members drawn from such a techno-minded society, the SAF naturally has a professional culture that embraces innovation and RMA technology, a phenomenon that goes against military character which typically shuns change.

Finally, the technocratic homogeneity in vision, direction and constitution of the military, civil service and politicians encourages the growth of "3G-ness" in the SAF, as well as in local defence industries that support this effort. Working from a baseline of technological favouritism, as will be subsequently explored, there is rarely any public tension in the Singaporean civil-military relationship for the direction the civilian government and military want to head towards are the same. The rigidly bureaucratized nature of Singaporean governance under the dominant People's Action Party (PAP), where public debate is eschewed, further facilitates this plain sailing towards the horizon of indigenously facilitated "transformation" in the SAF.

It is tempting to dismiss the SAF's RMA-styled "transformation" as par for the course for prosperous developed states with an educated society and already modern military. The glaring counterpoints to this argument are Taiwan and Korea. Despite having economies as developed and populations as educated as Singapore's, only the city-state is presently energetically pursuing the full spectrum of RMA technologies.⁶ This is surprising, considering both Korea and Taiwan are IT powerhouses in the region, if not the world, which dominate the global production of random-access memory (RAM) semiconductors.⁷ Even more surprising is Taiwan's apparent disinterest in "transformation" considering the attention it is being showered with by its main security threat, China. James Mulvenon sums the Taiwanese experience up succinctly: "The principle finding is that Taiwan is blessed with many technological and economic precursors to a deep RMA, but that largely political and bureaucratic constraints have thus far impeded a full exploitation of this potential capability." South Korea has fared no better, with its RMA "just approaching the starting line."⁸ Scholars have concluded that despite sizeable defence budgets, "... South Korea and Taiwan have made relatively little progress towards taking advantage of the RMA."⁹ Singapore's obsession with "transformation" and the RMA therefore appears to be an anomaly worthy of deeper study.

What is "3G-ness"?

In May 1978, then Minister for Defence Dr Goh Keng Swee remarked,

In the course of my work, I often visit military camps. One of the lasting impressions I get on these occasions is the image of the National Serviceman on sentry duty – a bespectacled youth of slender proportions, ill at ease in an unaccustomed environment but trying to conceal it. An improbable soldier.¹⁰

Thirty years later, on the cover of the March/April 2008 issue of the Singapore Army's bimonthly publication, *Army News*, a young bespectacled soldier, quite probably a National

⁶ The International Institute for Strategic Studies (IISS), "Asia's Evolution in Military Affairs: Patchy 'Transformation'", *Strategic Comments*, vol. 10 no. 3, April 2004, 1-2.

⁷ Richard A. Bitzinger, "Come the Revolution: Transforming the Asia-Pacific's Militaries", *Naval War College Review*, vol. 58 no.4, Autumn 2005, 49.

⁸ James Mulvenon, "Taiwan and the Revolution in Military Affairs", in *The Information Revolution in Military Affairs*, eds. Emily O. Golmand and Thomas G. Mahnken (New York City: Palgrave Macmillan, 2004), 139.

⁹ IISS, "Asia's Evolution in Military Affairs", 2.

¹⁰ Leong Choon Cheong, *Youth in the Army* (Singapore: Federal Publications, 1978), iii.

Serviceman too, is featured confidently operating the latest military equipment. The issue's title declares "World Class Army: Ready, Relevant and Decisive." Individually, because he is plugged into a sophisticated information-command network that allows him to bring immense firepower to bear on enemy targets, this young soldier is also the most deadly in Singapore's history.¹¹

The contrast between the "improbable" National Serviceman of three decades ago and the "decisive" one of the nascent 3G SAF is stark. The present concern is no longer ill-adjusted conscripts—National Service is now woven tightly into Singapore's social-cultural fabric—but how to realize the vision of a World Class Army that "is a brand that is associated with trust, confidence and deterrence."¹² Equally dramatic to this change in concern from having citizens capable of basic soldiering to seeking an army that is of international standard is how far ahead the SAF casts its vision when appraising military technology. It seeks to be on the cutting edge, if not to create it.

This is not a recent development. During the early years of the second-generation SAF, when it was still struggling with hum-drum, run-of-the-mill problems of equipping a rapidly growing army, when the IT-led RMA as we know it today did not exist and the world was still deeply involved in the throes of the Cold War fronted by large conventional World War II-styled armies, the SAF contemplated the future of computerized war fighting. In 1981, then Minister for Defence Howe Yoon Chong told Parliament that an immediate goal of the SAF was to improve defence management systems and acquire better military equipment, concluding "SAF officers will be trained increasingly in the use of computers in order to deal with advanced military operations and weapon systems."¹³ This is notable considering this goal was similar to the American response to overwhelming Soviet numerical superiority in Europe, in spite of Singapore's far smaller size and resource-base.¹⁴ Two and a half decades later, the SAF still has not lifted its gaze from the capabilities IT promises to afford the war-fighter should its potential be fully realized and mastered. The 3G SAF's love affair with IT as an enabler, it would seem, had an early start in the preceding generation.

This passion has endured. The 3G SAF has generally taken its cue from the American efforts at force transformation, moving towards "Network Centric Warfare" and "Effects-based Operations." Much publicity has been given to the SAF's 3G transformation efforts, but only a hint of it is necessary to appreciate the depth of the SAF's fascination with the IT-led RMA. According to the SAF, the 3G SAF will be, *inter alia*, "Capable of a Spectrum of Operations", "Integrated and Networked", and "Technologically Advanced".¹⁵

The agent for this vision is technology, specifically, IT. By establishing the SAF Centre for Military Experimentation under the Future Systems Directorate, and allocating them sizeable resources, the SAF has confidently submerged itself in the deep end of the RMA pool, despite its comparatively austere budget when compared to the United States'. The result, as Tim Huxley posits, is "substantial progress towards establishing a low cost

¹¹ "Soldier, Just Dial a Bomb", *The Straits Times*, September 5, 2008.

¹² This vision was outlined by the Chief of Army, MG Neo Kian Hong, in his speech delivered during the 2008 Army Work Plan Seminar held on 04 April 2008.

¹³ *Parliamentary Debates: Republic of Singapore*, vol.40, no.1, Addenda to Presidential Address, Col. 35.

¹⁴ Jimmy Carter's Secretary of Defence, Harold Brown, envisaged using computers and precision munitions, instead of tactical nuclear weapons, to counter Soviet battlefield numerical superiority. It, however, has been argued that it was only after the 1991 Persian Gulf War that the impact of IT on the military was paid significant attention. David S. Alberts and Daniel S. Papp, "War in the Information Age Military", in *Volume III: Information Age Anthology: The Information Age Military*, eds. David S. Alberts and Daniel S. Papp (Washington, DC: DOD C4ISR Cooperative Research Program, 2001), 2.

¹⁵ Ministry of Defence (Singapore), "The 3rd Generation SAF - About the 3rd Generation SAF," http://www.mindef.gov.sg/imindef/mindef_websites/topics/3g/what.html [Last accessed on July 9, 2009].

'systems of systems' which will far outclass the military capabilities of other Southeast Asian states for at least the next decade."¹⁶ It can be taken that "3G-ness" is a celebration of technology within the Singaporean military.

Why "RMA'nia" in Singapore?¹⁷

If Taiwan, a state that is culturally, economically and demographically similar to Singapore, one which also faces an immediate security threat from China, has hitherto mostly resisted "RMA-nia", why has Singapore embraced it? Why the preoccupation with "3G-ness"?

Explanation #1: Technology, as a Force-Multiplier, Mitigates Vulnerability

Born out of an unpleasant political separation into a region that is culturally, socially and economically different from itself, Singapore has always taken its own security seriously. Without a credible defence force, Singapore would be at the mercy of others who did. The inability to make Malaysian forces stationed in Singapore quickly disengage from the island on Singapore's own terms, and the real fear that they could stage a coup to retake the island for Malaysia, caused much anxiety in Lee Kuan Yew's young government. This vulnerability to external forces made building up the SAF a top priority.¹⁸

More generally, Singapore's chief concerns have traditionally been its lack of strategic depth owing to its small geographical size, and lack of resources, namely manpower and indigenous primary resources such as food, energy and raw materials. Furthermore, most of Singapore's economy is based on trade and services, both of which can be dangerously affected by any perception of instability or military vulnerability. Being able to demonstrate that it can robustly defend its sovereignty is therefore crucial to both Singapore's existence as a nation, and the continued growth of its economy. Employing technology to "gain an asymmetric edge over its potential adversaries" by transforming the SAF into a leaner yet more potent force makes this demonstration credible.¹⁹

Additionally, given Singapore's essentially single-party rule and technocratic nature, a uniform defence policy, centred on using technology to mitigate Singapore's aforementioned strategic disadvantages, has been easily applied with a single-mindedness that was, and that remains to this day, rarely challenged. As Chan Heng Chee puts it, "Singaporeans had come to accept, even though grudgingly, that matters of defence were not considered a matter of public debate."²⁰ Even if there was opposition to developing a technological advanced SAF, it would be quickly hushed over by the PAP's dominance in the Singapore Government.

¹⁶ Tim Huxley, "Singapore and the Revolution in Military Affairs", in *The Information Revolution in Military Affairs in Asia*, eds. Emily O. Goldman and Thomas G. Mahnken (New York City: Palgrave Macmillan), 185.

¹⁷ I thank Michael E. O'Hanlon for this term. See Michael E. O'Hanlon, "Beware the 'RMA'nia!'", http://www.brookings.edu/papers/1998/0909defense_ohanlon.aspx [Last accessed July 9, 2009].

¹⁸ Lee Kuan Yew, *From Third World to First: The Singapore Story: 1965-2000* (Singapore: Times New Media, 2000), 33.

¹⁹ Ministry of Defence (Singapore), "The 3rd Generation SAF - About the 3rd Generation SAF." Teo Chee Hean, "[21 April 2005] Lunch Talk on 'Defending Singapore: Strategies for a Small State' by Minister for Defence Teo Chee Hean", http://www.mindef.gov.sg/imindex/resources/speeches/2005/21apr05_speech.html. [Last accessed July 9, 2009].

²⁰ Chan Heng Chee, "Singapore", in *Military-Civilian Relations in South-East Asia*, eds. Zakaria Haji Ahmand and Harold Crouch (Singapore: Oxford University Press, 1985), 153.

The SAF deems technology to be crucial for three broad reasons. At a very general operational level, technology allows the SAF to remain inter-operable with the US in both military and R&D domains. Presently, the US is a regional partner in guaranteeing maritime security, and a potential ally should Singapore's security be threatened.²¹ Additionally, the US and Singapore cooperate extensively in defence research, as the Master Information Exchange Agreement (MIEA) and the Technology Research and Development Project (TRDP) agreement reached in the 1990s suggest. The Singapore-US Defence Cooperation Committee (DCC), established in 2000, spells this out clearly, stating its goals, *inter alia*, are "to regularly discuss matters of mutual interest pertaining to defence equipment acquisition and support, to engage in early discussion of future equipment-related operational requirements, to promote systems interoperability and standardization between U.S. and Singaporean defence forces."²² A later agreement, the Strategic Framework Agreement between the United States of America and the Republic of Singapore for a Closer Cooperation Partnership in Defence and Security, signed in 2005, expands on these intentions. Tim Huxley, however, relegates Singapore's need to be inter-operable with the US to secondary importance.²³

Symbolically, the SAF needs to display a dramatic image of strength, prowess and capability to fulfil its primary mission—its official *raison d'être*—of deterring aggression.²⁴ The importance of the image of a "transforming" SAF to deterrence cannot be overlooked. Desmond Ball notes the apparent spike in the purchase of sophisticated weapons systems in Asia in the early 1990s was motivated as much by a desire to boast an enhanced defence capability as real strategic need.²⁵

This symbolism in defence is more fundamentally grounded in a state's psyche, or what Jacques Hymans terms "national identity conception".²⁶ Hyman argues the construction of an "oppositional nationalist" identity which combines a deep inherent antagonism towards a foreign enemy and the perception of an equal, if not greater, strength to it by political leaders can fuel a movement to acquire advanced weaponry.²⁷ Hymans concludes "this type of identity produces a mix of fear and pride – an explosive psychological cocktail," and was one reason why India and France both acquired nuclear weapons.²⁸ Hymans also posits a milder "sportsmanlike nationalist identity", where there is no inherent antagonism, just competitiveness, despite a clear realization of difference.²⁹ While it is difficult to conclusively pin-point Singapore's identity conception, it is clear that Singapore's self-confidence, as well as recognition that it is different from the rest of the region, has compelled it to develop the 3G SAF, as a tool to beat its competition either symbolically, or practically, in battle.

²¹ IISS, "Asia's Evolution in Military Affairs: Patchy Transformation", 1.

²² Office of the Under Secretary of Defense for Acquisitions, Technology & Logistics, *International Armaments Cooperation Handbook*, 4th Edition, 1 November 2006, <http://www.acq.osd.mil/ic/handbook.pdf> [Last accessed July 9, 2009].

²³ Huxley, "Singapore and the RMA", 204.

²⁴ Ministry of Defence (Singapore), *Defending Singapore in the 21st Century* (Singapore: Ministry of Defence, 2000), 27.

²⁵ Desmond Ball, "Arms and Affluence: Military Acquisitions in the Asia-Pacific Region", *International Security* 18 no. 3, Winter 1993/1994, 92-93.

²⁶ Jacques E.C. Hymans, *The Psychology of Nuclear Proliferation: Identity, Emotions and Foreign Policy* (Cambridge: Cambridge University Press, 2006), 18-25.

²⁷ Hymans studied the acquisition of nuclear weapons exclusively, but his arguments can be extrapolated to encompass advanced military equipment in general as well. Jacques E.C. Hymans, "Why Do States Acquire Nuclear Weapons? Comparing the Cases of India and France", in *Nuclear India in the 21st Century*, eds. D. R. SarDesai and Raju G.C. Thomas (New York City: Palgrave Macmillan, 2002), 139, Hymans, *The Psychology of Nuclear Proliferation*, 2.

²⁸ *Ibid.*, 139.

²⁹ Hymans, *The Psychology of Nuclear Proliferation*, 22-25. Hymans conveniently summarizes an "oppositional nationalist" identity as "Us against Them", and a "sportsmanlike nationalist" identity as "Us and Them".

While Singapore does not share a deeply antagonistic relationship with any state, historic, geographic and strategic reasons have left it feeling exposed and vulnerable in the region, especially given its historically bumpy relationship with its immediate neighbours, Malaysia and Indonesia. Then Indonesian President B. J. Habibie's remark in 1998 that Singapore was just a small "red dot" next to Indonesia is an instructive metaphor that encapsulates Singapore's vulnerability.³⁰ Singaporean Prime Minister Lee Hsien Loong, speaking as Deputy Prime Minister in 2003, even went as far as to note that "the little red dot has entered the psyche of every Singaporean, and has become a permanent part of our vocabulary."³¹ A strong, visibly modern SAF, the "bedrock on which the peace and prosperity of Singapore have been built",³² is an obvious panacea to such insecurity.³³ With able-bodied Singaporean males serving their National Service mainly in the SAF, a large percentage of Singaporeans have first-hand knowledge of the SAF's capabilities. National Service now a readily-accepted and highly visible Singaporean institution, the rest of the population lives vicariously through those who have served. This intimacy in experience, direct or indirect, affords any claim that Singapore can defend itself significant credibility among the general population, the foundation pride and confidence in Singapore is built on. One cannot overlook the morale dividend a "transformed" modern SAF pays].

Although the jury is still out as to whether advanced military technology gives one a decisive edge in war, MINDEF still sees technology as a functional means to achieve autonomous defence, a "silver bullet" which will give inherently small Singapore a crucial advantage over any enemy.³⁴ This lead, the Singapore Government argues, is crucial, and cannot be lost. As then Minister for Defence Yeo Ning Hong put it in 1994, Singapore has to constantly develop better equipment, as well as improve upon the same military equipment used by others, or "[Singapore would] not survive."³⁵ Presently, through the RMA, technology will not only be a vital force-multiplier, but will also allow the SAF to retain the initiative and persecute battles with greater preciseness and awareness. It is believed the RMA will change the nature of warfare in Singapore's favour, nullifying any advantage a quantitatively superior force may have and amplifying the combat effectiveness of a networked, leaner SAF force.³⁶ This interest and faith in technology has existed since the inception of the SAF in 1967. Arguably, this vision was delineated from the outset by Dr Goh Keng Swee, Singapore's first Minister for Defence. Goh's biographer, Tan Siak Sun, notes that Goh "was convinced that any country possessing superior technology would have the upper hand in modern warfare."³⁷ Chartered Industries of Singapore (CIS), which began Singapore's defence industry, was thus established in 1967, the same year National Service was introduced. Its successor, Singapore Technologies, now provides a wide-range of defence industry services, from weapon design and production to military aircraft maintenance.

³⁰ Richard Borsuk and Reginald Chua, "Singapore Strains Relations with Indonesia's President", *The Asian Wall Street Journal*, 04 August 1998. Habibie claims his remark was originally made matter-of-factly while referring to a map of Southeast Asia. It, however, was assumed to have a deeper, metaphorical meaning.

³¹ Lee Hsien Loong, "'Learning and Living the Singapore Story', Keynote Address by the DPM Mr Lee Hsien Loong at the Network Conference 2003, held on 03 May 2003," <http://stars.nhb.gov.sg/stars/public/viewHTML.jsp?pdfno=2003050301> [Last accessed July 9, 2009].

³² Ministry of Defence (Singapore), *Defending Singapore in the 21st Century*, 27.

³³ Andrew T. H. Tan, "Singapore's Defence: Capabilities, Trends, and Implications", in *Contemporary Southeast Asia: A Journal of International & Strategic Affairs*, vol. 21 no. 3, Dec 1999, 451.

³⁴ Huxley, "Singapore and the RMA", 189, 204.

³⁵ Tim Huxley, *Defending the Lion City* (Singapore: Talisman Publishing, 2004), 172, "An SAF that Strives for Excellence" [Excerpts of a speech by Minister for Defence, Mr Yeo Ning Hong], *Straits Times*, 01 July 1994.

³⁶ Ministry of Defence (Singapore), *Defending Singapore in the 21st Century*, 10.

³⁷ Tan Siok Sun, *Goh Keng Swee: A Portrait* (Singapore: Editions Didier Millet, 2007), 144. Goh believed technology, in general, was a vital driver of development. See Goh Keng Swee, "The Technology Ladder in Development: The Singapore Case", *Asia-Pacific Economic Literature* Vol.10 No.1, May 1996, 1-12.

A titanium helmet is exhibited in the Army Museum of Singapore, a prototype of a late 1960s indigenous attempt at producing a technically superior helmet that was not only stronger but also lighter than the existing steel helmet which most militaries used then. High cost, and not a lack of interest in technology or local engineering talent, ended the attempt to equip soldiers with futuristic equipment, even if it was just basic personal gear.³⁸ More visibly, on 09 August 1969, Singapore's National Day, Singapore unveiled its nascent armoured force of AMX-13 tanks to reassure an uncertain nation that it had the military hardware to defend itself. Less obvious was that Singapore had now become the first state in the region to possess a substantial armoured capability, what was then considered to be the benchmark of a technologically competent military. The SAF's Advanced Combat Man System (ACMS), a platform for connecting individual soldiers to a larger network of war-fighting resources, is merely the latest feather in the cap of the SAF, a continuation of a trend shaped by its techno-hunger.

That Singapore did not seek nuclear weapons, for a long time perceived to be the pinnacle of military technology, seemingly goes against this techno-compensator logic. It is crucial, however, to contextualize the logic accurately, and not view it in abstract. Singapore's defence policy has always paired diplomacy with military deterrence, which military weaponry, as seen in the SAF, lends credibility to. Introducing nuclear weapons into Singapore would have severely weakened Singapore's diplomatic relations within the region and made it a pariah, thereby effectively undermining its defence. Reactions to British hints that nuclear weapons might be stationed in Malaysia and Singapore were already starkly negative.³⁹ Acquiring nuclear weapons would therefore have been counterproductive. Besides, given the geographic interconnectedness Singapore shared with the region, the military utility of nuclear weapons was questionable. Furthermore, for deterrence to work, the SAF only needed to be better than others in the region, not absolutely best in terms of technology possessed. It would not have been in Singapore's interest to introduce nuclear weapons in the region.

Explanation # 2: The SAF is a Reflection of Singapore Society

The fact that the SAF is made up of mainly "part-time" citizen soldiers has resulted in the absence of a strong martial culture that typically separates the military from the rest of civilian society. In fact, cognisant of how it is staffed by soldiers who spend more time away from the SAF than actually in it, the SAF allows its management policies to be influenced by non-military "stake-holders" through the MINDEF-sanctioned Advisory Council on Community Relations in Defence (ACCORD) and Recognise the Contribution of Operationally-Ready National Servicemen to Total Defence (RECORD) committees. As such, because the nature of the SAF is so deeply intertwined with that of Singapore society, it is difficult to pigeon-hole it.

Emily Goldman has suggested military organizations can be seen as three systems, namely "natural", "rational" and "open".⁴⁰ A "natural" system is one that primarily seeks self-preservation in an environment of scarce resources yet unlimited demands. The

³⁸ In the 1950s and 1960s, titanium was mostly used in the manufacture of military aircraft components. Any other use would have been considered radical.

³⁹ Recently declassified documents, however, reveal the British did eventually do so, albeit covertly. See Richard Moore, "Where Her Majesty's Weapons Were", *Bulletin of the Atomic Scientists*, vol.57 no.1, January/February 2001, 61.

⁴⁰ Emily O. Goldman, "Introduction: Military Diffusion and Transformation", in *The Information Revolution in Military Affairs in Asia*, eds. Emily O. Goldman and Thomas G. Mahnken (New York City: Palgrave Macmillan, 2004), 15-16.

resulting tendency is risk-aversion and conservatism. A “rational” system works closely with the state and enjoys good civil-military relations as the military is often under the direct influence of civilian leaders. The military seeks to improve the efficiency of defending the nation, and responds to factors, not necessarily internal, which either promote or hinder this desire. The effectiveness of this system lies in how the military is able to precisely guard against threats set out by the state, the larger entity it must serve. One possibility of this rubric is the development of “cybernetic” (self-controlling, self-maintaining and self-realizing) military organizations that are open to learning new lessons. The mission, rather than constitution, being their main concern, “cybernetic” military organizations are generally more innovative.

Finally, an “open” system results in militaries being defined by institutional norms and myths which are imposed upon its members and hold them accountable to. Experience and tradition (history) are the chief source of these norms. Most significantly, in this system, “technologies succeed because of the social networks that support them.”⁴¹ The inherent nature of the technology being not deterministic, it (or innovation in general) prevails because it enjoys strong social patronage within the organization. In the words of sociologist Donald McKenzie, “technologies may be best because they have triumphed, not triumphed because they are best.”⁴² The social support a military technology receives can shockingly be independent of its actual technical value, resulting in anachronistic applications. The employment of Polish cavalry lancers during the early days of World War Two is perhaps the starkest case in point.

Most militaries are dominantly “natural” systems, even though they may also be “rational”, as they serve the state, or “open” because of powerful institutional rules. Bounded by its unique task of defence, exclusive traditions and monopoly of the tools of war, militaries are often considered apart from the other agents of the state. Yet, it still jockeys with them for funding from the same national coffer. As such, its survival and growth is often at the top of a military’s agenda. In fact, all four dominant models of military innovation recognize the centrality of scarce resources and the keen competition militaries face when attempting to acquire them.⁴³ The SAF, however, bucks this trend. It is dominantly a “rational” and “open” system, but not necessarily a “natural” one.

A “rational” system, the SAF enjoys close civilian support, and remains a faithful servant to its aims. It is necessarily “cybernetic”, proactive and sensitive to the need for change in response to sensors consciously designed to monitor stimuli from external environment.”⁴⁴ More importantly, it is not a “natural” system because the state shuns a “feast or famine” approach to defence spending, preferring “consistent investments in defence.”⁴⁵ MINDEF is consistently awarded an annual defence budget of between 4.5 to 6% of Singapore’s GDP and on average 30% of Singapore’s annual governmental expenditure.⁴⁶

⁴¹ Ibid, 16.

⁴² Donald MacKenzie, “The Social Shaping of Technology”, in *Major Problems in the History of American Technology*, ed. Merritt R. Smith and Gregory Clancey (Boston, 1998), 14.

⁴³ Adam Grissom has discerned four dominant models of military innovation. They are the “Civil-military”, “Inter-service”, “Intra-service” and “Cultural” models. See Adam Grissom, “The Future of Military Innovation Studies”, *The Journal of Strategic Studies*, vol.29, no.5, October 2006.

⁴⁴ Goldman, “Introduction”, 16.

⁴⁵ Teo Chee Hean, “[12 February 2009] Speech by Mr Teo Chee Hean, Minister for Defence, at the Committee of Supply Debate 2009”, http://www.mindef.gov.sg/imindef/news_and_events/nr/2009/feb/12feb09_speech/12feb09_speech3.html [Last accessed July 9, 2009].

⁴⁶ Ibid, Teo Chee Hean, “[29 February 2008] Speech by Mr Teo Chee Hean, Minister for Defence, at the Committee of Supply Debate 2008”, http://www.mindef.gov.sg/imindef/news_and_events/nr/2008/feb/29feb08_nr/29feb08_speech.html [Last accessed July 9, 2009]. See also Huxley, *Defending the Lion City*, 28.

In fact, because the defence budget is determined as a percentage of Singapore's GDP, it has consistently grown annually in absolute monetary terms as Singapore's economy grew. More notable is that the defence budget actually grew in 2009, a recession year, leading some to argue that it is "recession proof."⁴⁷ As far as resources are concerned, the SAF does not worry about its survival,⁴⁸ and therefore has space to innovate. This has led some Singaporeans to even worry the SAF has gotten too top heavy, its senior management needing to be pruned for the sake of fiscal prudence.⁴⁹ What makes the SAF unique, at least in the region, is the nature of its "open" system. Owing to it being a predominantly citizen army made up of "part-time" soldiers drawn from the general male population, the values and norms the SAF embodies are typically reflective of that of Singaporean society. Singapore is the SAF writ large, an observation made as early as the 1970s.⁵⁰ SAF culture, baring its contextual specificities, is Singaporean culture.

This symmetry has accelerated the fascination of "3G-ness" in the SAF. The 3G SAF has benefitted in two ways from having a backbone of "part-timers". Firstly, it draws its manpower from the same pool of educated Singaporeans that supplies Singapore's thriving "knowledge-based economy."⁵¹ Cognizant that its people are its greatest asset, education has always been high on Singapore's list of priorities. In fact, Dr Goh Keng Swee's realization in May 1978 as Minister for Defence that the "[poorly educated] private ... will in time ... form the largest single group of [Singaporean] citizens" could have influenced his reformist agenda when he became Minister for Education shortly after, from late 1978 to 1980.⁵² Notably, one of Dr Goh's first projects was a feasibility study on the use of computers in schools.⁵³

By 1998, Singapore was ranked the "fourth most information-driven economy." The Ministry of Education (MOE) has also undertaken an educational revolution of its own when it released an updated blueprint for education in 1997 that encouraged "thinking schools" which would lead to a "learning nation."⁵⁴ The "Masterplan for IT in Education" (1997) elevated the importance of IT in schools. Subsequent initiatives like "Innovation and Enterprise" (2003) and "Teach Less, Learn More" (2004), as well as the introduction of the "Integrated Programme" and International Baccalaureate diploma (2004 onwards) elaborate this approach towards education.⁵⁵ Notably, however, the MOE seeks to retain its traditional focus on science and maths, its "core strengths", an approach that ensures a "strong pipeline for engineering at the tertiary levels." Excelling in those fields will give Singapore a "decisive [technological] edge" that will propel it forwards.⁵⁶

⁴⁷ Richard A. Bitzinger, Adrian Kuah Wee Jin and Bernard F. W. Loo, "Should it be recession proof?" *Today*, February 9, 2009.

⁴⁸ Lim Choon Peng, "Developing the Thinking Competency of SAF Leaders", in *Pointer*, vol.33 no.3, 2007, 85.

⁴⁹ "Save Money By Having Fewer Generals? No way", *Straits Times*, 11 March 2007.

⁵⁰ Leong, *Youth in the Army*, iii.

⁵¹ Huxley, "Singapore and the RMA", 187.

⁵² Leong, *Youth in the Army*, iii.

⁵³ Tan, *Goh Keng Swee: A Portrait*, 153.

⁵⁴ Huxley, "Singapore and the RMA", 187.

⁵⁵ Both the Integrated Programme and International Baccalaureate diploma were introduced in selected schools to educate secondary and pre-university students more broadly. Instead of taking two separate national exams at the end of secondary school and pre-university respectively, secondary school and pre-university education are combined, allowing students to sit for just one exam at the end of the Integrated Programme or diploma course. With less emphasis on exams, schools have greater flexibility in their curriculum design.

⁵⁶ Ng Eng Hen, "Speech by Dr Ng Eng Hen, Minister for Education and Second Minister for Defence, at the MOE Work Plan Seminar 2008, on Thursday, 25 September 2008 at the Ngee Ann Polytechnic Convention Centre," <http://www.moe.gov.sg/media/speeches/2008/09/25/speech-by-dr-ng-eng-hen-at-the-moe-work-plan-seminar-2008.php> [Last accessed July 9, 2009].

The slaughtering of the sacred cow of rote learning while retaining the traditional emphasis on science and maths bodes well for the SAF which requires manpower with both critical thinking and technical skills to implement its 3G vision. Quality aside, MINDEF/SAF also presently has the critical mass in educated manpower too. According to the MOE, the percentage of each cohort progressing to post-secondary education has steadily increased over the last ten years.⁵⁷ In 2007, 87% of non-student Singaporean residents between the ages of 25 and 39 had secondary school or higher qualifications.⁵⁸ More than 47% of all personnel in MINDEF/SAF already hold tertiary qualifications, a proportion that MINDEF projects will increase.⁵⁹

The SAF also benefits from Singaporean society's familiarity with technology. As a country which has prospered because of initial successes in high-tech manufacturing, then IT-business services of the new "knowledge-based economy", the importance and prevalence of technology is widely recognized. Riding the technological wave at its crest is crucial for continued economic growth. In fact, it would not be an overstatement to argue it has become a Singaporean truism. It would not be extreme either to declare Singaporeans techno-faddists. A defining characteristic of an affluent society, the consumption of technology is conspicuous, most apparent in the relentless quest to seek the latest (and therefore instinctively assumed best) consumer technologies. From personal computers to cell phones, broadband connection speeds to flat-screen televisions, Singaporeans have a seemingly insatiable appetite for the latest technology. They thrive on being on the cutting-edge. So does the 3G SAF. It is the educated, techno-savvy Singaporean male who forms Goldman's "powerful social network" in an "open" system, the main agent that motivates the adoption of technology in the SAF.

Explanation # 3: The Professional Essence of the SAF

The role the SAF's professional essence plays in promoting "3G-ness" cannot be fully appreciated without examining how the organizational structure supports the spread of "3G-ness", and how a leadership fascinated with "transformation" is selected. After all, although innovation can be spawned by tactical necessity at the lower levels of the military, formalized innovation in the military is often conceived and introduced in the military as a top-down process.⁶⁰ Stephen P. Rosen argues "generational change" in the military can be invoked through the creation of new paths for young officers with alternate approaches to war to move to the top, by-passing conservative competitors.⁶¹ In MINDEF, the offices of the Chief Research and Technology Officer, Future Systems Directorate and Deputy Secretary (Technology and Transformation) report directly to the Permanent Secretaries of Defence.⁶² Additionally, the Director of the Future System Directorate, the department tasked with transforming the SAF to meet future challenges, also reports to the SAF's Chief of Defence Force. Collectively, these offices provide routes for technology-minded officers to move to

⁵⁷ In 2005, 93.1% of the corresponding Primary 1 cohort were admitted to post-secondary school educational institutions. Ministry of Education (Singapore), *Education Statistics Digest 2007* (Singapore: Ministry of Education, 2007), 55.

⁵⁸ Singapore Department of Statistics, *Statistics Singapore - Key Annual Indicators- Literacy & Education*, <http://www.singstat.gov.sg/stats/keyind.html#litedu> [Last accessed July 9, 2009]. Even if those who are ineligible for military service are discounted, the percentage is still significant.

⁵⁹ Ministry of Defence (Singapore), "The 3rd Generation SAF - Our Technology," http://www.mindef.gov.sg/imindef/mindef_websites/topics/3g/progress/technology.html [Last accessed July 10, 2009].

⁶⁰ Eliot Cohen, "Change and Transformation in Military Affairs", in *Military Transformation and Strategy: Revolutions in Military Affairs and Small States*, ed. Bernard Loo (Abingdon: Routledge, 2009), 19-20, and Grissom, "The Future of Military Innovation Studies", 919.

⁶¹ Stephen P. Rosen, *Winning the Next War: Innovation and the Modern Military* (Ithaca: Cornell University Press, 1991), 20-21.

⁶² Permanent Secretaries are the most senior civil servants in Singaporean government ministries.

the top. Given how the SAF is already pre-disposed to embracing technology and associated war-fighting methods, the need to bypass the competition is arguably moot. Instead, these paths enhance the speed these views permeate the organization.

The SAF's high command is also almost without exception staffed by officers who were, early on in their military careers, awarded generous scholarships to study in prestigious universities and academies overseas.⁶³ Following an established norm in the SAF's regular officer corps, many opt to study science, engineering and more recently, business.⁶⁴ The "Mil-Tech" dual-career scheme which grooms combat officers who are schooled in engineering to undertake defence research appointments certainly encourages this preference.⁶⁵ Upon graduation, these scholars bring an interest in technology and innovation back to Singapore. The three Chief of Defence Force this millennium, Lim Chuan Poh, Ng Yat Chung and Desmond Kuek, all SAF Overseas Scholarship (SAFOS) awardees in the early 1980s, exemplify this. Lim studied Mathematics at Cambridge University, and later obtained a Masters in Business Administration (MBA) from Cornell University.⁶⁶ Ng earned a degree in Engineering Tripos from Cambridge University too, and was later awarded a MBA from Stanford University.⁶⁷ Kuek has undergraduate and post-graduate degrees in Engineering Science from Oxford University.⁶⁸ All three, through various initiatives, and supported by equally techno-minded civilian leadership in MINDEF, contributed to the growth of the SAF as a technologically advanced force capable of a wide-range of operations. In particular, it has been noted that Ng was "instrumental in transforming the SAF as a networked, knowledge-based force by driving close integration between the Army, Navy and Airforce, developing new operational concepts and assimilating cutting-edge technologies in building up the SAF's new force structure."⁶⁹ This trend looks set to continue – three of the four SAFOS recipients in 2008 will study economics or physics in reputable American and British universities.⁷⁰

In 1993, seven out of the twelve SAF generals were such scholars.⁷¹ Present figures are unavailable, but the ratio is likely to be similar, possibly even in favour of scholars. This paper is not interested in taking up the "scholar-farmer" or "scholar-warrior" debate, ground that has already been admirably covered by existing scholarship.⁷² An interesting consequence of the dominance of "scholar-warriors" at the upper echelons of command, however, is how their perspectives and personalities, shaped by education at top-notch

⁶³ To date, 265 SAF Overseas Scholarships have been awarded. Ministry of Defence (Singapore), "News - Factsheet - SAF Overseas Scholarship Recipients (06 Aug 08)," http://www.mindef.gov.sg/imindef/news_and_events/nr/2008/aug/06aug08_nr/06aug08_fs.html [Last accessed July 10, 2009]. See also Huxley, *Defending the Lion City*, 109-110, and Sean P. Walsh, "The Roar of the Lion City: Ethnicity, Gender, and Culture in the Singapore Armed Forces," in *Armed Forces & Society*, vol.33 no.2, January 2007, 269.

⁶⁴ Derek Da Cunha, "Sociological Aspects of the Singapore Armed Forces", in *Armed Forces & Society*, vol.25 no.3, Spring 1999, 467, and Hugh Lim U Yang, "Integrating Technology into 21st Century Armies - A SAF Perspective", in *Pointer*, vol.26 no.1, Jan - Mar 2000, http://www.mindef.gov.sg/safti/pointer/back/journals/2000/Vol26_1/1.htm [Last accessed July 9, 2009].

⁶⁵ Lim, "Integrating Technology into 21st Century Armies - A SAF Perspective."

⁶⁶ Agency for Science, Technology and Research, "A*Star - Biography - Lim Chuan Poh," http://www.a-star.edu.sg/a_star/164-Biography?iid=54 [Last accessed July 9, 2009].

⁶⁷ "A Stimulating Time Abroad," *Straits Times*, 18 February 1994.

⁶⁸ Ministry of Defence (Singapore), "News Release - Change of Chief of Defence Force and Chief of Army", http://www.mindef.gov.sg/imindef/news_and_events/nr/2007/feb/06feb07_nr.html [Last accessed July 9, 2009].

⁶⁹ *Ibid.*

⁷⁰ Ministry of Defence (Singapore), "News - Factsheet - SAF Overseas Scholarship Recipients (06 Aug 08)", http://www.mindef.gov.sg/imindef/news_and_events/nr/2008/aug/06aug08_nr/06aug08_fs.html Last accessed July 9, 2009].

⁷¹ "Groomed for the Top," *Straits Times*, 09 August 1993.

⁷² The term "farmer" is used in the SAF to refer to a career officer who works his way up through the ranks without the privileges, either opportunities or career management, which SAF scholars supposedly enjoy. The term's etymological roots can be traced to the Confucian social hierarchy which places the "scholar" one level above the "farmer". See, for instance, Walsh, "The Roar of the Lion City", 267-270, Huxley, *Defending the Lion City*, 109-111, 241-242, and Chan, "Singapore," 145-148.

overseas institutions, as well as their youth, colour the direction, thus the organizational essence, of the SAF.

The importance of the need to have well-educated scholars at the helm of the SAF was recognized early on. At the commissioning of the first five SAF Overseas Scholars in 1971, then President Benjamin Sheares, having described the scope and expanse (not to mention expense) of the SAF's procurement and employment, concluded "any organisation this large and enterprise this expensive needs top echelon management personnel of high ability, wide experience, sound judgement and impeccable character." Chan Heng Chee would later interpret this statement to be the birth of the "trademark of the SAF", "the unique breed of scholar officer."⁷³ By 1983, it was recognized in the SAF that intellect and technology would be a substitute for experience.⁷⁴ Given how the entry-level salary scale for SAF officers is pegged to education qualifications, it appears this policy continues to this day.⁷⁵

All senior officers are retired from active service in their mid-forties, a comparatively young age given Singapore's national retirement age is 62. Such a policy ostensibly renews the focus and energy of the SAF's personnel.⁷⁶ The policy of early retirement elevates the centrality of technology in the SAF by accelerating the career of the SAF scholar. Owing to their short careers in active service, SAF scholars often assume senior commands when they are still comparatively junior in age and experience to their counterparts in other militaries. Many SAF scholars themselves assume they will be involved at important command and management levels given their educational qualifications.⁷⁷ This contributes to the SAF's institutional fascination with "3G-ness" for the latest technology is typically most readily embraced and understood by those not conditioned by decades of familiarity with the old. Furthermore, youth typically affords one with a comfort and familiarity with technology. The lack of experience as perceived by critics could therefore actually encourage innovation.⁷⁸

Admittedly, an innovative environment should also encourage self-criticism and alternate points of view. After all, new technology is often developed by the critical process of "thinking out of the box" and going against convention. Even the MOE hopes to develop "critical thinking and the ability to ask questions" among students.⁷⁹ Yet, ironically, opinion in the SAF is often so overwhelmingly pro-technology that it eclipses any idea that is not "transformative". "3G-ness" is accepted almost uncritically. Several officers have spoken out against relying on technology and warned of captivation by RMA *Sirens*.⁸⁰ They, however, form the minority. From 2004 to the present, only 5 out of a total of 48 features and viewpoints which discuss "transformation" in the SAF journal *Pointer* critiqued it

⁷³ Chan, "Singapore," 145.

⁷⁴ Huxley, *Defending the Lion City*, 110.

⁷⁵ The scheme (A, B or C) an SAF officer is employed in is dependent on his or her education qualifications. Scheme A is for non-graduates, whereas Schemes B and C are for graduates. Additionally, there is further differentiation within schemes. For example, according to the SAF's Army Recruitment Centre, the difference in pay between a lieutenant with a basic university degree, and one who has a degree with "good honours" is S\$430. See Army Recruitment Centre, "Career Progression - Salary Scale," <http://www.mindef.gov.sg/arc/careerprogression.html> [Last accessed July 9, 2009].

⁷⁶ Walsh, "Roar of the Lion City", 267.

⁷⁷ Chan, "Singapore," 146.

⁷⁸ Walsh and Huxley, for instance, describe SAF officers, as being inexperienced in several areas. See Walsh, "the Roar of the Lion City", 266-270, and Huxley, *Defending the Lion City*, 121.

⁷⁹ Ministry of Education (Singapore), *Education Statistics Digest 2007*, vi.

⁸⁰ See, for example, Lawrence Leong, "Uncertainty, Friction, Politics and the Moral Dimension: Four Reasons Why NCW Theorists Should Re-read Clausewitz," in *Pointer*, vol.33 no.2 (2007), 52-59, Toh Boon Kwan, "Viewpoint: Don't Harbour High Hopes for Experimentation," in *Pointer*, vol.32 no. 2 (2006), 73-74, Ng Pak Shun, "Realising IKC2: The Limits of Technology in Military Innovation," in *Pointer*, vol.30 no. 1 (2004), 69-78, and Li Lip Khoon, "Viewpoints: Whose Transformation is it Anyway?" in *Pointer*, vol.29 no.4 (2003), 105-106.

significantly.⁸¹ These alternative views are often not even challenged, or refuted, even though its charter encourages debate.⁸² Alfred Fox, a serving SAF officer, notes this lack of intellectual engagement in *Pointer*. He fears that it might become merely a “vehicle that reinforces official positions” which does not “surface controversy and engage officers in debate.”⁸³ The hegemony of “3G-ness” in the SAF, an “open” organization which has institutional pro-technology norms simply drowns out the small voices of alternate views. The reason is simple: the military is clearly hierarchical and necessarily undemocratic.⁸⁴ By virtue of its constitution and purpose, direction is given from the top down, where disagreement with one’s superiors should be avoided.⁸⁵ As Samuel Huntington puts it, “the supreme military value is obedience.”⁸⁶

The RMA, however, with its emphasis on precision and high-tempo operations, flattens traditional military hierarchies by empowering individuals to act quicker on their own initiative. Recognizing this, some argue the SAF has in recent years evolved into a “learning organization” whose members are equipped with critical thinking skills and alternate views should be encouraged.⁸⁷ Providing the “opportunity to think”, however, remains an inherent problem.⁸⁸ It still remains unclear at what level these opportunities should be provided. A soldier often straddles a fine line between deviance and initiative. Huntington suggests this is a difficult dilemma solve, but concludes “professional competence [as opposed to blind obedience of an order] must be the final criterion” in determining whether initiative, deviance from the prescribed, is exercised.⁸⁹ Yet, deviating from the norm to do a competent job can be costly, especially when obedience carries such a high premium in the military. Anecdotal evidence in the SAF suggests that initiative and “out of the box” thinking is encouraged when solving tactical problems, but creative thought at the strategic level remains in the hands of a select few, namely the senior leadership. For example, much is invested in the SAF’s Productivity and Innovation in Daily Effort (PRIDE) movement. Soldiers are encouraged—and duly rewarded—to increase productivity and efficiency through creative approaches. It, however, is difficult, if not impossible, for alternate views to influence strategic thought at the upper echelons of command. A speech by Prime Minister Lee Hsien Loong highlights this clearly. “Every [soldier],” said PM Lee, “understands the intent of his commander and is trained to act independently and exercise initiative to turn the tide of battle ...”⁹⁰ This is vintage *Auftragstaktik* as espoused by Moltke the Elder - the strategic objectives of a superior are fixed, but how that goal is tactically achieved is left to the subordinate. The rigid structure of militaries preserves this dynamic. Team-work and tactical innovation are encouraged but independence in higher-level strategic thought is eschewed. It therefore pays to toe the organization’s line in order to thrive in it. No one wants to be branded a “trouble-maker”.⁹¹

⁸¹ 2004 was the year MINDEF began to publicly emphasize its 3G transformation efforts.

⁸² *Pointer*, The Journal of the Singapore Armed Forces, “About Us - Charter,” <http://www.mindef.gov.sg/imindef/publications/pointer/about/Charter.html> [Last accessed July 9, 2009].

⁸³ Alfred Fox, “Viewpoints: “What’s An Opinion?” in *Pointer*, vol.30 no.1 (2004), <http://www.mindef.gov.sg/imindef/publications/pointer/journals/2004/v30n1/viewpoints.html> [Last accessed July 9, 2009].

⁸⁴ Samuel P. Huntington, *The Soldier and the State: The Theory and Politics of Civil Military Relations* (Cambridge: The Belknap Press of Harvard University Press, 1985), 60.

⁸⁵ Lim, “Developing the Thinking Competency of SAF Leaders”, 85, 87-88.

⁸⁶ Huntington, *The Soldier and the State*, 74.

⁸⁷ See, for example, Lim, “Developing the Thinking Competency of SAF Leaders,” Goh Kee Nguan, Bryan Tan and Damian Lim, “Learning Army Thinking Soldier”, in *Pointer*, vol.33 no.4 (2007) and Ong Jun Wei, “Harnessing the Full Potential of Our Soldiers”, in *Pointer*, vol.34 no.2 (2008).

⁸⁸ Lim, “Developing the Thinking Competency of SAF Leaders,” 89.

⁸⁹ Huntington, *The Soldier and the State*, 76.

⁹⁰ Lee Hsien Loong, “[September 27, 2007] Speech by Prime Minister, Lee Hsien Loong at the ‘40 Years of National Service Commemoration Dinner’,” <http://www.pmo.gov.sg/News/Speeches/Prime+Minister/Speech+by+PM+Lee+at+40+Years+of+National+Service+Commemoration+Dinner.htm> [Last accessed July 9, 2009].

⁹¹ Lim, “Developing the Thinking Competency of SAF Leaders,” 88.

The result of these policies of early retirement and the choice of SAF scholars for senior command is that the leadership of the SAF is typically young, both in actual age and perspective, at ease with the latest technology, and well aware of the possibilities it offers. The structure of institutional obedience in the military entrenches these views. This has created fertile ground for the growth of "3G-ness".

Explanation # 4 – Together as One: The Military-Industrial-Administrative-Complex

The elite of the SAF are seemingly happy to be merged into Singapore's larger administrative framework.⁹² This sharply contrasts the experiences of other countries in the region whose militaries, at different times and to different degrees, involved themselves in local politics, often forcefully.⁹³ The Singaporean Civil-Military Relations model had run against the regional norm.

In 1975, Chan Heng Chee, surmised that Singapore had become an "administrative state," where "the meaningful political arena is shifting, or has shifted to the bureaucracy."⁹⁴ Chan would later coin the term "Military-Industrial-Administrative Complex" to explain this unity in the relationships between the military, industry and government as all three worked towards ensuring Singapore's growth.⁹⁵ Tim Huxley subsequently expanded this argument by claiming Singapore was not only an administrative state, but one where senior active and reservist SAF officers came to fill key bureaucratic and political positions, an arrangement which, in part, ensured MINDEF would remain closely subservient to political direction.⁹⁶ Huxley, however, goes on to note that these officers might be partial to the SAF, having spent many years in that institution. As civil servants, they may therefore act to preserve, or advocate, the interests of their former employer.⁹⁷ This "jointness" between the military, industry and government, the term itself a hallmark of the RMA, has allowed an uncontested acceptance of technology, allowing the MINDEF/SAF to further its fascination with "3G-ness".

Another reason why the government and military so easily and readily cooperate with each other is the common ground that National Service is for all male Singaporeans. Overwhelmingly dominated by men, the government has become, in a very general sense, an "old boys club" of ex-soldiers. It is for this reason Tan Tai Yong suggests the use of the term "Civil-Military Fusion" to highlight this lack of clear distinction between the civilian government and military.⁹⁸ A larger, more significant reason, which the idea of "fusion" alludes to, is the Dual Career Scheme, launched in 1981. Through this scheme, capable middle or high ranking SAF officers can be seconded to civilian appointments in the government. A recent example is Perry Lim, a 1991 SAFOS recipient. An army officer, he was seconded to the MOE as Director of Higher Education from 2006 to 2008, before returning to the SAF as the Deputy Assistant Chief of General Staff for Operations (Current Operations).⁹⁹

⁹² Tan, "Singapore: Civil-Military Fusion," 292.

⁹³ Chan, "Singapore," 136. Neo Beng Tong also investigates this phenomenon in considerable detail. Neo Beng Tong, *Civilian Control of the Military in Singapore*, Unpublished MA Thesis, State University of New York at Buffalo, 2006.

⁹⁴ Chan Heng Chee, "Politics in An Administrative State: Where has the Politics Gone?" in *Trends in Singapore*, ed. Seah Chee Meow (Singapore: Singapore University Press, 1975), 62.

⁹⁵ Chan, "Politics in an Administrative State", 61.

⁹⁶ Huxley, *Defending the Lion City*, 76, 232.

⁹⁷ *Ibid*, 244.

⁹⁸ Tan, "Singapore: Civil-Military Fusion," 278.

⁹⁹ Lim was also jointly awarded the President's Scholarship in 1991. In 2008, he was awarded the Lee Kuan Yew Post-graduate Scholarship to pursue a Masters in Business Administration (MBA). Channel News Asia, "Channelnewsasia.com, 24 August

Eventual retirement from the SAF will subsequently guarantee them a senior position in the civil service.¹⁰⁰ The official reasoning is cross-posting “provides a more macro perspective of how Singapore works.”¹⁰¹ That may have been the intention, but a consequence of the scheme is that a homogeneity in vision and approach exists across the civil service, given the wide spread of SAF officers to a variety of posts outside the military.

For example, some joke that the Ministry of Education (MOE) is a second MINDEF. The current Minister for Education, Dr Ng Eng Hen is concurrently the Second Minister for Defence. Numerous SAF scholars have also helmed senior appointments there. A previous Minister for Education, Teo Chee Hean, was a former SAF Overseas Scholar and Rear Admiral in the Republic of Singapore Navy (RSN). He is now the Minister for Defence. The previous Minister of State for Education, Liu Tuck Yew, was formerly Chief of Navy. Lim Chuan Poh, a former Permanent Secretary at the MOE, was previously the Chief of Defence Force. This relationship between both ministries began early on. Dr Goh Keng Swee was the Minister for Defence prior to taking over the education portfolio from 1978-1980. The team Dr Goh assembled immediately to review Singapore's education system were former colleagues at MINDEF.

Additionally, the SAF's present transformation efforts are also widely supported by the maturing local defence industry. In particular, the vision and planning of Singapore's first Minister for Defence, Dr Goh Keng Swee, must be emphasized. An economist by training, Goh recognized the importance of an indigenous defence industry.¹⁰² Immediately, it could create jobs that the country desperately needed then, a belief that some still hold in the present.¹⁰³

A local defence industry is also a strategic asset, initially a means to achieve a basic level of self-sufficiency in armaments, initially in basic weaponry, but subsequently—and vital to the SAF's efforts at “transformation”—a crucial base to engineer into reality the advanced weapons platforms developed by Singapore's defence scientists. In 1967, just two years after Singapore's independence, Dr Goh established Chartered Industries of Singapore (CIS). CIS initially secured the rights and infrastructure to manufacture the Colt M-16 rifle locally, the standard assault rifle of the SAF, as well as a wide-array of ammunition. Sister companies followed soon after. Singapore Aircraft Industries (SAI) and Singapore Automotive Engineering (SAE) subsequently progressed to upgrading more complicated foreign weapons platforms, such as the A4 Skyhawk and AMX-13 tank. Presently, the Singaporean defence industry is represented by Singapore Technologies Engineering, a consortium of various local defence companies that spawned from the original CIS. Singapore now has the capability of designing and manufacturing advanced weapons platforms, some of which have been successfully marketed overseas. While Singapore has traditionally been secretive about its RMA technologies, it has recently begun to be more open.¹⁰⁴ What has been revealed thus far suggests the 3G SAF is well on its way to walking its talk.

2008 - Lawyer and Army Colonel are this Year's LKY Scholars,” <http://www.channelnewsasia.com/stories/singaporelocalnews/view/371192/1/.html> . [Last accessed July 9, 2009].

¹⁰⁰ Huxley, *Defending the Lion City*, 233.

¹⁰¹ “Groomed for the Top,” *Straits Times*, 09 August 1993.

¹⁰² For an overview of what motivated the development of a Singaporean defence industry soon after independence, see Bilveer Singh, *Singapore's Defence Industries* (Canberra: Australian National University, 1990), 38-49.

¹⁰³ Chan Chin Bock, the former chairman of Singapore's Economic Development Board, has identified the local defence industry as one that could help take Singapore's economy forward. “Defence Harnesses Singapore's 'Man-made' Competitive Advantage,” *Straits Times*, 22 April 2009.

¹⁰⁴ Huxley, “Singapore and the RMA”, 193.

This indigenous capability to produce such advanced military equipment would not have been possible if not for an early investment in defence research and development (R&D). In 1971, under Goh's direction, Project *Magpie*, a grouping of returning engineer-scholars, was initiated. Calling themselves the "Electronics Test Centre," these bright, young engineers were tasked to develop advanced electronics for military applications.¹⁰⁵ Thus, less than five years after its birth, the SAF's love affair with the latest and the most advanced military technology began in earnest. It has not ended. An estimated 10% of Singapore's defence budget is presently channelled to R&D, IT procurement and experimentation. Indeed, the SAF heavily invests in technology, spending an estimated 50% of its capital budget on programmes intrinsically linked to the 3G SAF, such as precision weapons and unmanned systems.¹⁰⁶ This interest looks set to endure well into the future. According to former Minister for Defence Dr Tony Tan, Singapore's defence industry and the Defence Science Technology Agency (DSTA) are two of the three key pillars (the third being the SAF's highly educated personnel) that allow the SAF to harness the latest technology for military use.¹⁰⁷ Notably, the personnel who staff the first two legs of the triad inexorably also serve in the third as National Servicemen. The military experience of Singaporean defence engineers and scientists allows them to understand the SAF's operational needs better, enhancing the developmental process.¹⁰⁸

Conclusion

Two questions have typically been asked in the study of militaries as institutions - why they fight, and how they fight. An equally rewarding question worth asking is to combine both - why does a military fight the way it does. This paper is a preliminary sketch of the social-political organizational reasons why the SAF is fascinated with the RMA, a concept that deeply colours how the SAF will fight an external aggressor.

As has been noted by the lack of similar macro-level, RMA-styled transformation programmes in Taiwan, a country similar to Singapore in many regards, such a trajectory of military development is not a given, even if it has the necessary resources to support such a movement.

While suggesting Singapore's experience is unique might be an over-statement, it is certainly not typical. In the space of just four decades since its inception in 1967, the Singapore Armed Forces (SAF) has grown from a tiny regular force armed with British and Malaysian hand-me-downs to a technologically advanced citizen army equipped with advanced military hardware—some of which is locally produced—whose design is heavily informed by the RMA. Exercise *Lightning Warrior* conducted by the Singapore Army and Republic of Singapore Air Force (RSAF) in 2008,¹⁰⁹ as well as the recent commissioning of new stealth frigates by the RSN, illustrate this clearly.

¹⁰⁵ Tan, *Goh Keng Swee: A Portrait*, 144.

¹⁰⁶ IISS, "Asia's Evolution in Military Affairs", 2. According to a Minister for Defence Teo Chee Hean gave in 2008, MINDEF spends "about 4%" of its budget on R&D alone". Teo Chee Hean, "[29 February 2008] Speech by Mr Teo Chee Hean, Minister for Defence, at the Committee of Supply Debate 2008", http://www.mindef.gov.sg/imindef/news_and_events/nr/2008/feb/29feb08_nr/29feb08_speech.html [Last accessed July 9, 2009].

¹⁰⁷ Huxley, "Singapore and the RMA", 188.

¹⁰⁸ Lim, "Integrating Technology into 21st Century Armies - A SAF Perspective."

¹⁰⁹ According to the SAF, Exercise *Lightning Warrior* validated "the SAF's air-land integration" and demonstrated "the ability to coordinate a network of sensor and shooter assets that allows a Division to see, strike and influence the battlefield in depth." See Ministry of Defence (Singapore), "Integrating 3rd Generation SAF's Strike Capabilities," http://www.mindef.gov.sg/imindef/news_and_events/nr/2008/may/18may08_nr.html [Last accessed July 9, 2009].

Singapore's "chronic sense of vulnerability" leads it to rely on technology to mitigate its lack of strategic depth and small population, and fund the high cost of such an approach through a consistent comparatively large constant defence budget, even during economically lean times. The national love of technology in Singapore, promoted in school and by society in general, provides a natural cultural base for the RMA to thrive in the military. Led by comparatively young, well-educated, technology-inclined regular officers, with the majority of its other ranks "part-time" citizen soldiers drawn from Singapore society because of National Service, "3G-ness" is not only attractive, but also a real practical possibility because it is implementable in the mainstream. Finally, above all, the "jointness" of the Singaporean military-industrial-administrative complex has resulted in a competent local defence industry, as well a unitary vision towards technological warfare, in no small part due to the "old boys club" of ex-soldiers found at different levels in the civilian government that is still largely technocratic in approach, a legacy from the island state's first generation of leaders.

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Bibliography

Books

- Alberts, David S. and Papp, Daniel S. "War in the Information Age Military." In *Volume III: Information Age Anthology: The Information Age Military*, edited. David S. Alberts and Daniel S. Papp, 1-28. Washington, DC: DOD C4ISR Cooperative Research Program, 2001.
- Chan, Heng Chee. "Politics in An Administrative State: Where has the Politics Gone?" In *Trends in Singapore*, edited by Seah Chee Meow, 51-68. Singapore: Singapore University Press, 1975.
- Chan, Heng Chee. "Singapore." In *Military-Civilian Relations in South-East Asia*, edited by Zakaria Haji Ahmand and Harold Crouch, 136-155. Singapore: Oxford University Press, 1985.
- Cohen, Eliot. "Change and Transformation in Military Affairs." In *Military Transformation and Strategy: Revolutions in Military Affairs and Small States*, edited by Bernard Loo, 15-26. Abingdon: Routledge, 2009.
- Goldman, Emily O. "Introduction: Military Diffusion and Transformation." In *The Information Revolution in Military Affairs in Asia*, edited by Emily O. Goldman and Thomas G. Mahnken, 1-22. New York City: Palgrave Macmillan, 2004.
- Huntington, Samuel P. *The Soldier and the State: The Theory and Politics of Civil Military Relations*. Cambridge: The Belknap Press of Harvard University Press, 1985.
- Huxley, Tim. *Defending the Lion City*. Singapore: Talisman Publishing, 2004.
- Huxley, Tim. "Singapore and the Revolution in Military Affairs." In *The Information Revolution in Military Affairs in Asia*, edited by. Emily O. Goldman and Thomas G. Mahnken, 185-208. New York City: Palgrave Macmillan.
- Hymans, Jacques E.C. *The Psychology of Nuclear Proliferation: Identity, Emotions and Foreign Policy*. Cambridge: Cambridge University Press, 2006.
- Hymans, Jacques E.C. "Why Do States Acquire Nuclear Weapons? Comparing the Cases of India and France." In *Nuclear India in the 21st Century*, edited by. D. R. SarDesai and Raju G.C. Thomas, 139-160. New York City: Palgrave Macmillan, 2002.
- Lee, Kuan Yew. *From Third World to First: The Singapore Story: 1965-2000*. Singapore: Times New Media, 2000.
- Leong, Choon Cheong. *Youth in the Army*.(Singapore: Federal Publications, 1978.
- MacKenzie, Donald. "The Social Shaping of Technology." In *Major Problems in the History of American Technology*, edited by Merritt R. Smith and Gregory Clancey, 13-15. Boston, 1998.
- Mulvenon, James. "Taiwan and the Revolution in Military Affairs." In *The Information Revolution in Military Affairs*, edited by Emily O. Golmand and Thomas G. Mahnken, 139-166. New York City: Palgrave Macmillan, 2004.
- Rosen, Stephen P. *Winning the Next War: Innovation and the Modern Military*. Ithaca: Cornell University Press, 1991.

- Singh, Bilveer. *Singapore's Defence Industries*. Canberra: Australian National University, 1990.
- Tan, Siok Sun. *Goh Keng Swee: A Portrait*. Singapore: Editions Didier Millet, 2007.
- Tan, Tai Yong. "Singapore: Civil-Military Fusion." In *Coercion and Governance: The Declining Political Role of the Military in Asia*, edited by Muthiah Alagappa, 276-293. Stanford: Stanford University Press, 2001.

Journal Articles

- Ball, Desmond. "Arms and Affluence: Military Acquisitions in the Asia-Pacific Region." *International Security* 18 no. 3, Winter 1993/1994: 78-112.
- Bitzinger, Richard A. "Come the Revolution: Transforming the Asia-Pacific's Militaries." *Naval War College Review*, vol. 58 no.4, Autumn 2005: 39-60.
- Borsuk, Richard and Chua, Reginald. "Singapore Strains Relations with Indonesia's President." *The Asian Wall Street Journal*, 04 August 1998.
- Da Cunha, Derek. "Sociological Aspects of the Singapore Armed Forces." *Armed Forces & Society*, vol.25 no.3, Spring 1999: 459-475.
- Fox, Alfred. "Viewpoints: 'What's An Opinion?'" *Pointer*, vol.30 no.1 (2004).
<http://www.mindef.gov.sg/imindef/publications/pointer/journals/2004/v30n1/viewpoints.html> [Last accessed July 9, 2009].
- Goh, Kee Nguan, Tan, Bryan and Lim, Damian. "Learning Army Thinking Soldier." *Pointer*, vol.33 no.4 (2007).
http://www.mindef.gov.sg/imindef/publications/pointer/journals/2007/v33n4/Learning_Army_Thinking_Soldier.html [Last accessed August 28, 2009]
- Goh, Keng Swee. "The Technology Ladder in Development: The Singapore Case." *Asia-Pacific Economic Literature* vol.10, no.1, May 1996: 1-12.
- Grissom, Adam. "The Future of Military Innovation Studies." *The Journal of Strategic Studies*, vol.29, no.5, October 2006: 905-934.
- Leong, Lawrence. "Uncertainty, Friction, Politics and the Moral Dimension: Four Reasons Why NCW Theorists Should Re-read Clausewitz." *Pointer*, vol.33 no.2 (2007): 52-59.
- Li, Lip Khoon. "Viewpoints: Whose Transformation is it Anyway?" *Pointer*, vol.29 no.4 (2003): 105-106.
- Lim, Choon Peng. "Developing the Thinking Competency of SAF Leaders." *Pointer*, vol.33 no.3, 2007.
<http://www.mindef.gov.sg/imindef/publications/pointer/journals/2007/v33n3/feature7.html> [Last accessed August 28, 2009]
- Lim U Yang, Hugh. "Integrating Technology into 21st Century Armies – A SAF Perspective." *Pointer*, vol.26 no.1, Jan – Mar 2000.
http://www.mindef.gov.sg/safti/pointer/back/journals/2000/Vol26_1/1.htm [Last accessed July 9, 2009].
- Moore, Richard. "Where Her Majesty's Weapons Were." *Bulletin of the Atomic Scientists*, vol.57 no.1, January/February 2001: 58-64
- Ng, Pak Shun. "Realising IKC2: The Limits of Technology in Military Innovation." *Pointer*, vol.30 no. 1 (2004): 69-78.
- Ong, Jun Wei. "Harnessing the Full Potential of Our Soldiers." *Pointer*, vol.34 no.2 (2008).
<http://www.mindef.gov.sg/imindef/publications/pointer/journals/2008/v34n2/viewpoint1.html> [Last accessed August 28, 2009]
- Tan, Andrew T. H. "Singapore's Defence: Capabilities, Trends, and Implications." *Contemporary Southeast Asia: A Journal of International & Strategic Affairs*, vol. 21 no. 3, Dec 1999: 451-474.
- The International Institute for Strategic Studies (IISS). "Asia's Evolution in Military Affairs: Patchy 'Transformation'." *Strategic Comments*, vol. 10 no. 3, April 2004: 1-2.

Toh, Boon Kwan. "Viewpoint: Don't Harbour High Hopes for Experimentation." *Pointer*, vol.32 no. 2 (2006): 73-74.

Walsh, Sean P. "The Roar of the Lion City: Ethnicity, Gender, and Culture in the Singapore Armed Forces." *Armed Forces & Society*, vol.33 no.2, January 2007: 265-285.

Official Documents

Ministry of Defence (Singapore), *Defending Singapore in the 21st Century* (Singapore: Ministry of Defence, 2000), 27.

Ministry of Education (Singapore), *Education Statistics Digest 2007* (Singapore: Ministry of Education, 2007), 55.

Office of the Under Secretary of Defense for Acquisitions, Technology & Logistics. *International Armaments Cooperation Handbook*, 4th Edition, 1 Nov 2006.

<http://www.acq.osd.mil/ic/handbook.pdf> [Last accessed July 9, 2009].

Parliamentary Debates: Republic of Singapore, vol.40, no.1, Addenda to Presidential Address, Col. 35.

Speeches

Ng, Eng Hen. "Speech by Dr Ng Eng Hen, Minister for Education and Second Minister for Defence, at the MOE Work Plan Seminar 2008, on Thursday, 25 September 2008 at the Ngee Ann Polytechnic Convention Centre." <http://www.moe.gov.sg/media/speeches/2008/09/25/speech-by-dr-ng-eng-hen-at-the-moe-work-plan-seminar-2008.php> [Last accessed July 9, 2009].

Lee, Hsien Loong. "'Learning and Living the Singapore Story', Keynote Address by the DPM Mr Lee Hsien Loong at the Network Conference 2003, held on 03 May 2003."

<http://stars.nhb.gov.sg/stars/public/viewHTML.jsp?pdfno=2003050301> [Last accessed July 9, 2009].

Lee, Hsien Loong. "[September 27, 2007] Speech by Prime Minister, Lee Hsien Loong at the '40 Years of National Service Commemoration Dinner.'"

<http://www.pmo.gov.sg/News/Speeches/Prime+Minister/Speech+by+PM+Lee+at+40+Years+of+National+Service+Commemoration+Dinner.htm> [Last accessed July 9, 2009].

Tan Keng Yam, Tony. "Launch of the Defence Science and Technology Agency - Speech by Dr Tony Tan Keng Yam, Deputy Prime Minister and Minister for Defence, at the DSTA Inauguration Ceremony at the Auditorium, Singapore International Convention and Exhibition Centre, on 29 March 2000."

http://www.dsta.gov.sg/index.php?option=com_content&task=view&id=1743&Itemid=401 [Last accessed July 8, 2009].

Teo, Chee Hean. "[April 21, 2005] Lunch Talk on 'Defending Singapore: Strategies for a Small State' by Minister for Defence Teo Chee Hean."

http://www.mindef.gov.sg/imindef/resources/speeches/2005/21apr05_speech.html [Last accessed July 9, 2009].

Teo, Chee Hean. "[February 12, 2009] Speech by Mr Teo Chee Hean, Minister for Defence, at the Committee of Supply Debate 2009."

http://www.mindef.gov.sg/imindef/news_and_events/nr/2009/feb/12feb09_speech/12feb09_speech3.html [Last accessed July 9, 2009].

Teo, Chee Hean. "[February 29, 2008] Speech by Mr Teo Chee Hean, Minister for Defence, at the Committee of Supply Debate 2008."

http://www.mindef.gov.sg/imindef/news_and_events/nr/2008/feb/29feb08_nr/29feb08_speech.html

Unpublished Material

Neo, Beng Tong. *Civilian Control of the Military in Singapore*. Unpublished MA Thesis, State University of New York at Buffalo, 2006.

Websites

Agency for Science, Technology and Research. "A*Star - Biography - Lim Chuan Poh," http://www.a-star.edu.sg/a_star/164-Biography?iid=54 [Last accessed July 9, 2009].

Army Recruitment Centre. "Career Progression - Salary Scale." <http://www.mindef.gov.sg/arc/careerprogression.html> [Last accessed July 9, 2009].

Channel News Asia. "Channelnewsasia.com, 24 August 2008 - Lawyer and Army Colonel are this Year's LKY Scholars." <http://www.channelnewsasia.com/stories/singaporelocalnews/view/371192/1/.html> . [Last accessed July 9, 2009].

Ministry of Defence (Singapore). "Integrating 3rd Generation SAF's Strike Capabilities." http://www.mindef.gov.sg/imindef/news_and_events/nr/2008/may/18may08_nr.html [Last accessed July 9, 2009].

Ministry of Defence (Singapore). "News - Factsheet - SAF Overseas Scholarship Recipients (06 Aug 08)." http://www.mindef.gov.sg/imindef/news_and_events/nr/2008/aug/06aug08_nr/06aug08_fs.html [Last accessed July 10, 2009]

Ministry of Defence (Singapore). "News Release - Change of Chief of Defence Force and Chief of Army." http://www.mindef.gov.sg/imindef/news_and_events/nr/2007/feb/06feb07_nr.html [Last accessed July 9, 2009].

Ministry of Defence (Singapore). "News - Factsheet - SAF Overseas Scholarship Recipients (06 Aug 08)", http://www.mindef.gov.sg/imindef/news_and_events/nr/2008/aug/06aug08_nr/06aug08_fs.html [Last accessed July 9, 2009].

Ministry of Defence (Singapore). "The 3rd Generation SAF - About the 3rd Generation SAF." http://www.mindef.gov.sg/imindef/mindef_websites/topics/3g/what.html [Last accessed on July 9, 2009].

Ministry of Defence (Singapore). "The 3rd Generation SAF - Our Technology." http://www.mindef.gov.sg/imindef/mindef_websites/topics/3g/progress/technology.html [Last accessed July 10, 2009].

O'Hanlon, Michael E. "Beware the 'RMA'nia!'" http://www.brookings.edu/papers/1998/0909defense_ohanlon.aspx [Last accessed July 9, 2009].

Pointer, The Journal of the Singapore Armed Forces, "About Us - Charter." <http://www.mindef.gov.sg/imindef/publications/pointer/about/Charter.html> [Last accessed July 9, 2009].

Singapore Department of Statistics. *Statistics Singapore - Key Annual Indicators- Literacy & Education*. <http://www.singstat.gov.sg/stats/keyind.html#litedu> [Last accessed July 9, 2009].