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DRAGON AT THE DOOR

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How China's military is changing the game in the Pacific

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Introduction

China's military modernization remains a key concern for defence planners in the United States, and should be a concern for Canada if it hopes to ever increase its military role in the Indo-Pacific. Crucial in that regard has been China's development of forces geared towards preventing uncontested access from potential adversaries, such as the US and its allied militaries, to its "near seas" and beyond.

The US military and its key allies have long enjoyed an ability to project military power into China's air and maritime approaches. This has long been a keystone for US strategic predominance in the Indo-Pacific. If China could thwart the ability of the US to do this, it would be a significant blow to US leadership in the region.

The Chinese, in particular, learned lessons from watching the US and its coalition partners in Iraq in 1991 and 2003, Kosovo in 1999, and Afghanistan from 2012. The Chinese recognized the importance of denying an opponent an information advantage, leaving them deaf, dumb, and blind. Having this capacity would level any conflict and make it easier to prevent US bases and its military forces from being used against China in a crisis. China could then employ its own military against forward-deployed US forces and those of its allies, thereby raising the cost of intervention to politically unacceptable levels.

China is attempting to address the challenge here by developing "anti-access and area denial" (A2/AD) capabilities. A2/AD is a concept, often touted in the West, which describes key capabilities that are designed to either deny an adversary access to a particular region (anti-access, i.e., preventing an adversary from attacking its forward bases and other infrastructure), or contest its freedom of movement within that theatre (area denial, i.e., by being able to attack its surface ships with relative impunity). While often used in reference to China, it has also been applied to countries like Russia, Iran, and others.

Source: Erickson, Denmark, Collins 2012, 22-23

China does not use the term A2/AD in its own military writings. Instead, it refers to "counter-intervention" and the need to attack an adversary's "centre of gravity" and "exterior lines." But elements of A2/AD can certainly be found in such statements (McDonough 2013). It can also be seen in China's naval approach to the "near seas" (out to the First Island Chain) and "middle seas" (out to the Second Island Chain) (see accompanying map). The strategy entails a push to ensure sea control over the near seas by having sufficient offensive *and* defensive capabilities to both deny an adversary from operating in this area and ensure China maintains control over it. Submarines offer an ideal "denial" capability, since they can strike at the surface fleet presence needed for "control." And a surface fleet's anti-submarine warfare and anti-air assets provide the protective cover needed to forestall an adversary's own efforts at denial.

China is also intent on having the means to prevent sea access up to the Second Island Chain. At the moment, however, Beijing still lacks the mix of long-range offensive and defensive capabilities, especially away from its shore-based assets, to make the transition from sea denial to sea control in the middle seas.

For China, the primary goal of this strategy is to prevent the US and its allied forces from having access to China's maritime and air approaches in the event of a military conflict over Taiwan or any other crisis in the South China Sea, and to deny the US and its allies from using their forward bases within the near and middle seas. Table 1 lists some notable developments in the capability of the People's Liberation Army (PLA) in this regard.

These developments have transformed what used to be a backward, land-centric military force waging obsolete "people's war under modern conditions" into an "informationalized" military built to fight and win any "informationalized local war." This notion of "informationalized" warfare is a direct reference to the increasing role of information technology in warfare and growing reliance on more advanced, complex, high-technology battlefield systems. It has led to an emphasis on precision-strike, unmanned systems, and the PLA's development of the means to undertake integrated joint operations. The next 20 years may see equally dramatic changes. So what's next?

Table 1: Developments in Chinese A2/AD Capability

1. Long-range strike warfare capabilities based around advanced conventional ballistic and cruise missile systems. The most significant of these is the DF-21D anti-ship ballistic missile and, more recently, the DF-26 anti-ship capable intermediate range ballistic missile.
2. Quieter missile-armed diesel-electric submarines and more capable nuclear-powered attack submarines and ballistic missile submarines.
3. An aircraft carrier capability for the PLA Navy (PLAN) that could see as many as four locally built carriers in coming years.
4. More sophisticated multi-role naval surface combatants such as the Type 052D Luyang III guided missile destroyer and, more recently, the Type 055 Renhai class, aptly described as a guided missile cruiser.
5. Modern multi-role combat aircraft that are tasked with offensive and defensive air and space operations, and the development of long-range counter-air capabilities aimed against critical US combat enablers such as airborne early warning and airborne refueller aircraft.
6. Sophisticated intelligence, surveillance, and reconnaissance capabilities, including a large unmanned air vehicle (UAV) fleet and advanced ISR (Intelligence, Surveillance, and Reconnaissance), Communications and Precision-navigation and Timing satellites.
7. Counter-space and cyber/electromagnetic weapon systems designed to attack critical US and allied C4ISR (Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance) networks.

China's strategy is to best use China's geographic advantage in the Western Pacific and exploit the vulnerability of forward deployed US forces, either at sea in the form of naval forces centred around aircraft carriers and submarines, or from exposed land bases such as Guam and Okinawa. China can also exploit the US dependency on C4ISR (Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance) networks and precision-navigation and timing. Both are essential for gaining and maintaining an information advantage, and for fighting a "western way of war" – one that is fast, decisive, precise, and with minimal cost in lives and capabilities. By undertaking cyber attacks or anti-satellite strikes to disrupt this network, for example, China could force the United States to operate without its traditional technological and information advantages.

American responses to Chinese A2/AD have been based around notions of a "Third Offset" strategy (Pellerin 2016), following the "First Offset" under President Eisenhower that significantly built up the US nuclear arsenal, and the "Second Offset" in the 1970-80s that emphasized technological advances such as precision-strike capabilities (i.e., cruise missiles) and stealth aircraft.

The US Third Offset strategy is the current concept for countering the growing power of peer competitors such as China and Russia, and preserving a military-technological edge for the United States. In a speech in January 2015, then US Deputy Secretary of Defence Robert Work stated that the Third Offset strategy is "about developing the means to offset advantages or advances in anti-access area denial weapons and other advanced technologies that we see proliferating around the world" (Work 2015).

Robert Work went on to state that the Third Offset would be focused on near-term technologies that could lead to new capabilities in the 2020s and ensure an advantage into the 2030s. Work envisaged multiple offset strategies to best match different opponents, and greater reliance on the commercial sector for advances in robotics, autonomous systems, biotechnology, additive manufacturing (i.e., 3D printing), and advanced computing.

The Third Offset strategy focused on five key areas: (1) autonomous learning systems, (2) human-machine collaborative decision-making using advanced computers and better visualization, (3) assisted human operations, meaning plugging soldiers into the battle network, (4) advanced manned-unmanned systems operations, meaning forming new ways for these systems to operate and (5) network-enabled autonomous weapon systems and high-speed projectiles.

In the future the US and its allies will have to focus on gaining and maintaining operational access in order to preserve freedom of actions in the global commons (sea, air, space, and cyberspace) against a growing challenge of increasingly sophisticated and rapidly proliferating military threats. The US already has a number of operational concepts to achieve such access (e.g., Air-Sea Battle, now evolved into Joint Access and Manoeuvre in the Global Commons) (van Tol et al. 2010; Hutchens et al. 2017).

> "What is emerging is that the US and China are racing to achieve comparative military-technological advantage."

With these concepts, the US seeks to ensure an ability to operate, even in contested environments, without necessarily having to destroy an adversary's A2/AD, in a manner that reduces the inherent risk of seeking to directly defeat an opponent's capabilities. One example of this is using long-range air or sea-launched missiles for direct "blinding attacks" against Chinese forces deep inside China. That could allow the United States to sidestep the more formidable capabilities arrayed against it along China's coast, which has made access to the littoral so much more challenging.

However, China is already pursuing counters to these concepts as it continues to build its own advantages and new types of capabilities. Expect China to further enhance its A2/AD capabilities (listed in Table 1) as a starting point in this effort. What is emerging is that the US and China are now racing to achieve comparative military-technological advantage. Given the nature of the US Third Offset technology, and rapid advances by China in these areas, it would be a risky to assume the US will win this race. If the Chinese can achieve advances in some critical areas over the next 10 years, doing so may obviate the Third Offset. So what are the areas to watch?

Hypersonics: Hypersonic technology could be used to develop more sophisticated and longer-range ballistic and cruise missile capabilities for both land-attack and anti-ship roles. Hypersonic weapons would be incredibly fast, flying at speeds of Mach 5 or higher, which would increase the speed of attack, extend the range, improve tactical flexibility, and decrease the defender's reaction time (Mizokami 2017). Due to their high speeds, hypersonic weapons would also prove very challenging to a defender's air and missile defence systems.

China is testing the DZ-ZF Hypersonic Glide Vehicles (HGVs), a boost-glide system placed on ballistic missiles that would detach before the missile reached lower earth orbit, gliding back to earth at up to Mach 10 speeds (Nersisyan 2017). Chinese research into other hypersonic systems, including "scramjet" technology, which uses engines to suck in air to burn fuel (Davis 2016), could also lead to hypersonic anti-ship cruise missiles (ASCMs) that would complicate (and possibly penetrate) the US Navy's sea-based air defence systems.

Submarine and anti-submarine warfare capability: The Chinese could deploy Type 095 (Sui-class) nuclear-powered guided-missile submarines that will have a land-attack capability and offer acoustical performance comparable to the US Navy's Improved Los Angeles-class boats. Chinese conventional attack submarines, including Yuan-class boats, are also getting quieter (Chan 2017). The challenge is that US Navy submarine numbers available for deployment in the Western Pacific are shrinking, while the Chinese PLA Navy (PLAN) submarine fleet is growing. Estimates suggest a fleet of between 72 and 81 boats, according to US Rep. Randy Forbes (Gorman 2016), including conventional and nuclear-powered. Even though the US Navy (currently) maintains a technological edge, it will only have 53 submarines of all types by the late 2020s. That fleet must then be divided up for global deployments. With some submarines unavailable for operations due to training, repairs, and maintenance, that will leave even fewer operational US Navy submarines in the Western Pacific.

In a related development, Chinese anti-submarine warfare (ASW) is improving while US Navy ASW has atrophied since the end of the Cold War (Majumdar 2017). There has been a drop-off in US ASW training, an erosion of capability with the loss of the S-3 Viking surveillance aircraft, and reduced shore-based ASW training for maritime patrol aircraft. China has made investments to plug its own ASW gap: it has deployed large numbers of Type 056A Jiangdao-class ASW corvettes with towed arrays; deployed fixed acoustic sensors to detect submarines, particularly in the South China Sea, in what has been termed an "Underwater Great Wall"; and developed more sophisticated land-based maritime patrol and ship-based ASW helicopter capabilities (Panda 2017).

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Long-range counter-air capability: The Chinese PLA Air Force (PLAAF) is seeking to replace older combat aircraft with advanced fourth- and fifth-generation multirole platforms. The PLAAF is also developing a next generation long-range bomber (H-20), which would give China a much more potent anti-ship and land-attack capability by the mid-2020s (Gady 2016). As for its fighter aircraft, PLAAF increasingly favours targeting high-value combat *enablers* (e.g., Airborne Early Warning and Control aircraft, airborne refuellers) that support shorter-range US planes like the F-35 Lightning, F/A-18E/F Super Hornet, and E/A-18G Growler.

If PLAAF long-range counter-air capability can threaten these platforms, shorter-range aircraft on US Navy aircraft carriers will not be effective in penetrating Chinese A2/AD systems. Conventional ballistic missiles could then threaten US Pacific Air Force forward bases such as Guam and Okinawa. Long-range air-to-air missiles and hypersonic missiles launched from PLAAF fighters such as the J-16, Su-35, and J-20 could certainly threaten US forces deep into the middle seas from bases on the artificial manmade islands created in the South China Sea (Axe 2017).

Quantum technology: Perhaps one of the most significant developments, but also one of the most difficult to understand, is the quantum revolution. China is investing heavily in research and development in this area (Chen 2017). Advances towards quantum cryptography could lead to secure, unhackable C4ISR at long range. In fact, China demonstrated a satellite-based system of this type in July 2017 (Ren et al. 2017). The impact of *quantum cryptography* should not be hyped – it's complex to set up, and provides only marginal gain in speed or bandwidth. Its main advantage is security, and as China thinks about its future military modernization, ensuring secure, unhackable command and control would be important.

The development of *quantum computing* is much more significant, given its ability to transcend the limitations of Moore's Law (i.e., that the number of transistors per square inch on integrated circuits doubles every year), and thereby lead to an explosion in computing power and speed akin to moving from transistors to microprocessors. There are challenges in realizing that vision, notably the problems caused by "decoherence," a degradation of the beneficial effects of quantum computing that come from unavoidable interaction between a quantum computer and the outside world that leads to accumulating errors in calculation. A solution to the issue of decoherence might emerge, and with it, the practical applications of quantum computing. Quantum computers can handle large tasks much more rapidly than traditional computers, including managing the complexity of a networked battlespace.

Quantum sensing may see advances in ASW that makes it more difficult for submarines to penetrate close to China – in the South China Sea, for example. Chinese researchers have suggested they have made progress on developing superconducting quantum interference devices (SQUIDs) that would allow maritime patrol aircraft to detect submarines at longer ranges, no matter how quiet they are (Hambling 2017).

Finally, much has been made of *quantum radar* as a means of rendering stealth technology ineffective (Majumdar 2017). By using photon entanglement, this technology could, in theory, detect the presence of a stealthy aircraft by disrupting photon pairs. Once again, decoherence emerges as the challenge, where the entanglement of paired photons collapses as they interact with the outside world. The range of a quantum radar will be limited by decoherence, and this is the major challenge with making such a radar useful. If this challenge can be overcome, then quantum radar could make it more difficult for stealth aircraft to penetrate contested airspace within a future Chinese A2/AD zone. Quantum computing, particularly if it is tied in with advances in Artificial Intelligence (AI) (Lant 2017), could be the tipping factor that solves some of these challenges, enabling advances in other areas like quantum sensing and quantum radar.

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AI and battlespace robotics: Russian President Vladimir Putin noted recently, "Artificial Intelligence is the future, not only for Russia but for all humankind. Whoever becomes the leader in this sphere will become the ruler of the world" (Caughill 2017). The Chinese apparently agree, as they are investing large sums of money into AI and autonomous systems that can network and swarm (Kania 2017). Advances in this area would see China emphasize a "small, cheap, and many" paradigm for defence systems, compared to one focused on "large, expensive, and few" – as first suggested by Martin Libicki in the 1990s (Libicki 1994). The Chinese have already demonstrated autonomous drone swarming, where each unmanned air vehicle (UAV) collaborates and works together to complete tasks. This includes large formations, with 119 fixed wing UAVs undertaking catapult-assisted take-offs in June 2017, and an earlier demonstration of 1,000 UAVs.

The key implications of this swarming capability are for a networked "cloud" of small airborne autonomous vehicles to provide entirely new ways of undertaking military tasks, including attacking with lethal precision while sustaining little damage to themselves. Tasks for such a swarm include intelligence, surveillance, and reconnaissance against an adversary's naval forces, electronic warfare, or a swarming strike against naval surface combatants. Even if each UAV is small with limited explosive payload, enough of them acting together could at the very least deliver a "mission kill" by wrecking a naval vessel's exposed sensors and electronics,

opening up opportunities for more powerful anti-ship cruise missiles and ballistic missiles to then attack the ships. Small UAVs have limited range and endurance and they tend to be slow, which means they need to be released close to a target. That would imply a larger "mother ship" akin to US plans for an "arsenal plane" (Drew 2016) either manned or unmanned.

The nature of swarming implies that such capabilities must also be largely autonomous rather than piloted remotely. China is interested in AI research because AI would enable the swarm to be much more adaptive to a rapidly changing tactical situation and able to coordinate its actions without relying on human input. Whilst there is intense debate in western liberal democracies about the legal, ethical, and moral constraints on "lethal autonomous weapons," in authoritarian states such as China, little debate appears to be occurring, but plenty of development and progress is clearly underway.

Conclusion

This paper analyzes some of the areas of future Chinese military-technological development that could contribute towards a more effective A2/AD capability – a version 2.0 that would make it tougher for US and allied military forces to project power into China's air and maritime approaches in the Western Pacific.

> "Expect more sophisticated counter-space (i.e., anti-satellite) capabilities."

Existing capabilities will likely be further enhanced with the development of longer ranged ballistic and cruise missile systems, more sophisticated submarine and naval surface combatants, and more advanced air combat capabilities. The formation of the PLA Strategic Support Force in 2015 that brings together space, cyber, and electronic warfare capabilities into a new operational command highlights the importance of these areas and winning the information battle from the outset. Expect more sophisticated counter-space (i.e., anti-satellite) capabilities, along with sophisticated, operationally responsive space capabilities to figure prominently.

The new capabilities discussed above enhance these traditional systems, and in some cases, such as quantum technology and swarming UAVs, add entirely new ways for China to undertake A2/AD. These advances make it much more difficult for the US and its allies to maintain an ability to respond in a crisis. Whilst US efforts towards a "Third Offset" strategy may go some way to mitigating these risks, as noted earlier, there are no guarantees of success. The US Third Offset may fail, not only in strategic competition with China, but with other peer competitors, such as Russia.

Meeting the complicated balance between readiness, force size, and force modernization for the US, while dealing with the risk of further sequestration may blunt US efforts to achieve a Third Offset. Some of the technologies mooted by US thinkers may be beyond reach for viable application within a short timeline of the next 10 years, and these technologies – autonomy, robotics, and AI – will need to take into account legal, ethical, and moral norms and debates. China and Russia, by contrast, do not need to engage in such debates. Unlike China or Russia, the US as a Western liberal democracy is answerable to its people, and the broader aspects of international legal norms.

About the Author

Malcolm Davis joined Australian Strategic Policy Institute (ASPI) as a Senior Analyst in Defence Strategy and Capability in January 2016. Prior to this he was a Post-Doctoral Research Fellow in China-Western Relations with the Faculty of Society and Design at Bond University from March 2012 to January 2016, and he currently retains an Honorary Assistant Professor position in the Faculty. He has worked with the Department of Defence, both in Navy Headquarters in the Strategy and Force Structure area, and with Strategic Policy Division in the Strategic Policy Guidance and Strategic External Relations and Education sections from November 2007 to March 2012. Prior to this appointment he was a Lecturer in Defence Studies with Kings College London at the Joint Services Command and Staff College, in Shrivenham, UK, from June 2000 to October 2007. He holds a PhD in Strategic Studies from the University of Hull as well as two Masters degrees in Strategic Studies, including from the Australian National University's Strategic and Defence Studies Centre. His main research focus is on defence strategy and capability development, military technology, and the future of warfare.

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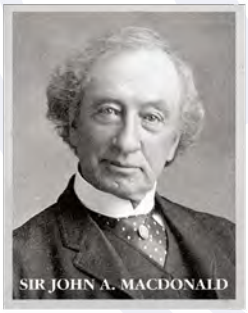
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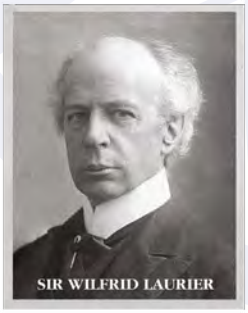
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Good policy doesn't just happen; it requires good ideas, hard work, and being in the right place at the right time. In other words, it requires MLI. We pride ourselves on independence, and accept no funding from the government for our research. If you value our work and if you believe in the possibility of a better Canada, consider making a tax-deductible donation. The Macdonald-Laurier Institute is a registered charity.

Our Issues

The Institute undertakes an impressive program of thought leadership on public policy. Some of the issues we have tackled recently include:

- Aboriginal people and the management of our natural resources;
- Making Canada's justice system more fair and efficient;
- Defending Canada's innovators and creators;
- Controlling government debt at all levels;
- Advancing Canada's interests abroad;
- Ottawa's regulation of foreign investment; and
- How to fix Canadian health care.

True North in
Canadian public policy

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What people are saying about the Macdonald-Laurier Institute

In five short years, the institute has established itself as a steady source of high-quality research and thoughtful policy analysis here in our nation's capital. Inspired by Canada's deep-rooted intellectual tradition of ordered liberty – as exemplified by Macdonald and Laurier – the institute is making unique contributions to federal public policy and discourse. Please accept my best wishes for a memorable anniversary celebration and continued success.

THE RIGHT HONOURABLE STEPHEN HARPER

The Macdonald-Laurier Institute is an important source of fact and opinion for so many, including me. Everything they tackle is accomplished in great depth and furthers the public policy debate in Canada. Happy Anniversary, this is but the beginning.

THE RIGHT HONOURABLE PAUL MARTIN

In its mere five years of existence, the Macdonald-Laurier Institute, under the erudite Brian Lee Crowley's vibrant leadership, has, through its various publications and public events, forged a reputation for brilliance and originality in areas of vital concern to Canadians: from all aspects of the economy to health care reform, aboriginal affairs, justice, and national security.

BARBARA KAY, NATIONAL POST COLUMNIST

Intelligent and informed debate contributes to a stronger, healthier and more competitive Canadian society. In five short years the Macdonald-Laurier Institute has emerged as a significant and respected voice in the shaping of public policy. On a wide range of issues important to our country's future, Brian Lee Crowley and his team are making a difference.

JOHN MANLEY, CEO COUNCIL