



Professional Military Education and Simulation

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Introduction

Let me give you my bottom-line up front: **simulation is not about technology – it's about culture.**

Simulation is about being willing to be confronted directly by your strengths but, more importantly, also your weaknesses. It is about learning how to deal with complexity, risk, uncertainty, chaos and ambiguity. In summary:

- simulation prepares people for operating in complex systems
- simulation allows learners to fail safely and quickly
- simulation provides objective adjudication
- simulation builds behaviours and culture
- simulation builds capability, and
- simulation also saves resources.

Let me start by going back in time. Britain in the 19th century underwent a major technological change we now call the 'Industrial Revolution'. While many people focus on the changes that occurred in agriculture, manufacturing, mining and transportation, it was the social and cultural changes that made the biggest differences. People left the agricultural system and moved into an urbanised factory workforce; standards of living rose; traditional family structures changed; the population grew; cities developed; the landscape of politics changed; and the working classes developed organisation and power.

So while the Industrial Revolution was powered by technology, its real effect was the way society and culture changed, with technology simply the enabler. In a way, this effect might best be seen as a spiral; technological changes lead to economic and social changes; in turn, these open doors for further change. Perhaps the internet is a similar example, with the changes it is bringing about and the impact of social media.

I introduce this notion as a parallel for Defence. While I believe that Defence is one of the leaders in the use of simulation across Australia, I don't believe it has kept pace with best practice when compared with the militaries of other leading nations, particularly the US. This is because Defence has traditionally seen simulation as technology that supports training.

While we have always used scenario-based planning, and have exercised against simulated threats, we have not consciously understood simulation from a sophisticated and integrated perspective. This has led to a relatively narrow and limited focus that fails to fully exploit the power of simulation and the opportunities it offers. It has also meant that simulation has not been integrated into professional military education (PME) in the way it should.

We need to have a broader understanding of the power of simulation, and its contribution to both capability and culture, to harness its potential. In particular, simulation provides objective adjudication to prescribed scenarios so that we can learn to deal with complexity, and remove prejudice and pre-conceptions from our policy and operational decision making. It has the potential to change the way we think about what we do that is informed by evidence and experience. In other words, it has the potential to change our culture.

To address these issues, I will firstly offer my perspectives of simulation as I have seen it practised in the military. It will, of necessity, be heavily land-focused. I will then raise some key issues we need to address if we are to better integrate simulation into PME. I will then outline the potential of simulation within Defence and make some comments about the direction I see it taking in PME over the next few years.

Early simulation in Defence

My early experience of simulation was very limited. However, in 1980, I went on exchange to the UK and had the opportunity to participate in their training package for deployment to Northern Ireland. We were exposed to urban patrolling ranges, with live-fire activities using sub-calibre rounds; fire discipline ranges, with realistic targeting in an urban environment; and 'crack and thump' ranges to teach fire location techniques. On top of that, extensive use was made of video recording for 'after action reviews'. I was staggered by its sophistication and effectiveness. It established in my mind a standard I did not find in the Australian Army.

At this time in Australia, we were engaged in a very basic form of simulation that focused on equipment, not decisions. Exercises were scripted and closely controlled. Each had a 'main events list' that described each action in a pre-determined sequence. They were 'controlled' exercises, where random outcomes and chaos were eliminated. Adjudication was the purview of learned 'Directing Staff', who wore white arm bands and conferred casualties in an arbitrary way. They epitomised the military adage that 'tactics is the opinion of the senior officer present'.

Fast-forward to the later 1980s and the establishment of the Army Battle Simulation Group. This was the time when the Australian Army saw the introduction of computer wargaming integrated into tactics courses and some training. It had serious potential to change the way we thought about fighting. Unfortunately, it didn't catch on.

Simulation and wargaming of this sort were not uniformly welcomed within Army. The manoeuvre and combat support corps were advocates and early adopters of simulation, as it demonstrated the value of the integration of combat power, fires, and manoeuvre—and, therefore, the value of their systems. However, simulation and wargaming were not well received by other combat corps, who started taking considerable 'casualties', contrary to the perceptions they held of their operational capabilities. The simulations just weren't providing the tactical outcomes they were seeking.

There were often heated arguments when both direct and indirect fires led to higher casualties than expected. Also the 'manoeuvrists' would simply bypass fixed positions and not oblige defenders by offering to fight on ground the 'Blue Force' had decided was important. In addition, the elements of chaos and lack of control over the 'Red Force' did not lead to many wins for Blue. For many, simulation did not provide the answers they wanted. So why would they become its champions?

Yet good tactics, effective grouping and synchronisation of combat, combat support and combat service support—combined with manoeuvre and fires—proved the importance of combat power and manoeuvre in battle. In other words, bad plans, bad tactics and weak capabilities were exposed by effective combat simulation.

The steady rise of computing power, and the associated increase in the proliferation of computers in the 1990s, led to increasing power and accessibility of simulation. While simulation began taking off overseas at an incredible rate, particularly in America, the sad truth is that this was not matched by an increase here for either training or exercising. For Army, there was continued emphasis on field deployments to replicate operational conditions, rather than targeted and focused exercising of the system components. While the Navy and the Air Force were making some use of simulation, it was mainly in the form of procedural simulators for flying or, at most, bridge simulation for watch-keepers.

Further overseas experience

I was fortunate during this period again to be on exchange, commanding a tank squadron in the British Army. I had the good fortune to be involved in the first tactical exercises using 'Direct Fire Weapons Effects Systems' and 'Area Weapons Effect Systems and Tactical Engagement Simulation Systems'. These were truly game changers. For the first time, we had effective and genuine combat adjudication.

Specifically, if you took up a poor fire position or moved using exposed ground, you were shot and your tank disabled. There was no debate, no justification, just simple resolution. These simulators adjudicated the battle in a way we had not seen, short of the battlefield itself. It was a truly revolutionary experience. Simulation had again demonstrated beyond doubt its benefits in the development and testing of tactics, techniques and procedures.

At the same time, we were also using GPS to identify exact locations and actions throughout the battlespace. This enabled us to conduct effective debriefs and after-action reviews. We knew who fired, where they fired from, and where the targets were. We also knew how they got there. Both literally and metaphorically, there was nowhere to run and nowhere to hide. Good tactics and fieldcraft won; bad tactics and poor fieldcraft lost. Training was becoming very realistic and myths were being shattered.

In 1994, I had the opportunity to take my British tank squadron to the US to convert from Chieftan tanks to the M1 Abrams. We went to the 25th Mechanised Infantry Division in Georgia and exchanged with 4-64 Armor Battalion (which had fought in the First Gulf War and would also be the vanguard of the US advance into Iraq and Baghdad in 2003). Tank conversion focused on 'UCOFT' (Unit Conduct of Fire Trainer) and tactical training focused on the use of 'SIMNET', a wide area network for real-time simulation of tanks, helicopters and aircraft in a virtual battlefield.

We did everything needed to qualify on the vehicles in the various simulators and we achieved standards higher than we would have reached using traditional techniques. On deploying to the field in real tanks, the soldiers qualified on range firing to the level of their US counterparts and performed to a very high tactical standard. In a resource sense, we trained using simulation and we confirmed that training with live fire and manoeuvre. So what did I learn from this?

The first lesson was that simulation isn't just about resources. While you do save resources, and your training is much more focused and logistically simpler, it is also better. There was also an overwhelming improvement in capability and assessment of performance offered to commanders at all levels. Commanders were better able to understand what was happening on the ground, with total situational awareness in a simulated environment. Their feedback was accurate and effective and this enhanced training outcomes.

The third lesson was the vast increase in performance provided by visualisation of the battlefield, especially through SIMNET. People now had an opportunity to 'see' the battlefield in a way that normal field training had denied them. This led to increased performance across operating systems, as each component was able to see clearly what the other was doing and how they worked together. The fourth lesson is based on the adage that you must 'use correct tools correctly'. The lesson for simulation was that you need to identify what you want to do, and use the correct simulation medium to deliver that outcome. For example:

- Crew and procedural trainers are great for crew training and some low-end tactical training but are not good for higher-level activities.
- Collective simulation, such as SIMNET, which links crew drills and tactical movement, is useful for tactical manoeuvre and synchronisation of combat systems but not especially good at exercising higher headquarters.
- Wargaming is effective to simulate a complex environment for headquarters, especially by demonstrating the unpredictability of events. It also builds awareness of the challenges of decision making in a volatile world where 'cause and effect' may not be readily identified.
- And finally, you get the best results from a sophisticated approach that combines the benefits of each tool to deliver effective training and learning outcomes.²

There is an excellent saying that 'you train for certainty and educate for uncertainty'. Perhaps the simulation version of this is that you use procedural simulation for certainty (for training) and wargaming for uncertainty (for education). The bottom line is that you need to use the correct tool for the job—not just any tool for every job.

The final lesson, and perhaps the most impressive part of this experience, was not just the simulation capability, which was far beyond anything even being imagined in Australia at the time. It was the fact that simulation was being done at unit level, across the entire military force. It was not a technology demonstrator but part of the fabric of capability that was genuinely increasing the performance of all components of the force. It is only when simulation is part of the fabric of training and education at all levels that it really starts to change culture.

Back in Australia

On return to Australia, I saw the parlous condition of simulation and the debate in Australia. We were talking but we were not doing. As a Commanding Officer in the late 1990s, I wasn't seeing any simulation support at unit level, so I established a simulation centre in the 1st Armoured Regiment. I acquired some cast-off computers, loaded them with US-derived software, and opened the Hannaford Simulation Centre in 1997. I was trying to apply the lessons I had learned overseas to employ simulation on a daily basis at unit level. It heartened me to see soldiers going to the centre during their lunch breaks and after work to use the simulations; they wanted this capability and expected simulation to be available.

However, as a military—especially Army—we still did not 'get' simulation. Indeed, we still did not want simulation. And if we did, we made a poor commitment to providing it. To be frank, we were a light force and we didn't like what the simulations were telling us about our combat weight and our survivability in any environment that looked like warfighting.³ While some recognised the utility of simulation in 'force-on-force' exercises, where the enemy is unscripted, the organisation lacked the will to make it happen. Senior field commanders resisted being tested by simulation for fear of failure—tactically, organisationally or personally. The risk of not getting the desired outcomes was just too great for anyone to really want to push simulation hard.

Ultimately, the momentum was lost, in a strategic sense, in the pre-9/11 period. Commanders and leaders appeared to have very little appetite for a 'virtual' unconstrained enemy or to conduct exercises based on free play. Exercises remained closely scripted, the enemy tightly held, and Blue Forces inevitably emerged successful, both in tactics and capabilities. The opportunity to learn from failure was not identified and was actively discouraged. And this became more apparent the higher the level of the exercise.

The story of simulation in the post-9/11 world is similar. Perhaps the biggest change was the introduction of the 'Mission Rehearsal Exercise' to certify force readiness for operations. Navy had adopted this model for many years in their work-ups for deployment. These exercises were much better resourced than previous exercises, with excellent exercise management. Improvements were made in the use of simulation but not to the extent necessary or possible.

In my two years as a Brigade Commander, preparing forces for Afghanistan, Iraq, Timor and the Solomon Islands, we were able to conduct more realistic exercises with role players and exercise infrastructure. However, while we were attempting to make training more realistic, there was a preference and priority for procedural simulators rather than the simulation of complex decision making that was offered by wargaming and command post exercises.

Further, there was a lack of investment in and subsequent maintenance and sustainment of direct fire weapons-effects simulators which could accurately depict the effects of fires on the battlefield and highlight weaknesses in tactics, techniques, procedures and equipment. The simulation debate was cast in terms of resource savings not capability building. Further, the simulation debate was not mainstream, it was not being championed at the highest levels, and it was not penetrating Defence.

I should note, however, that with the increase of new vehicle combat systems, such as Abrams and light armoured vehicles, we did see some increased and accelerated use of crew and procedural trainers and some low-level simulation. This was also reflected across the other Services. We also had instances of effective simulators but these tended to be linked to specific capabilities or equipments. My point is that we did still not have a 'systems' view of simulation. The response was not to develop a sophisticated simulation approach. Rather, we used whatever simulations were available and exploited them to achieve training outcomes. Also, simulation acquisition was, and still largely is, buried in individual projects.

In sum, to the extent that simulation has infiltrated Defence, it is still more about training and certainty, rather than developing skills around complex decision making and uncertainty. Regrettably, we have not yet built a culture that embraces simulation, nor a culture that embraces it as an opportunity to liberate our thinking and remove fixed and inflexible notions of success. We remain a conservative organisation that has yet to develop a mature and strategic approach to simulation. We don't yet see simulation as part of the fabric and system of training and education.

Unless and until we address these issues in detail, and demonstrate a willingness to have commanders at all levels subject to wargaming and simulation, then we will not have integrated simulation into our culture—it will remain at the level of a technology.

The potential of simulation in PME

When I first took up command of the Australian Defence College (ADC) in August last year, I asked each of the learning branches how much they used simulation. The answer from ADFA was none. The answer from the Australian Command and Staff College was none. And the answer from the Centre for Defence and Strategic Studies was—you guessed it—none.

Of course, the question was loaded by the assumption that simulation meant the use of simulators or computer-generated wargames. In reality, we were using forms of simulation with scenarios, role-playing, planning activities and desktop exercises. But we were not having a conscious conversation about simulation as a system—we were thinking of simulation as an activity or technology.

As a result, while most of the simulation capability being acquired can be used by the military educational institutions, we have not, up until now, been a real stakeholder. For example, in the 'Introduction to Simulation Guide' published by the Defence Simulation Office, there is a description of what you can use simulation for—and military education does not appear. This is not a failure on the part of the Simulation Office. It is a failure on the part of the Australian PME system.

For my own institution, the only place in the ADC that simulation is being used is at the ADF Warfare Centre in Williamstown. Here, a number of systems are being used, including 'Virtual Battlespace' to support the training of joint terminal attack controllers and UN military observers. 'Joint Theatre Level Simulation' is used to drive joint operations wargames. Further, the 'Joint Seminar Wargame Adjudication Tool', developed by DSTO, is sometimes used by students on our Joint Planning Courses to support their 'course of action' analyses within the joint military appreciation process. When pressed, however, the use of simulation is low and its impact on ADC learning is minimal.

The reality is that simulation in the ADC has not been a key component of our learning strategy. It is not being used at a systems level and is not part of our culture. But this is set to change. Our focus at the ADC should be on education and training. We must train for certainty and educate for uncertainty. So how can we do that? Let me provide two examples of how simulation can change the way we think, and the way we behave, and contribute to the building of operational culture.

The Moros planning game

The saying that 'simulation is about building culture' is well demonstrated in an excellent book by Dietrich Dörner titled *The Logic of Failure: recognizing and avoiding error in complex situations*.⁴ In it, Dörner describes the 'Moros planning game', in which a physicist and an economist were asked to use a

computer-assisted planning game to create better living conditions for the Moros, a West African tribe of semi-nomads. After 20 simulated years, things had not turned out as the rational thinkers had planned. Their logical and well-meaning interventions had actually created a worse situation. For example:

... the drilling of numerous deep wells made available a rich supply of groundwater that allowed the Moros to enlarge their pasture radically. Eventually, however, the pasturage was no longer able to support the large herds and overgrazing occurred. By year 20, hardly any cattle were left because the pasture was almost completely barren. The drilling of yet more wells ... exhausted the remaining ground water supply. The Moros were now in a hopeless situation that could only be alleviated by a massive infusion of outside aid.⁵

The point of Dörner's story is that even the best plans can come unstuck if you don't adapt to changing circumstances. It also highlights the complex interactions among components in and across systems. What we now call 'wicked problems' demonstrate the challenges of identifying interdependencies. We also learn that the resolution of one problem often creates another more vexing one.

I highlight this because it goes to the heart of simulation and education, as well as the challenges of dealing with complexity. Using this style of simulation demonstrates that a plan is the beginning of a process that anticipates a particular future. Simulating the future, based on decisions informed by one frame of reference, demonstrates that things will not always go to plan—and often those things that disrupt or create chaos in the system were not dreamt of or accommodated in the initial plan. From the Moros simulation, we can see that what rational people think should happen, more often does not.

Dörner's story also draws into focus the complementary challenge of preparing learners to recognise the way in which they think about problems. In response to complex challenges, it is not enough to be decisive. Learners need to understand how they approach problems and how they can best monitor and check their own performance. Decision makers must be able to adjust subtly as they respond to complex issues and to change as the environment changes.⁶

In the Moros case, the aim was a prosperous and successful community. That didn't need to change. However, the plan to achieve that aim needed to adapt to change. When a plan does not go the way you expect, that is not failure. But when you fail to adapt to a changing environment because you mindlessly stick to the original plan, that is failure. Using simulation, we are able to shift people's ability to accept change and respond. We move from a focus on planning, to learning how to deal with change and how to be adaptive.

The Moros example also shows that there are other vehicles for education using simulation that are not just military scenarios. Indeed, a strategy to increase the use of simulation in PME may well begin by using simulations of this type to broaden thinking and develop critical skills, especially at places like ADFA. Working collaboratively on a complex non-military problem, developing skills in critical thinking and collective problem solving, would also help overcome the bias of single-Service military tasks.⁷

The Van Riper dilemma

A second example comes from the US experience of 'Exercise Millennium Challenge' in 2002. The exercise was meant to test a future military transformation activity. It involved both live exercise and virtual simulation between a US Force (Blue) and a hypothetical Middle East adversary (Red).

The activity was to be a free-play event, with the Red Force commanded by US Marine Corps Lieutenant General Paul Van Riper. Van Riper used a range of old-fashioned methods to overcome the advantages held by the 'network centric' Blue Force, such as motorcycle messengers to transmit orders and light signals to launch planes without creating a radio signature. He also used a fleet of small fast boats to identify the location of Blue Force's fleet. He then launched a pre-emptive strike using cruise missiles to overwhelm Blue's sensors and destroy 16 warships, including one aircraft carrier, ten cruisers and the bulk of Blue Force's amphibious ships. Soon after, he launched a second attack using a flotilla of small boats, resulting in significant Blue Force casualties.

At this point, the exercise was suspended. Blue ships were ‘refloated’ and the rules of engagement changed. After that, the exercise was much more closely scripted, free play was effectively removed and Blue Forces ‘saved the day’. The post-activity review highlighted what I will call the ‘Van Riper dilemma’—or maybe it’s the simulation dilemma.

Blue Forces criticised Van Riper’s tactics as being unrealistic and fanciful. Van Riper resigned as the Red Force commander and later expressed his concern that the wargame’s purpose had shifted to reinforce existing doctrine and notions of infallibility within the US military, rather than serving as a learning experience.⁸ The most telling judgment came when Van Riper said that ‘Millennium Challenge echoed the same view promoted by the US Department of Defense under Robert McNamara, before and during the Vietnam War, namely that the US military could not and would not be defeated’.⁹

Fast forward to 2008 and an article in the *New York Times* talked about US military officers’ concerns over tactics used by Iranian patrol boats in the Strait of Hormuz.¹⁰ They were concerned that their recent experience of being swarmed by Iranian patrol boats was reminiscent of the ‘Millennium Challenge’ scenario, as well as what had happened in the attack on the USS *Cole*.¹¹ The reason I raise this is that the response to Van Riper was to deny him his success, and reset the exercise to conform to the bounds of what Blue Force wanted the enemy to do. The risk posed by a ‘crazy’ enemy was perceived as unrealistic. But given what happened in 2008, was Van Riper so crazy after all?

So why is simulation so important?

When we consider the high stakes involved in the exercise of military power, it is clear that PME is where we should be encouraging the taking of risk, the trialling of new ideas, and iterating and re-iterating events to learn about chaos and complexity. PME helps us to understand how to make decisions in response to complex and ‘wicked problems’—and how to adapt when those decisions don’t deliver the expected outcomes.

In complex systems, the interconnections between cause and effect, combined with the effects of chaos and unpredictable responses, come together to form a myriad of outcomes. Good simulation offers the capacity for mixing both the ‘fog of war’ and something like the stress of combat decision making. By providing the conditions that approximate the pressure and fatigue that might be expected in an operational environment, learners begin to understand their individual limits and how to develop coping mechanisms.

Moreover, even when learners adapt to one scenario, the very next iteration can deliver a completely different result. Multiple iterations demonstrate the effects of chaos and chance, and of course—that greatest of military attributes identified by Napoleon—luck. Simulation gives us the opportunity to learn that failure generally only occurs when we fail to adapt. The current emphasis on the certainty associated with planning, and the integrity of the plan, is shifted to a focus on the outcomes and how to deal with change.

Simulation also encourages self-awareness and the understanding that we are all fallible and that, while we might get some parts of the solution right, it is almost guaranteed that we will get some parts wrong. It shows that serendipity is a key player in conflict and that the enemy also gets a vote. Through greater use of simulation in military education, we can nurture the adaptive characteristics and flexibility that our people need—and that the ADF needs to build an adaptive military culture.

Perhaps the biggest contribution simulation can make is to demonstrate that things change. Victory comes to those who respond and adapt the fastest—and who keep doing it over and over again. In complex and ambiguous environments, simulation changes your views of what should happen by providing information about what is happening. When used effectively, simulation builds a culture that:

- is comfortable dealing with complexity
- understands how to identify and manage risk
- is confident in its judgments

- is willing to adapt and change as circumstances change
- understands that a plan is a start-point not an end-state
- builds creativity, innovation, collaboration and information sharing, because it demonstrates behaving any other way will lead to failure
- breaks down stove pipes
- encourages adaptive behaviour
- contributes to identifying talent and developing performance, and
- creates the conditions for success.

The way ahead

So how can we implement the sort of changes I am suggesting? Joint Project 3028, the Defence Simulation Program, was until very recently the core of our organisational response. As a result of the 2012 Federal Budget, Defence is reconsidering its approach to simulation modernisation. It is too early to discuss how we might respond to those changes in terms of project numbers and scope.

However, while JP3028 offered a good foundation for the more effective integration of simulation into Defence capability development, it arguably has focused more on the technology and partnerships with industry to deliver that capability, rather than the benefits to be derived from the way we use simulation. Indeed, while major capital projects must tackle the important components of simulation, we need to realise simulation as an enabling capability.

We must also develop a simulation strategy that addresses how simulation will be integrated and make explicit its use in military education. We have seen the benefits of simulation in training but we have not seen the opportunity for simulation to become part of the fabric of military education. Happily, I can report that this is being progressed, not least by ensuring that PME is part of the Joint Combined Training Centre's systems approach to the integration of simulation across the ADF.

More broadly, I am convinced that simulation has a place in military education and training at *all* levels, and at *all* phases of a professional military career. All our learning centres should be making use of simulation in their training and education. This includes procedural simulation for training, and wargaming in all its forms to introduce and develop skill and acumen in planning and decision making in complex systems. And I might also say that it should include non-military simulations to enhance and develop critical thinking, leadership and management, personal effectiveness and other skilling outcomes.

The current discussion on the use of simulation in Defence and the ADF is too narrowly defined, too process-oriented, and lacking in sufficient imagination to see other uses. However, even with the best simulation technology in the world, we still have problems if we only see simulation as technological support. Until we understand the power of simulation to influence culture and behaviour, we won't realise its full potential. And until simulation is embedded across all levels of the ADF, we won't 'get it'.

The Van Riper dilemma is not about the inappropriate use of simulation technology. It is about how we deal with change, discontinuities, ambiguity, chaos and outcomes that don't suit our organisational agenda. We currently deal with the dilemma by ensuring there are no Van Ripers! And we avoid dealing with the real power of simulation by treating it as a technology that supports training, rather than a capability that builds culture.

Warfighting in future will be characterised by increasing complexity, chaos and uncertainty. The demands on our people will be in the area of critical analysis, higher order cognitive skills, improved networking, and collaborative behaviours—on top of the traditional demands of mastery of our weapons and logistics systems, physical toughness, resilience and character. If the post-9/11 period has taught us anything, it is that we only see the future 'through a glass darkly'.¹²

We will fight and conduct future operations with what we have at hand. But our advantage will come from the innovation and adaptability of our people. It is not our equipment that will win but how we fight with that equipment, how we innovate and how we adapt. We need to build a military culture that is

adaptive, understands and manages risk, is comfortable with uncertainty, and practised in dealing with ambiguity and change.

PME is one of the principal vehicles through which this cultural change can be effected—and the increased use of simulation will assist in achieving that change. As I said at the outset, simulation is not about technology, it is about culture. We have much ground to make up—but we need to and we will.

Major General Craig Orme is an Armoured Corps officer with a background in tanks and cavalry. Key commands have included the 1st Armoured Regiment (1996-98), the 1st Brigade (Mechanised) (2006-07) and his current role as Commander of the Australian Defence College. Senior staff appointments have included Director of Senior Officer Management (2001-02), Director General Personnel–Army (2004-05) and Head of People Capability (2008-11).

His operational experience has included the Rifle Company Butterworth, Malaysia with 3 RAR; the UN Iran-Iraq Military Observer Group at the end of the Iran-Iraq war in 1989; senior Australian representative in the Coalition Joint Task Force in Kuwait in 1999; and senior Australian representative at US CENTCOM in 2002. His training and education appointments have included Officer Commanding Long Tan Company at RMC in 1991; second-in-command of the School of Armour in 1995; and Instructor at the US Army Command and General Staff College at Fort Leavenworth in 1999-2001. Other overseas service has included Tank Squadron Commander in the British Army with the 4th and 1st Royal Tank Regiments in both the British Army of the Rhine and in the UK 1992-94.

Major General Orme oversaw Army's contribution to the Senate Inquiry into Military Justice 2005, authored the Workforce Companion Review to the 2009 Defence White Paper, and authored the 2011 ADF Personal Conduct Review. He has a Masters of Defence Studies (UNSW), a Master of Arts in Strategic Studies (Deakin) and a Bachelor of Arts (Military Studies, UNSW).

NOTES

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- ¹ This is an edited version of a speech presented at the 'SIMTECT 2012: Asia-Pacific Simulation & Training Conference and Exhibition' on 19 June 2012.
 - ² For example, large field deployments without effective weapons effects simulators don't deliver efficient training at the lower levels; they don't test and develop headquarters effectively; and they lead to control in exercises that reduces free play and chaos. Large field deployments tend to deliver 'canned' outcomes masked as successful training. A better approach sees extensive use of a free-play enemy, with weapons-effects simulators on individuals and vehicles. This replicates the effects of real weapons and drives tactical behaviour. Also the best way to test and develop headquarters is the use of static and mobile command post exercises with two-sided exercises and free play. This allows free manoeuvre and generates real logistics challenges over wide areas without artificial exercise constraints.
 - ³ This was reinforced during simulations conducted by DSTO during the 'Restructure the Army' trials conducted in the Northern Territory in the late 1990s.
 - ⁴ Dietrich Dörner (translated by Rita and Robert Kimber), *The Logic of Failure: recognizing and avoiding error in complex situations*, Metropolitan Books: New York, 1996.
 - ⁵ Dörner, *The Logic of Failure*, p. 4.

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- 6 In the field of psychology, this ability to self-regulate and to maximise one's capacity to think, learn and evaluate, is referred to as 'meta-cognition'. In simple terms, I prefer to think of it as the capacity to adapt.
- 7 We are beginning some work in this area at ADFA using the commercially available 'Sim City' to model some alternate futures to develop decision-making skills.
- 8 Julian Borger, 'War game was fixed to ensure American victory, claims general', *The Guardian*, 21 August 2002: see <<http://www.guardian.co.uk/world/2002/aug/21/usa.julianborger>> accessed 19 May 2012.
- 9 Quoted in the '*New York Times* Television Co-Produces News Documentary "The Perfect War" with Germany's ZDF', Business Wire blog, 23 March 2004: see <http://findarticles.com/p/articles/mi_m0EIN/is_2004_March_23/ai_114531926> accessed 19 May 2012.
- 10 Thomas Shanker, 'Iran Encounter Grimly Echoes '02 War Game', *New York Times*, 12 January 2008: see <<http://www.nytimes.com/2008/01/12/washington/12navy.html>> accessed 20 May 2012.
- 11 The USS *Cole* was attacked in October 2000 in the Yemeni port of Aden, by suicide bombers in a small boat, killing 17 sailors and crippling the warship: see 'Suicide bombers attack USS Cole', BBC News, 12 October 2000: <http://news.bbc.co.uk/onthisday/hi/dates/stories/october/12/newsid_4252000/4252400.stm> accessed 19 May 2012.
- 12 Corinthians, 13:12. But a number of books and articles have used the same title, notably the article by Martin van Creveld, 'Through the Glass, Darkly: some reflections on the future of war', 2000: see 'Defense and the National Interest' website <<http://dnipogo.org/creveld/throughaglassdarkly.html>> accessed 21 May 2012.



<http://www.defence.gov.au/adcc/publications/publications.html>

