The Revolution in Military Affairs for Small States

REPORT OF A CONFERENCE ORGANIZED BY THE INSTITUTE OF DEFENCE AND STRATEGIC STUDIES (IDSS)

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**INTRODUCTION**

In his opening remarks, Mr. Barry Desker, Director of IDSS observed that the 1991 Gulf War appeared to herald a “revolution in military affairs” (RMA)—brought about by the integration of emerging technologies into military operations and possibly heralding a change in the way war was fought. While this claim was perhaps in hindsight premature, military power has since increasingly emphasized the importance of surveillance and precision strike, led by advances in information and communications technology and emphasizing the importance of quality over quantity.

Mr. Desker went on to say that if the world was on the cusp of an RMA in 1991, then it seems we are now truly in the midst of this phenomenon. What this RMA means in strategic and operational military terms, remains a matter of debate, with several schools of thought. The “system-of-systems” school sees the conduct of war dominated not by platforms or people, but by data processing and networking of forces. The vulnerability school highlights the easy accessibility of these technologies to both friends and foes alike. The dominant battlespace knowledge school posits that the battlefield will become more “transparent” through the use of sensors, whilst the multi-dimensional school believes the real revolution will come through the networking of mobile, rapid deployment and special operations forces.

Mr. Desker argued that the RMA is attractive to Singapore for a number of reasons: declining birth rates and its impact on enlistment of available national servicemen; its high education standards, knowledge economy and organic defence industrial base; and most significantly, the SAF’s mature conventional warfare capability. The RMA would seem to be the next logical step; however, this step will likely be both difficult and expensive. Existing RMA literature tends to be U.S.-centric, and the aim of this conference is to seek an understanding of what the RMA might mean for small states like Singapore.

**KEYNOTE ADDRESS**

Eliot Cohen (Johns Hopkins University) spoke of “Change and Transformation in Military Affairs”. What exactly is an RMA? A young U.S. Army captain in 1974 could have spent his entire career up until now thinking about and encountering nothing but the RMA; having reached this stage, however, that captain might not be certain what the “RMA” is, or if indeed it had happened. This possibly calls into question the whole idea of an RMA. In order to answer this more adequately, Cohen outlined four “critiques” of the current state of thinking about the RMA in theoretical terms, and then looked more empirically at exactly what has happened to the conduct of war.

The first critique relates to RMA theory’s geopolitical assumptions. Much of RMA theory has been premised on the overwhelming predominance in global politics of the U.S., as the only power with the full-spectrum of RMA capabilities. This has coloured the RMA debate, in that it reflects U.S. capabilities. The second critique of RMA theory is that it has focused on technology as the main, if not exclusive, engine behind transformation. While much of the technology is truly astounding, perhaps a more comprehensive and holistic approach is necessary. The more interesting part of transformation, even the technological side, is the human component that “puts it all together”. The hardest part to change is doctrine and culture, not the “gadgets”. Some of the most interesting changes have been in the human dimension, such as the role of NCOs, officers’ career paths and the role of civilians and private companies.
A third critique revolves around the question of how transformation actually occurs. Cohen made the point that much of RMA theory is actually “a normative debate masquerading as a positivist discussion”. What initially seems like basic social science may in fact be a more normative stance that the RMA is “a good thing” or that transformation “ought to happen”. This has led to the belief that change is imposed from the top down. However, there is some doubt concerning the ability of military institutions to change in this fashion. From a military history perspective, most change would actually appear to “bubble up” from below. In the case of the U.S. today, real change is not coming from top level “experimentation” (with its all too predictable results) but from “people tinkering around in the field” in training or actual operations. If this is the real process by which change occurs, the more important question might be: Is change accepted or rejected by those above, and are leaders willing to let their people try new ideas?

A fourth critique revolves around the tendency of RMA theory to ignore the reactions of other states to the RMA. U.S. defence spending is “so far off the charts” that other countries (and non-state groups) are exploiting their own available technology. The desire for WMD capabilities is one example of the danger of this, as states seek to neutralize the U.S. conventional advantage. Medium powers have pursued RMA-type capabilities, but the key question is how effective they have been and what difference it really makes. Finally, there is also the threat posed by terrorism and other such non-state groups. RMA theory would traditionally treat this as irrelevant to conventional warfare and capabilities. However, terrorism is a way of bypassing conventional strengths. Furthermore, there is much evidence that even basic information technology can be of use to both sides (for example, the Internet and GPS).

Cohen then posed the question: Has there been any transformation or radical change in military affairs? The answer may be found in three empirical “tests”. First, do soldiers and military organizations look different today? A U.S. Army infantryman of 1945 and his 1975 counterpart are essentially similar in their basic equipment and weapons. However, the U.S. Army infantryman in 2004 has a different uniform, wears body armour, uses night vision devices and possesses advanced communications equipment and GPS systems.

Second, are battle outcomes different? While the answer is somewhat harder to say, two facts can be acknowledged: outcomes are far more lopsided, which can be directly related to the possession of RMA capabilities; and it may be a mistake to look only at the battles that did occur rather than those that did not, that is, inter-state war has declined in part because of this perception of lopsided outcomes.

Third, are battle processes (that is, combat) different? Whilst much remains the same at the close quarter element of war (characterized by factors such as fear, friction and violence), it should be acknowledged that this is but one reality of battle. At a higher level (at the command post and operational levels) and in a parallel reality, combat is profoundly different.

In conclusion, whether one calls these changes a “revolution” or not, the fact remains that we have witnessed a very large transformation in “war”. This has been the result of both hard elements like technology and geopolitics, and also softer elements of military power. The most important questions are whether these changes are complete, and what further changes will we continue to see over the next 30 years—what the Army captain of 2035 will think on reflection of that transformation.
PANEL ONE

MILITARY TRANSFORMATION IN THE ASIA-PACIFIC

Larry Wortzel (Heritage Foundation), spoke on “Chinese Perspectives on the RMA”. Chinese military leaders have been watching the changes in U.S. military doctrine and operations very carefully for well over 20 years. PLA leaders and key thinkers from institutions such as the Academy of Military Science and the PLA National Defence University have sought to acquire documents and doctrine about the U.S. transformation process. The PLA was convinced about the utility of the RMA when they witnessed first hand how both China and the U.S. (in cooperation) were able to successfully support the mujahadeen in Afghanistan to defeat Soviet forces, the “marriage” of technology and doctrine on the battlefield could make a difference.

Much of the PLA’s RMA capability has come from U.S. assistance, both in terms of hardware (like artillery locating radars) and in terms of documents and doctrinal support. It is because of this level of assistance that the PLA understands how technology, equipment and doctrine can fundamentally affect warfare. The principle areas of Chinese RMA capability are battlefield connectivity, range and endurance of weapons, precision and miniaturization, stealth, automation and simulation, in addition to the main operational concepts (such as dominant manoeuvre). Moreover, they understand no single technology will be dominant (the “silver bullet” approach). However, this level of success has not yet translated into the industrial sector and production. Whilst they are very good at some aspects of production (missiles) in many areas, they have little or no expertise in systems engineering (aircraft engine manufacture being a key example).

This experience has key lessons for small and medium states. States embarking on the RMA must analyse carefully the scope of their needs, what the threat is and what the desired ability to respond is. China has largely done that. They must also ask what new platforms and technology can they adopt within manpower and budget limits (what can we NOT do?). Again, China is a good example of success in this area. Finally they must ask the strategic question of where they fit internationally in terms of defence industrial production. It is this area that China has not done well.

Tim Huxley (IISS) then spoke on the Singapore experience of the RMA. Singapore has the most advanced military capability in Southeast Asia, reinforced by the advantages of its status as an advanced economy and a highly educated population. However, while Singapore has clearly well developed RMA capabilities in the areas of precision, C4ISR and integrated logistics, some problem areas persist.

The first key challenge is the organizational...
and doctrinal aspects of the RMA. In technical terms, Singapore has the necessary prerequisites for participation in the RMA, but so far has not implemented the necessary organizational and doctrinal innovations that make the RMA a total “system of systems”. MINDEF and the SAF already “speak the language of the RMA” with a high degree of fluency, now they need to become more creative to enhance their natural competitive advantage. A related problem lies in the traditional structures of command and control, coupled with the SAF’s characteristically rigid, hierarchical reluctance to delegate. An incipient change is evident, however, in the frustrations of junior officers to this culture, as seen in recent Pointer articles.

The second key challenge for Singapore is to adopt RMA capabilities that are relevant to the evolving strategic environment. Since 1998 the regional security environment deteriorated significantly, increasing the importance of the deterrent ability of the SAF. The SAF must retain its capability to locate/target/destroy any enemy in the context of combined arms/joint operations. However, Singapore also needs to take account of asymmetric challenges to this conventional capability and to the specific demands of any possible complex regional emergency. Non-state threats to Singapore’s national infrastructure are another tangent that the SAF will need to be able to address. The complicating factor for Singapore is the slim resources available for procurement and production of RMA capabilities. The SAF has little prospect for expansion in real terms, given the cap in government spending set at 6% of GDP. This has forced the deferment of important programmes and delayed equipment replacements.

Finally, the “RMA” forms only one component of Singapore’s wider “transformation”. Huxley quoted Andrew Tan who believes that Singapore must move away from core competencies involving quantity and adopt a more “portfolio” approach of quality capabilities. The recent formation of a Future Systems Directorate charged with challenging established military thinking is evidence of the SAF’s potential for radical change. In the medium term, this implies that the SAF may “evolve” into quite a different organization, smaller and more specialized with older equipment replaced by locally produced high-tech options.

Michael Evans (Land Warfare Studies Centre, Australia) then spoke on Australia’s perspective on the RMA. Australia has been interested in the RMA for over a decade, but does not see it so much as a “revolution” or dramatic change in the nature of war, rather as a continuum of military transformation. Australia sees three key technologies as characteristic of this transformation: C4ISR, precision strike and stealth. However, due to its demographics and vast continental geography, Australia has been most interested in an RMA based on quality, not quantity, and has as such developed a unique approach called the Knowledge Edge.

The Knowledge Edge began as an in-service debate, and has progressed into an official philosophy that refers to “the exploitation of information technologies to allow Australia to use the relatively small ADF to maximum effectiveness”. The Knowledge Edge has
formed the foundation for the development of two other concepts, namely, network-centric warfare and multidimensional manoeuvre. Both concepts allow the Knowledge Edge as a theory to be operationalized, and reflect the belief that it is possible to move away from massing forces towards massing the effects of weapons platforms through the accumulated power of a network. To Australia, network-centric warfare is about the transformation from a “joint force” into a “seamlessly integrated force”, where platforms are treated as “nodes” that share information to increase combat power. The long-term aim is the creation of a networked series of three “grids”: a sensor grid, a command-and-control grid, and an engagement grid. Multidimensional manoeuvre constitutes the ADF’s Future Warfighting Concept, and is facilitated by the fusion of network-centric warfare and effects-based operations. It is additionally seen as the key enabler in the creation of a “seamless force”.

Several major theorists provide the main intellectual influences on Australian military transformation: Liddell Hart, John Boyd, John Warden and David Deptula. However, possibly more important, has been the influence of foreign military experiences. The U.S. and the Office of Force Transformation (headed by Admiral Cebrowski) has been a key influence, as has the cooperation with the Swedish Armed forces with whom Australia shares an unexpected degree of similarity in defence and strategy.

For Australia, high technology will never be a panacea for all security problems. In fact, it was not yet clear if the network-centric approach would be truly applicable to joint warfare, given its origins in air-power theory. The Australian approach to the RMA can be characterized as one of modesty, pragmatism and caution. Australia has relied on tying theory to real experimentation before expending resources. Finally, Australia must avoid the view of an “immaculate battlespace” and complete information dominance, and he ended with a quote from Clausewitz: “In war, the example is the real-life case, [and] the formula the abstraction”.

**DISCUSSION**

Wortzel asked Cohen whether he detected any operational differences in the newer “digitized” formations now serving in Iraq. Cohen responded that he observed not so much operational differences, but a willingness to be creative and to “play around” with the benefits provided by digitization. He also noted that they seem to have adapted very quickly to the demands of the counter-insurgency campaign. Cohen however cautioned against drawing any conclusions at all from the conduct of the second Gulf War, due largely because of the
“wretched” performance of the Iraqi Army.

**Bernard Loo** (IDSS) commented that Cohen’s three “tests” of an RMA ontology might not be applicable outside of the U.S. experience. He made the observation that when RMA theory is translated into the world of smaller states, the levels of asymmetry (and lopsided victory) may not be as great, and that to a large extent levels of uncertainty as to the outcomes of military confrontation still exist.

**Jason Sherman** (Defence News) asked the panel how they would “rank” countries of the region from an RMA perspective. Wortzel noted that Japan is the most advanced in Northeast Asia, with arguably the most advanced naval and air forces in the Pacific region. South Korea does not understand the RMA at all, as evidenced by their angst over the redeployments of the USFK away from the DMZ. Taiwan has achieved a good level of doctrinal understanding and technological ability, but still has very strong parochial service structures that will hamper further development. Huxley gave a rough order of merit as Australia, Singapore, Malaysia and then perhaps Thailand. He posed a further question, however, as to the extent states like Singapore and Australia understand their regional strategic circumstances and the relevance RMA systems have to the “real challenges” facing the region over the next 20 years. Evans offered a rejoinder that for Australia, it was clearly not a question of “either/or”. Australia faces two parallel strategic concerns: the ANZUS Alliance and its associated commitments and regional tensions. Furthermore, RMA technologies have a vast impact on operations conducted by the ADF in the region, Timor being an excellent example of the benefits of a networked approach to command and control and logistics particularly.

**Malcolm Brailey** (IDSS) asked Huxley what the minimum threshold for Singapore’s RMA was, and whether they really do need to follow the U.S. model. He then asked Evans to comment on the dangers of Australia becoming a provider of “niche” forces for the U.S. at their own expense. Huxley reiterated his comments regarding the limitations on Singapore’s defence budget; the implication of this was that the real benefits of the RMA would always be constrained in Singapore’s case. He pointed out that an appropriate term to describe Singapore’s RMA efforts might be one coined by Malcolm Davis, “RMA lite”. Evans responded that it is not good for any army to be SOF heavy. Balanced ground forces with true combined arms capabilities are the best structure in this region, and a “big change” can be seen in Australia over the next ten years as they move from being a light-infantry force to being a light-armoured force.

Finally, **Andrew Tan** (IDSS) asked the panel that if the key to the RMA was not just technology but also cultural change, then what kinds of organizational cultures were best suited to the RMA and if this can culture be created. Cohen responded that in his opinion there are four main cultural qualities that any good military wishing to transform itself must have. First, it must accept mistakes as normal and not punish people for experimenting. Second, it must be self-critical. Third, it must share information. Last, and underpinning all these, it must have a high regard for the truth. This cultural change requires strong leadership and “wisdom” from the top of the organization.

**Lunch Talk**

**Jimmy Khoo** (FSA, SAF) spoke on “Networks and the Knowledge Warrior”. He began by
pondering on some of the risks posed by transformation. He reminded the conference that many corporate companies only start to look at transformation when “death is at their doors”, but few are lucky in these last ditch attempts. The best time to explore and implement transformation therefore is when you are at the peak. The SAF has chosen the perspective that you should not wait until it is too late, and is exploring transformation at a time of its own choosing, in order to conduct experiments and then correctly decide its future.

Rapid developments are afoot in many military technology areas, from sensors to precision guidance to unmanned vehicles, which when “synergized” with new operational concepts and organizations allow armed forces to “jump to the next level”. The information-led RMA will allow the SAF to do things better and faster. The SAF has developed its own concept of information warfare, namely IKC2 (Integrated Knowledge Based Command and Control). IKC2 is “network enabled and knowledge based” and acts as a force multiplier that will allow the SAF to do more with less. It is conceptualized on the OODA loop warfighting cycle and aims to reach superiority across the spectrum of capabilities, hence achieving asymmetry over any opponent. In the physical domain, the SAF wants to “see first and see more”. In the cognitive domain, it wants to “understand faster and better” and to make better decisions in shorter time. Finally, the SAF wants to be able to act faster and more decisively. The possibilities are limitless and depend rather on how the SAF can creatively exploit technology and knowledge. The SAF is embarking aggressively on experimentation, and has for that purpose recently opened the SAF Centre For Military Experimentation.

The SAF believes that it is not enough, however, to focus on the hardware alone. At the heart of transformation are people, and education of defence professionals is a key part of this, as well as creating a true “learning organization”. Second is the capacity for change. All long-term resources have been safeguarded and the Future Systems Directorate will also look at what types of organizations will shape change. Third, the SAF wants to create a “marketplace” of creative concepts and ideas. There is a need for competing ideas to challenge existing ideas and issues. This process has to be internalized and to become “second nature” for the SAF.

**Panel Two**

**Operational Transformation (Part 1)**

Christopher Coker (LSE) spoke on “Biotechnology, the Military Transformation, and the Future of War”. He began by making two important points. First, the information and biotechnology revolutions are not distinct as the information age influences biology. Since the DNA was looked upon as a kind of information storage package, Darwin’s theory of “survival of the fittest” is being replaced by “evolution by negative feedback”. He also said that we are living in an age where nature is far more important than nurture. We are entering an age when man will try to alter human nature by biological means as opposed to cultural projects. Some of the nightmares in this century will be biological rather than cultural.

On the impact of biotechnology on the existential dimension of war, it will allow the reengineering, reconfiguring and reprogramming of the warrior in the future. This is not mere science fiction. There are two ways to “transform” the warrior: performative and behavioural. The performative method can
change warrior-machine interaction by making the warrior more machine friendly by fusing man and machine functionally and/or meshing man and machine physically. The U.S. military has been working on fusing the body and machine functionally, not meshing them physically. The behavioural method enhances the power of the soldier by gene manipulation and/or the use of synthetic drugs. Since conscience and guilt flow along the same neural pathway as fear, a drug that reduces fear might also reduce (and even eliminate) conscience. It would then be possible to create “natural born killers” who kill under orders without remorse or guilt.

What are the implications of these potential developments on war? There is a danger that these developments will instrumentalize war by taking out the existential element of war. Biotechnology threatens to instrumentalize human nature according to instrumental preferences and can erode the ethics of war, as it has the potential to change the way a warrior experiences life by genetic and biochemical means. The most worrying development is the rise of a warrior caste rather than a class that perceives itself to be distinct due to “technicity”—technological prowess, not by ethnicity or race. This has the potential to alter our self-understanding as members of the same species.

It is possible that in the future, the human body may become an object to be modified or redesigned at will by the state. The idea of humanity is a continuous process of “becoming” human, and the ethical challenges of biotechnology are so daunting that the prospect that we would fight “post-human” wars should prompt deep contemplation. The current RMA debate is centred on technologies with a potential to change the “character and conduct” of war; however, biotechnology has the potential to change human nature itself and by implication could change the “nature” of war itself.

Joshua Ho (IDSS) spoke of the theory and practice of effects-based operations (EBO) as “The Advent of a New Way of War”. EBO is an attempt to move away from the destruction-centric attrition-based linear approach to warfare to a new way of fighting by first identifying the outcomes of a campaign and then deriving the means to achieve those outcomes. Implicit to the EBO strategy is shaping the behaviour of the adversary to such an extent that he chooses to surrender and not fight the war. EBO thinking can be found in the writings of Sun Tzu, Clausewitz and even Liddell Hart and Douhet.

Six different concepts of EBOs can be discerned from the literature. One theory sees EBO as a planning methodology for the conduct of operations. Operation Iraqi Freedom (OIF) provides one such example, where the national strategy was integrated with the operational objectives. A second theory treats EBOs as efficient targeting. Effects-based targeting was used extensively in OIF. A third theory treats EBO as the application of all sources of national power. OIF represented a limited example of the use of this concept as alternative measures such as economic sanctions after Operation Desert Storm and diplomatic negotiations at the UNSC were attempted before resorting to the use of force. A fourth theory treats EBO as rapid dominance. OIF provided a visible example of this theory where cruise missile strikes and air bombardment were conducted on hundreds of targets in parallel with the deployment of manoeuvre forces on the ground. The fifth theory focuses on EBO as interaction and collaboration between the operational commander and other key actors in the campaign in order to deal with uncertainty in operations arising from a complex and adaptive adversary. There was little indication that this theory was applied in the ground battle during OIF. The sixth theory focuses on
EBO as network-centric warfare (NCW). This theory also considers the adversary as a complex adaptive system. Although not demonstrated during OIF, the proponents have cited the U.S. Army’s advanced warfighting experiments as proof of the efficacy of NCW.

Sensor capabilities are the first requirement in the conduct of EBO. However, there are limitations to the current sensing capabilities: the inability to detect and identify mobile missile launchers; the inability to discriminate against civilian and mobile targets (for example, trucks); and the inability to detect, identify and discriminate targets holding in foliage or within buildings. Knowledge creation and management is the next important component capability required. Just as crucial as knowledge creation and management is the need to convey information from the sensors to the knowledge systems. Another aspect is the communication backbone needed to communicate command intent. The next step after sensing the environment, deciding on the course of action to take based on the analysis of adversary information and creating knowledge through computer models is to create precise effects through physical action with “effectors”—precision guided munitions, manoeuvre forces, Special Forces and information operations.

EBOs hold promise for the future of warfare as their successful execution can allow militaries to economize on the employment of force and reduce the number of troops needed on the ground during the hot war phase. This is not going to be easy, as it requires pervasive and persistent sensors, the ability to manage the knowledge created of both expected enemy courses of action and own responses to achieve the desired strategic outcomes, and the ability to affect those outcomes through precise application of kinetic and non-kinetic means on the targets of choice. If one does not possess the full spectrum of such capabilities, the conduct of EBO is likely to be limited. Finally, it requires a human in the loop to know the adversary and self as well as to dictate the pace of war.

Manjeet Pardesi (IDSS), in his paper, “UAVs/UCAVs – Missions, Challenges, and Strategic Implications”, studied the impact of UAVs/UCAVs on manned aircraft. To answer this question, three air operations were studied: ISR, Suppression of Enemy Air Defences (SEAD) and air superiority mission. UAVs are important because they provide the military with a radically new platform and are also integral to the network-centric warfare concept.

UAVs have been traditionally used as Intelligence, Surveillance and Reconnaissance (ISR) assets and their ability to do so has been boosted by the advances in sensor and modern info-communication technologies. UAVs compare favourably with manned ISR platforms (AWACS and JSTARS) as well as satellites. AWACS and JSTARS aircraft have limited manoeuvrability and self-defence; moreover, their loss is likely to bring severe political repercussions. Manned missions provide high-resolution data and are extremely flexible at adapting to multiple mission scenarios. However, their major limitation is their loiter time. UAVs, on the other hand, are capable of long loiter times, but this makes a UAV a slow platform as there is a direct trade-off between loiter time and speed. This makes the UAV a highly vulnerable platform. When compared to satellites, UAVs have two major advantages: they can fly closer to the target and their flight path can be changed at will. However, unlike satellites, UAVs lack situational awareness (SA). Moreover, UAVs require a great deal of bandwidth and this puts serious limitations on their use. The ISR system of the future is likely to be space-based, providing wide-area surveillance at a low level of resolution, but looking for cues that require more detailed monitoring, which would be covered by manned and unmanned vehicles.

The successful strike missions performed by the armed Predator UAV in the global War against Terrorism has opened up a new debate on their role for SEAD missions. With a variety of new enemy tactics such as the “shoot and scoot” tactic employed by the Serbians in the Kosovo War together with “anti-access threat” systems like SAMs, cruise missiles and theatre ballistic missiles, this has prompted the U.S. to consider using armed UAVs and UCAVs for SEAD missions. However, mobile SAM sites are difficult to detect, and the higher speed of newer missiles makes them more manoeuvrable thereby reducing the “escape zone” for friendly UAVs. Unmanned jet engine G-force limitations do not significantly exceed those of the human pilot, and do not substantially increase their defensive capability against missiles. Furthermore, since the final decision to “shoot/kill” a target would rest on the human
in the loop, this would exacerbate bandwidth requirements and this communication delay might prove fatal in a high threat environment. Due to these limitations, UCAVs are likely to play a role in “pre-emptive” SEAD missions and not “reactive” SEAD missions, and that they would be used together with manned platforms and satellites for communications purposes).

After a Predator launched an unsuccessful air-to-air Stinger missile in March 2003 at an Iraqi MiG, speculation about their role in counter-air operations has grown. However, given that there are limitations along the same lines as those for SEAD missions, they might at best be used to provide active sensors against highly lethal anti-aircraft weapons in support of manned aircraft, not to replace them. Furthermore UCAVs will not likely have their own air-to-air weapons as they would be carrying a modified Sidewinder missile and/or AMRAAM that already exist.

The U.S. is not likely to have more than 400 UAVs/UCAVs by the end of this decade but is planning to purchase close to 3,000 JSFs and more than 300 F-22s. Moreover, the investment made by the U.S. in UAV/UCAV projects is miniscule compared to the investments made in the F-22 and the JSF programme. Finally a UAV system is not necessarily much cheaper than these advanced manned tactical aircraft. Their high cost makes them attritable, not expendable. The UAV is thus not a disruptive technology as there would always be missions that would require the manned aircraft. With the increased U.S. emphasis on pre-emption, this makes the use of UAVs (armed with chemical or biological weapons) a very serious threat.

**Discussion**

Kumar Ramakrishna (IDSS) referred to the 1980 Craig Thomas novel *Firefox*, in which the pilot was able to control the aircraft using his thought processes. Is Thomas’ vision within reach? Coker replied by saying that McDonnell-Douglas had initiated a programme in 1986 called the “Pilot Associate Project” that treated the pilot as just another electronic subsystem in the aircraft and was designed so that his controllers can switch him off if need be or enhance his performance. He added that in the future the computer could remove the human pilot out of the loop by monitoring fear through sweat and excessive palpitation. According to Coker this would remove the distinction between a manned and an unmanned aircraft by making the pilot a “surplus”.

David Betz (King’s College, London) wondered if the acquisition of machine-like attributes by the human warrior coupled with the parallel process of acquisition of human-like attributes by machines will meet somewhere in the middle along the lines of a “cyborg”. He then commented that we should perhaps channel our funding to expendable and cheap robots with some level of human
discernment. Coker replied saying that the main point that needs to be understood about the biotechnology age is that we would not be drawing the distinction between man and machine. Betz also enquired about the high costs of UAVs, in contrast to the promises of cheap UAV technologies found in early RMA debates. Pardesi replied saying that their costs were being escalated by the expensive sensor technology together with engine technology which needed to cater for long loiter time together with a high acceleration rate.

Wortzel commented that conscience-less murder has existed without the benefit of biotechnology; one need only to look at the Nazis in World War II, ethnic cleansing in Rwanda, Kosovo, Uganda, and the radical Islamists of today. These acts need to be explained. Coker responded by saying that the whole question of nature or nurture in explaining mass murder is heavily debated. Most evolutionary psychologists are working on explaining the nature of violence and not necessarily that of the nature of war or violence in war. These studies show that murderers are impulsive, hyperactive, not easily disciplined, suffer from attention deficit disorders or low intelligence. Paramilitary organizations (as opposed to the military) frequently recruit people who who fit this profile, and many of the atrocities perpetrated during war, including the Nazis in World War II, were perpetrated by paramilitary organizations. Evolutionary psychologists have shown that the gene pool for violence of a collective organized nature becomes smaller as a species progresses, simply because the strategy for killing for a purpose becomes less attractive. The argument put forward by proponents of genetic engineering for the creation of conscience-less warriors is exactly this, that is, genes require manipulation as the gene pool for collective organized violence is shrinking.

Coker then went on to talk about the ethics of robotics, that is, ethics governing autonomous weapons systems that can not only acquire targets independently but also kill independently on the basis of their judgment. The U.S. Congress passed a law in 1986 forbidding the U.S. military to build autonomous weapons systems that can kill on their own judgment. Crude forms of such systems are only 10 to 15 years away. This is extremely important ethically as it raises the Isaac Asimov principle of robotics that robots should never be armed and should never be able to take human lives. The point about biotechnology is not to change human nature but to make us better at things we have been doing for the last few thousand years, including war. Biotechnology is giving us a chance to conduct war more effectively. However, by trying to change the nature of human beings, we risk diminishing war rather than improving it.

Wortzel commented on the limits of EBOs by saying that (hypothetically) he could see George Tenet talking to George Bush and saying that “one bomb on one restaurant in Baghdad and we are not going to have to fight a war”, and Tommy Franks in the U.S. Army saying that “we are not ready for 30 days” and some “brilliant guy” saying that EBOs will make the Iraq War unnecessary, but they all squandered their chances. Ho replied by saying that the purpose of his paper was to demystify EBOs as they had stimulated interest after the Iraq War. EBOs can be seen at three levels. At the strategic level, EBO is about the national decision-making process; at the operational level, EBO is about how to win the war better; and at the tactical level, EBO attempts to lift the fog of war. On
UAVs, Wortzel suggested that one could look into bandwidth issues by creating models to turn certain functions on and off at specific times to circumvent bandwidth limitations imposed by technology. Pardesi agreed that this made a good research topic while adding that the purpose of his research was to study the air missions that were likely to be transformed with the introduction of UAVs.

Cohen advised that when thinking about the RMA, one should think about how modern technology would change the nature of certain phenomena, for example, the fog of war. There has always been some uncertainty about what combatants on a battlefield know. However, modern technology, while removing some of these uncertainties, can create new ones, as knowledge would depend upon inputs that could be erroneous or interpreted incorrectly. In effect, modern technology would change the “nature” of that fog.

Evans commented on the difference between the existential or the primal force on the one hand, versus the detached professional on the other. Military professionals have not come to grips with the phenomenon of the Madmax warrior, who mixes barbarism with the tools of modernity. This issue is often not discussed because it involves the basic principles, that is, the nature of violence and the nature of human beings.

Khoo expressed optimism in the ability of technology to lift the fog of war provided one knew how to best use such technology. Technology permits not only the networking of systems but also the networking of people who can then better understand a given situation in a battle and provide better solutions. What if two networked opponents go against each other? The answer is that in such a situation, the more manoeuvrable opponent with a faster decision-making cycle would end up outdoing the less manoeuvrable one.

**Panel Three**

**Operational Transformation (Part 2)**

David Betz, (King’s College, London) spoke on “The RMA and Military Operations Other than War”. The basic question is if the concept of RMA is relevant to Military Operations Other than War (MOOTW). In part, the answer to this question lies in how one defines these two concepts. MOOTW includes two categories of operations. The first category involves operations that deter wars and resolve conflicts, and includes operations like peace enforcement, peacekeeping, counter-terrorism and counter-insurgency. The second category involves operations that promote peace and support civil authorities, and includes operations like humanitarian assistance, counter-drug and civil support. Without getting into the academic debate on the definition of the RMA, the RMA has been described by various catch phrases like Effects-based Operations, Rapid Decisive Operations and Network-centric Warfare. Central to all these themes was a formula to “fight light and fight fast”.

The conceptual difficulty with understanding the current RMA is the elusiveness of victory. Fighting and winning large-scale wars in high intensity combat is a relatively small part of what armed forces do today. Going down the spectrum of conflict, the case for the RMA becomes less convincing. What could be constituted (if at all) as the moment of victory in Operation Iraqi Freedom (OIF)? The things armed forces find themselves doing in Iraq today (after April 2003) are not the tasks for which they are optimized. While the RMA replaces manpower with a weapon effect, the application of technology to MOOTW is not a simple task, as it requires “boots on the ground”.

There are fundamental differences between war and MOOTW. Unlike war, the objectives of an MOOTW are seldom clear. Compared to wars, which have an open fire policy, strict rules of engagement govern MOOTW. Moreover, unlike a war, the military may not necessarily have a lead role in MOOTW. Last but not the least, while in a war, victory is self-evident; in an MOOTW, victory is equivocal. There is no RMA in MOOTW and given that MOOTW is perceived to be the future of war, it calls into question the relevance of the RMA.

Malcolm Brailey (IDSS) spoke on the role of Special Operations Forces and the RMA. In the latter half of the 20th century, it has
become standard practice among most military organizations to include elite combat units within their organizational structure. Initially special operations forces (SOF) were meant to support the aims of conventional strategy and the activities of conventional military forces. However, over the last ten years or so, they have developed into an indispensable component of modern armed forces outside of and separate to conventional structures and doctrine. SOF are displaying greater utility across the spectrum of conflict and are shaping the strategy and conduct of operations in both character and intent.

SOF have been recently required to conduct operations on a global scale, across regions within a “strategic culture of pre-emptive action” against two key threats: international terrorism and the proliferation of WMD. Coalition and partner nations have participated and cooperated with the U.S. on such tasks. Counter-terrorism is also a mission for the SOF within the domestic environment. SOF operations have come to be seen as a defining part of any strategy for homeland security. SOF are increasingly performing a wide variety of missions outside of the “warfighting rubric”, like the counter-drug missions in Central and South America, and the location and capture of international war criminals. He mentioned that one of the most interesting and challenging missions performed by SOF since the early years of the Vietnam War was that of “unconventional war” (UW). UW in Afghanistan was so successful that the “SOF-centric” campaign has been described as a possible future model for the conduct of warfare and applicable across a wide range of future conflict types.

SOF in many countries are transforming themselves into truly “joint” organizations. The U.S. has created a unified command, the United States Special Operations Command (USSOCOM), with service-like responsibilities to oversee all SOF, reporting directly to the Secretary of Defense for all budget, equipment, training and doctrinal issues. The most striking example of the joint nature of the SOF and its role was demonstrated in the conduct of OIF in early 2003 when some 10,000 SOF were especially deployed into Iraq for combat purposes. The conduct of joint operations has also led to concrete technical innovations such as the integration of airpower with SOF on the ground. Highlighting the growing importance of technology, SOF are extensively using the Blue-Force tracking devices to increase their own situational awareness and to reduce the possibilities of fratricide by air delivered weapons. SOF are embracing the concept of NCW. Finally, SOF represent a harbinger for change in the way states regard the conduct of war, and they offer an increasingly viable, effective and legitimate alternative to traditional approaches to the use of force by states.

**DISCUSSION**

**John Ciorciari** (IDSS) enquired to what extent R&D was going into communications not between/within the military, but between the military and local population. He stated that there were different kinds of technologies to facilitate cooperation between soldiers on the ground and the local population, after the soldiers had attained an occupation stance. Betz mentioned that if the soldiers can be connected to a central site with translators then MOOTW operations can be simplified by calling this site up from the ground to be able to better understand the locals. Technology is important, but there is no “killer” technology for MOOTW. There are cases (like better body armour) where better technology is a definite plus. But the example of the British in southern Iraq, where their troops removed their headgear to be able to better communicate with the local community and in the process made themselves more vulnerable, is instructive. Technology can work at cross-purposes in combat and contact. There is no technology that has qualitatively transformed MOOTW (as opposed to high-intensity warfare). Brailey replied saying that some technologies could be extremely useful in a peacekeeping type operations, for example, in a riot-like situation if images of the protagonists could be transferred to a central repository and cross-checked to establish their identities. The most transformative technology in a peacekeeping mission is night vision.

Cohen raised an issue with the term MOOTW. He noted that on an average at least one U.S. soldier was killed every day in Iraq, and hence the situation on the ground was an actual war as opposed to a MOOTW. He mentioned that the
outcome of the conventional part of the wars in Iraq and Yugoslavia were over-determined since they were very weak states (economically and militarily). The real question was at what cost (of man and material) was the U.S. willing to fight to win the non-conventional part of the war in Iraq. He also noted that victory is very rarely self-evident in war. He wondered if the outcome of the first Gulf War could be declared a victory for the U.S. and its coalition partners. He mentioned that some of the militaries good at harnessing the RMA somehow ended up being good at fighting irregular wars. For example, the British had been able to innovate and got better at fighting irregular wars. Betz replied saying that conceptually speaking, he had made the same point as Cohen. MOOTW is indeed a modern war since it is what armies do these days, but there are no technological solutions to the problems faced by MOOTW.

**Panel Four**

**Limits to Transformation**

*Thomas Mahnken* (Johns Hopkins University) spoke of U.S. officer attitudes towards the RMA, based on a project done with the U.S. Naval War College. Essentially, the project sought to find how the officer corps felt about military transformation in the U.S. military. There are four reasons why officers’ attitudes matter. Firstly, officers will be the ultimate practitioners of the new way of war. Secondly, the true innovators will come from their ranks. Thirdly, as future leaders, they will set the command climate towards change. Finally, they are the nation’s recognized experts on military affairs.

The rationale for transformation is both threat and opportunity driven. The number of officers who believe radical change is needed increased from 47% in 2000 to 57% in 2002. A total of 69% of officers in 2002 feel that transformation is needed because of perceived projected threats compared with 9% in 2000. There has been an increase—from 63% in 2000 to 70% in 2002—in those who believe new technology, operational concepts and organizations will make it easier for the U.S. to use force. Moreover, 8 out of 10 officers believe, as a result, it will be easier for the U.S. to achieve decisive battlefield victories. A total of 70% of officers surveyed in 2002 feel that new technology, operational concepts and organizations will offer the U.S. the ability to engage in high-intensity operations with substantially reduced risk of casualties. In short, there is significant support for the benefits of transformation.

In terms of organization, there is significant support for change. Six out of 10 believe modern conditions require significant changes to traditional service roles and missions. More U.S. Army officers than U.S. Marine officers believe that the need to maintain separate services will diminish. However, there is not much support for the diminished role of each respective service.

On the question of whether the respective service tends to reward innovators, the majority were uncertain. The Marines agreed that most of their service rewarded innovators. When asked if fear of failure inhibits innovation in their branch of service, more than half said yes. Army officers see it as the greatest problem with Marine officers seeing it as the least of problems. Senior officers see it as the greatest problem while junior officers less so. About half of the officers said that their branch of service has a culture that is open to self-criticism. Again there were marked services differences, with the Marines agreeing most that their service is open to self criticism while the Army the least so.
When asked if officers believe that the U.S. military is on the right path, 6 in 10 officers believed in radical change. When asked if the U.S. military is on the right path of change, the answer was uncertainty. Moreover, officers were unsure if they had seen evidence of transformation. Eight out of 10 believe that real transformation will require major changes to personnel management, but 58% was uncertain if they had seen major changes to personnel management in their service. More than 8 out of 10 agree that real transformation will require changes to military training and education, but 65% was uncertain if they had seen such changes. U.S. officers clearly favoured jointness and 65% expect to see more centralization in future U.S. military operations, but the majority did not necessarily welcome centralization. Eight out of 10 officers feel they should spend time thinking about their profession and the overall impact of advanced technology on joint warfare but again the majority were uncertain if they had the time to do so.

The main observation was that there was latent support for transformation, driven by perception of threat and benefits, with some support for organization change, within the context of current services and specialties. Most officers do not appear to have a lot of experience with innovation and feel that some organizational pathology mitigates the possibility for innovation. Service affiliation is the most important determinant of officer attitudes, with the Army becoming more accepting of transformation since 2000. Service/specialities show preference as anticipated, but service appears to be a more important determinant of attitude than speciality or rank. Senior officers seem to be more open to change—at more than twice in scale—than junior officers. According to evidence related to transformation, in more than two times the number of cases, senior officers were supportive compared to junior officers.

Richard Bitzinger (APCSS) defined an RMA as a disruptive shift in the concept and conduct of warfare. The elements of the current RMA are: greater battlefield awareness/connectivity and automation; improving range, accuracy, speed and penetration; new sensors and seekers, new information technology, and also new materials and construction techniques; and finally new platforms for ISR, navigation and target acquisition and systems integration skills.

Transformation is more than just modernization. Many Asia-Pacific countries are acquiring previously unavailable high technology systems, such as submarines, PGMs, UAVs, and air-to-air refuelling. Transformation is not only about acquiring new weapon systems that accrue asymmetric advantage, it also means synergy as well as networking of existing systems.

Elements or ingredients to transformation include vision, institutional and leadership, financial resources, organizational space, experimentation, transformation of technological and industrial bases. The impediments to transformation are cultural/institutional, resources, impact of legacy system, the role and impact of industry both in the defence and commercial field.

One of the biggest impediments is the lack of vision or the inability/reluctance to conceptualize and implement transformation. Asia-Pacific militaries are often hierarchical, bureaucratic and risk averse. Most are resistant to the “levelling” nature of the IT-based RMA. Moreover, change is dangerous to SOPs and careers. Besides, the difficulty in accepting new
ideas is compounded by “old boys networks” in defence decision making, which reinforces conservative thinking. Moreover, there are few linkages on the part of the military to centres of innovation outside the military. The case study in Taiwan is a case in point. In addition, defence ministries prefer traditional platforms to transformational systems, because they are more prestigious.

Second is the issue of organizational and institutional resistances to change. Studies by Barry Posen have indicated that large institutions are resistant to change, especially militaries. What then are the factors that affect change? They are direct shocks such as loss in war or indirect shocks and even then there is considerable cognitive dissonance to overcome.

Third, transformation is not cheap. Very often, transformation requires new and expensive systems. Many Asia-Pacific countries are increasing defence spending, but it may not be enough to fund both legacy and transformational systems, or may not be buying enough transformational systems in sufficient quantities. This is a problem of resource limitations, in other words.

A fourth problem is the effects of legacy systems, which naturally exacerbates resource constraints and enforces institutional bias in favour of legacy systems over transformational systems. An example of legacy systems is manned aerial vehicles, which most air forces still prefer to UAVs, and land forces with large armoured columns as opposed to light mobile forces.

Inhibitions can also be found in the defence technology and industrial base. In many Asia-Pacific countries, their national defence and technology base is unable to contribute significantly to transformation. This is because of limited R & D capabilities, in particular, finding difficulties to adapt civilian technologies for military purposes. Moreover, many lack system integration skills and the ability to knit together disparate systems. Interestingly, there are few links to domestic commercial IT sectors. The inhibitor in the commercial sector is also hardly surprising. For many commercial sectors, especially IT sector, defence work is unprofitable, too much work and with limited dual application opportunities. Moreover, domestic “high-tech” capabilities were sometimes overstated. For example, in China and Taiwan, there is basically very much low end OEM production. The same problem applies to India, where low-end work is carried out and not much beyond software development.
DISCUSSION

Wortzel asked Mahnken if there was a perception that the U.S. Secretary of Defense did not trust the officer corps and was seeking innovative views from the defence science sector. Mahnken argued the officer corps is still important. From the top down perspective, it is important to know which part of the officer corps is receptive to the Defense Secretary’s ideas. From the bottom up perspective, interesting ideas arise from the officer corps.

A participant asked about Mahnken’s observations, namely whether the Marine Corps is ahead of its time in terms of what they are doing. Mahnken said this is true. The Marine culture has all the positive attributes, such as being self-critical and also the not-so-positive side, which is attachment to the status quo. In a way, the U.S. Marine Corp sees other services playing catch-up in learning the way warfare is becoming more integrated.

Wayne Turnbull (U.S. Embassy in Vietnam) asked if there have been similar studies done for the Non-Commissioned Officers and if they plan to do so. Mahnken replied that none has been done, but one may be considered in the future. The reason why the Officer Corps was chosen was because the officers are in a position to implement changes in a big way in the future.

Loo wondered if, in the case of Taiwan, since there are more entrepreneurs (and hence less risk averse), there is a disjuncture with regards to the military. Bitzinger replied that most militaries are a state unto themselves. While in Taiwan, there are many small and medium enterprises (SMEs) with a culture for innovation, these are not large state-owned enterprises. Moreover, the impact of these SMEs on military transformation is limited.

Coker commented that innovation can sometimes be dangerous and that there are fears that being too innovative may not necessarily be a good thing. Mahnken replied that the question is about what innovation can do. He added that sometimes there would be aversion to innovation because of uncertainty. On one hand, militaries tend to innovate, but being a large organization, there is a tendency not to innovate because it can be disruptive. Bitzinger agreed that innovation can be dangerous and it can be difficult to find a middle ground regarding innovation. Evans remarked that if any change is going to occur in an organization, there needs to be a convergence of two forces—the radicals from the bottom and the conservatives at the top must embrace change together. Only then can change take place.

Ho asked if there were any incentives to encourage officers to think about transformation and develop a positive attitude toward it. Mahnken replied that when the U.S. Army argued for transformation in 2000, many were sceptical. By 2002, the U.S. Army has gotten on the bandwagon. This was because most infantry officers see it as beneficial and perceive their role in the army as important. Thus, it is important to obtain support after identifying the path ahead and to explain it individually how these officers would fit into the new system.

Jeffrey Chen (IDSS) asked Mahnken what the main driving force for transformation is. Is it internally driven or because of external stimuli, or both? Also, would the U.S. military transform so significantly that adversaries no longer dare challenge the U.S.? Mahnken remarked that it was hard to pin down whether transformation was internally driven or a response to external circumstances. He opined that the military changes because of operational and strategic challenges. As for the benefits of transformation, it is unlikely that there are “absolute benefits” as adversaries tend to be adaptive. While U.S. doctrine seeks not only to deter but also to dissuade, the U.S. has had limited success as no one would challenge the U.S. Navy or Air force, but some countries or non-state actors have been responding in different measures.

Chen asked if the examples of successful U.S. defence companies can be replicated and, if so, what the key ingredients to successful replication were. Bitzinger replied that the arms industry has a high entry cost and there is little advantage to latecomers. In the case of the U.S., there is a large domestic market, even after industry consolidation, and there is still much competition and hence innovation. Moreover, the costs of transformational weapons systems are high, making it hard for many companies to compete effectively. Only government or state-owned defence companies can effectively compete but often, they do not respond well. Thus, the dynamics of the international arms
industry favour those larger U.S. companies. Smaller defence contractors can only benefit as junior partners.

Loo commented that one reason why many Asia-Pacific militaries go with traditional platforms such as aircraft and destroyers over networking of computers is that it is a more tangible manifestation of power, directed both at the targeted adversary, as well as for domestic consumption. Bitzinger agreed with Loo that in many instances, it was as much psychological reassurances as well as deterrence in purchasing platforms. Loo then asked Mahnken if he could explain why there was greater support for transformation by senior U.S. officers as compared with junior officers. Mahnken offered two explanations. One was that junior officers tended to be more parochial because, as junior officers, they are focused on learning the trade and getting promoted within the system. Secondly, junior officers have not been exposed to other services and know less of change in their lifetime compared with senior officers who have experienced change throughout their military careers.

CONCLUSION
THE ROAD AHEAD FOR MILITARY TRANSFORMATION

What is the future research agenda for the IDSS RMA Programme? While this first conference dealt with the “high theory” of the RMA, other issues will need to be examined in the future.

One key issue is organization change. Evans and Mahnken agreed that while technology changes are important, they are constantly occurring. In essence, it is the human and doctrinal issues that are important. While technology is always there, it is how humans use technology that is important. Organizational and cultural dimensions are very important, but it can sometimes be difficult to examine. A possible approach would be to examine the military transformation efforts of other countries, through a series of case studies on Australia, Sweden and Israel, examples that may have useful lessons for Singapore.

A second issue that needs further examination is the motivation behind different countries adopting RMA-type transformations. What is also not much examined is the implication of an RMA-transformed military on the strategic environment of the state. In the Asia-Pacific, an RMA-transformed military is likely to be in a minority—a situation of strategic asymmetry will therefore exist between the RMA-transformed military and its putative adversaries. What implications are there for future inter-state conflict, and will force-on-force encounters become a thing of the past as a result of this asymmetry?

Coker raised several issues needing closer examination. One was the ethics of RMA, such as ethics involved in the use of Unmanned Aerial
Vehicles. Secondly, it is important to consider the relationship of soldiers to their profession, such as the idea and concept of sacrifice and what it means to be a warrior in the age of RMA. Finally, the issue of non-lethal weapons, as this is considered neither hard nor soft power.

Brailey noted that RMA-related issues require attention especially since these issues will likely provoke even more questions. Chen noted other aspects and technologies that can have more immediate implications, say, over the next two decades, will also need further study.

What is clear from this conference is that the RMA and the related issue of defence transformation are not unproblematic phenomena. In this respect, while this conference sought to answer the question of what the RMA means for a small state, it has also raised more questions that will evidently need further examination.
## Conference Programme and Agenda

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### Lunch Speaker

- BG Jimmy Khoo
- FSA
- Networks and the Knowledge Warrior

### Panel Two Topics

- Bio-technology and the RMA
- Effects-Based Operations
- UAVs

### Panel Three Topics

- The RMA and Operations Other Than War
- Special Forces
Thursday
26 February 2004

0915–1030  **Panel Four**
Limits to Transformation

Chairperson:
Dr. Bernard Loo

Panelists:
Professor Thomas Mahnken
*Officer Attitudes Toward the RMA*

Dr. Richard Bitzinger
*Impediments to Military Transformation*

1030–1045  Morning Tea

1045–1200  **Conclusion**
The Road Ahead for Military Transformation

Chairperson:
Dr. Bernard Loo

Panelists:
All Participants

1200–1215  **Closing Remarks**
Dr. Bernard Loo

1215 onwards  Lunch
Conference Ends/Departure
The Institute of Defence and Strategic Studies (IDSS) was established in July 1996 as an autonomous research institute within the Nanyang Technological University. Its objectives are to:

- conduct research on security, strategic and international issues;
- provide general and graduate education in strategic studies, defence management and defence technology; and
- promote joint and exchange programs with similar regional institutions; organize seminars/conferences on topics salient to the strategic and policy communities of the Asia-Pacific.