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Autonomous Power?

Securing Singapore's Interests in the 21st Century

By Alexander Sullivan

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Cover Image
A scout trooper putting the finishing touch as he fixes the wing-tips of the Skyblade III.

(Photo courtesy of Singapore Ministry of Defence)

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I. INTRODUCTION

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Singapore punches above its weight in nearly every metric of national power. Despite being an island city-state with only 3.3 million citizens and 5.4 million total population,[1] it boasts the fifth-largest economy in the 10-member Association of Southeast Asian Nations (ASEAN) and the eighth-highest gross domestic product (GDP) per capita in the world[2] and spends more on defense in aggregate than any other ASEAN country.[3] Politically, it plays a crucial balancing role in the broader Indo-Pacific region and for decades has been one of the United States' strongest partners in Asia. Sitting on a natural deep-water harbor, at the eastern mouth of the Malacca Strait, the fulcrum of the Indo-Pacific and one of the world's most important choke points, Singapore is a hub for commerce of all kinds – seaborne trade in goods and energy, air cargo, telecommunications, financial services, etc. This commanding position also means a lack of geographic strategic depth among much-larger neighbors, and an ingrained rhetoric of vulnerability has impelled Singapore to overinvest, relative to its size, in a technologically advanced and highly trained military, the Singapore Armed Forces (SAF), and zealous strategic and defense diplomacy. Recent trends suggest that, as Asian countries spend more on defense, Singapore will seek new ways to preserve its local technological edge, especially by leveraging emerging technology. Singapore has articulated a capability development plan that flows from its overall strategic posture and outlook, described below. But in the medium term, Singapore may elect to bet heavily on unmanned or autonomous systems that could address its driving security concerns with greater effect and efficiency than legacy manned systems, potentially delivering a big strategic payoff in the medium term.

II. SINGAPORE'S STRATEGIC POSTURE AND OUTLOOK

The classical understanding of Singapore's strategic position, and hence its core foreign policy driver since attaining independence from Malaysia in 1965, is one of "vulnerability."[4] As mentioned above, its location at a global crossroads is both blessing and curse – generating economic opportunity but creating critical resource dependencies and exposing it to much larger surrounding countries, of whose good intentions Singapore has not always been certain. Size asymmetries are compounded by ethnic considerations: Singapore, a secular, tenuously multiethnic nation made up of Chinese, Indian and Malay citizens, has been perceived by its largely Malay-Muslim neighbors as an ethnic Chinese exclave exercising disproportionate economic power in the neighborhood. Globalization has added to the list of potential dangers, opening the young nation up to terrorism, piracy and transnational crime, the threat of pandemic disease, cybercrime and natural disasters caused by climate change.[5] As Michael Leifer puts it, "a combination of limited scale and a potential domestic fragility, together with a confined geographic location, has served to generate worst-case thinking in foreign policy, even though that location has also been a source of Singapore's material good fortune."[6] This core vulnerability has created a tendency to look at security comprehensively as composed of economic, political, military and other factors. Singapore also enacts a multilayered diplomatic strategy of bilateral and multilateral efforts to augment its perceived vitreous position and preserve its sovereign autonomy.

Singapore's holistic approach to security is encapsulated in the concept of "total defense," of European provenance and adopted by Singapore in the 1980s.[7] Defense is seen to stand upon five pillars: military, civil, economic, social and psychological, none of which can be neglected due to a perilous environment and constrained resources.[8] Economically speaking, far from being a vulnerable state that seeks to isolate itself, Singapore has always predicated its security on competitiveness in liberal international markets.[9] Accordingly, Singapore endorses the foundational concepts of the so-called liberal international order, including free access to the global commons, free trade and capital flows and other precepts of global governance.[10] Its emphasis on the civil, social and psychological elements of defense – a unity of common purpose granting resilience – provides the rationale for Singapore's largely conscript- and reservist-based military manpower system, which avoids the economic drag of a standing army.[11] It also illuminates Singapore's relatively illiberal social contract. The ruling party is given broad latitude over civil liberties in exchange for an effective pursuit of physical and economic security.[12] In short, Singapore's perceived insecurity causes the government to promote a comprehensive, technocratic, forward-looking approach to security that greatly informs the country's unique social model.

Singapore's size and position also create a strategic imperative for proactive foreign policy to enlarge its strategic space and ensure a positive local and regional environment. Singapore's officials are known for being astute interpreters of geopolitical trends, and its diplomats for their effective advocacy of Singapore's interests in capitals around the world, on everything from bilateral trade deals to extradition treaties.[13] In the security realm, defense diplomacy is seen as a fundamental pillar of defense policy, along with deterrence, rather than a separate or secondary mission.[14] At the strategic level, the broad diplomatic toolkit is applied at different levels to prevent the rise of a hostile local hegemon that could threaten Singaporean interests.[15] This principally entails three vectors of effort: maintaining a balance of power in the Asia-Pacific region favorable to Singapore, with the

United States seen as still playing an indispensable balancing role, but with China assuming an ever-greater role; promoting rules-based international architectures, mostly centered on ASEAN, that discourage great power conflict or predation by larger countries, providing political and normative bulwarks where physical ones are lacking; and fielding technologically advanced and adaptive Singapore Armed Forces.[16]

Balancing Between the United States and China

The focus of Singapore's diplomatic strategy cannot be reduced to its relationship with the United States or China, but an exhaustive review of Singapore's bilateral relations is beyond the scope of this paper.[17] Nevertheless, balancing the roles of Washington and Beijing in the region is an important goal of Singaporean foreign policy.[18] As former Australian Foreign Minister Robert Carr put it in his candid diary published earlier this year, the Singapore dream is peace with and between China and the United States.[19]

Washington is historically seen as not only the preponderant global power, but as a benign hegemon sharing interests basically consonant with Singapore's own.[20] Thus, ensuring a strong U.S. presence in the Asia-Pacific, especially Southeast Asia, has been a core tenet of Singaporean policy since World War II. After the United States was evicted from Subic Bay and Clark Air Base in the Philippines in 1992, Singapore stepped up to enable critical logistics and resupply access for U.S. operations in Southeast Asia and beyond.[21] This cooperation was codified and elevated in the 2005 Comprehensive Framework, which also took into view Singapore's cooperation in the "War on Terror" and related initiatives such as the Container Security Initiative.[22] In recognition of the close relationship, Washington has allowed Singapore to purchase high-end American weapons systems, such as F-15 and F-16 warplanes and possibly the Joint Strike Fighter.

In keeping with the policy of engaging the United States in Asia, Singapore has supported U.S. rebalancing policy both rhetorically and in practice – while being careful to distinguish it from a containment strategy aimed at China.[23] Defence Minister Dr. Ng Eng Hen has said, "The US, as a resident power in the Asia-Pacific for the past 50 years, needs to continue that role as a stabilising force in the region."[24] In April 2013, the inaugural littoral combat ship (LCS) USS *Freedom* began a 10-month deployment at Singapore's Changi Naval Base, the first of up to four ships that will rotate through Singapore.[25]

Nevertheless, Singapore is careful not to get so close to the United States as to provoke China – despite decades of close cooperation, Singapore has eschewed the idea of a formal alliance with Washington.[26] Singapore is eyeing the rapid trajectory of Chinese economic and military power, and the potential instability this could sow in the region. As Ng noted at the Shangri-La Dialogue in 2012, "China is currently the largest trading partner of ASEAN, Australia, Japan and South Korea, while the United States remains the dominant resident security power in this region. This divergence of economic partnerships and defence relationships will challenge existing alignments among nations."[27] Accordingly, after several decades of keeping Beijing at arm's length, since 2000 Singapore has gradually increased security and defense cooperation with the PRC, including high-level dialogues and joint exercises.[28]

Multilateral Diplomatic and Security Activities

The United States and China are not the only powers that affect important Singaporean interests. Moreover, competition between Beijing and Washington and its allies has already led to greater uncertainty in Asia and could further roil the region, with negative effects for Singapore.[29] As a result, the latter has invested heavily in multilateral dialogues and security and diplomatic cooperation to address issues of shared concern.[30]

This includes groupings such as the Five Power Defence Arrangements[31] but has principally come to mean ASEAN and its related security institutions, the ASEAN Regional Forum and ASEAN Defence Ministers' Meeting-Plus (ADMM-Plus). Since 2002, Singapore has also paid to host the Shangri-La Dialogue, an informal dialogue of minister-level defense officials at which security initiatives are often announced. ASEAN is intended to function as, among other things, a bloc that can deal with great powers from a position of strength where individual countries would be unable to do so. The Singaporean government thus hopes to use these forums to foster U.S.-China mutual understanding and forestall the more pernicious effects of great power competition or, worse, conflict. [32] Singapore attenuates its commitment to supranational frameworks where its own interests supersede them: For instance, it has withheld support for the Philippines' efforts to seek international arbitration on China's nine-dashed line in the South China Sea, so as not to offend Beijing. But broadly speaking, the regional armature provides strategic insulation for an otherwise exposed Singapore.

International security cooperation is most significant for Singapore when it comprises not just dialogue but concrete cooperation on issues of shared concern. Indeed, through its participation in ASEAN processes – especially the ADMM-Plus beginning in 2010 – and other ad hoc international groupings, Singapore has prioritized SAF participation in cooperative exercises and operations, which have tended to target lowest-common-denominator transnational threats such as piracy and humanitarian assistance/disaster relief (HA/DR).[33] The Republic of Singapore Navy has participated in the international counterpiracy mission in the Gulf of Aden and has commanded Combined Task Force 151 three times. It sent more than 500 troops to the International Security Assistance Force mission in Afghanistan.[34] Singapore has also played major coordinating roles in actual disaster relief operations in Asia, including the international responses to the 2004 Indian Ocean tsunami and the Typhoon Haiyan disaster in 2013.[35] The experience of these latter operations has led Singapore to put forth its command and control (C2) facilities at Changi as a regional HA/DR coordination center, which could be developed into a more general information-sharing architecture for multilateral maritime domain awareness.[36] In addition, among ASEAN countries, Singapore has one of the only submarine salvage capabilities in its MV *Swift Rescue* vessel.[37] The South China Sea is about to get very crowded with submarines fielded by nations with limited experience deconflicting subsurface operations. Collisions are bound to happen, and Singapore could lend crucial aid to friendly countries if circumstances warrant. Because these types of activities yield political benefits in addition to operational experience for the SAF, they will continue to be a priority for the government and may drive requirements for expeditionary capabilities that Singapore might otherwise forgo.

Fielding an Advanced Singapore Armed Forces

As important as diplomacy and multilateral mechanisms may be, the Singapore Armed Forces are the core of the nation's security posture – the "foundation for peace and progress in Singapore."[38] The strategic goals defined above drive the SAF's capability needs, procurement and personnel policies.

The SAF are the best-trained and -equipped military in Southeast Asia, despite Singapore's size. While China, India and others vastly outclass the SAF, this local superiority allows it to deter and deal confidently with neighbors Indonesia and Malaysia, despite periodic tensions.[39]

The lack of strategic depth creates a paramount need for persistent situational awareness, assets to maintain presence and a serious if small power projection capability for flexibility and rapid response. Should any much larger country attack it,

Source: Ng Eng Hen, "Speech by Dr Ng Eng Hen, Minister for Defence, at Committee of Supply Debate 2014" (Singapore Ministry of Defence, March 6, 2014), http://www.mindef.gov.sg/imindef/press_room/official_releases/sp/2014/06mar14_speech.html#.U-APKkjUuJ4.

Singapore can likely count on intervention by other great powers, as long as it can buy time and credibly defend its interests in the short term.

In addition, the modern Singaporean military is designed not only for conventional war-fighting in its immediate environs, but also for addressing transnational threats such as terrorism and piracy and participation in a range of multilateral exercise and collective security actions that support diplomatic objectives. These missions require expeditionary capabilities that can deploy and interoperate with allied forces.

The conceptual framework for force development over the past 10 to 12 years has been the "Third Generation SAF," which basically refers to a network-enabled force joining sophisticated intelligence, surveillance and reconnaissance (ISR) capabilities with advanced strike capabilities seamlessly across ground, air and naval forces.[40] Besides the success that the United States has enjoyed with a similar approach (at least in conventional conflict), Singapore is almost compelled to adopt this strategy due to its small but highly technically adept population.[41] The networked approach

is intended to facilitate an adaptable, ever-ready military that can interoperate with other countries. Doctrinal and training adjustments have reportedly kept pace with technological development and receive high priority.[42]

In practice, Singapore's force development is highly conditioned by cost. In 2013, Singapore had the fifth-highest military expenditure per capita worldwide, behind only Oman, Saudi Arabia, Israel and the United States.[43] This reality affects both growth in overall defense expenditures and the type of systems developed indigenously versus purchased internationally. Singapore seeks "steady" defense spending growth, providing some annual growth over inflation but avoiding volatility, especially sudden spikes.[44] Thus, its defense spending has grown from approximately $8 billion in 2003 to $9.8 billion in 2013 (constant 2011 USD), representing a 22 percent real growth or compound annual growth rate of just over 2 percent.[45]

While Singapore seeks to incubate indigenous design where possible, buying power and defense diplomatic needs encourage collaborative weapons development. It of necessity buys many advanced systems from abroad, with a preference for U.S. systems where affordable, to support interoperability. It then relies on its highly capable defense industrial workforce to customize and periodically upgrade those systems to suit Singapore's needs.[46] In general, Singapore prefers proven weapons with robust technology transfer, training and maintenance packages to exquisite but untested systems.[47] These approaches aggregate to a reputation for ruthless cost-effectiveness in procurement, which the Ministry of Defence notes with pride.[48]

The Singapore Armed Forces' current force structure has been exhaustively covered in publications on national militaries, including *Jane's* and *The Military Balance*. This overall force structure is not expected to change radically, barring exogenous changes in the military-technical environment. Changes and augmentations planned out to the 2030 time frame as articulated by the Ministry of Defence are described below.[49]

Singapore is almost compelled to adopt this strategy due to its small but highly technically adept population.

The core mission set of the Republic of Singapore Navy (RSN) addresses a familiar litany of Singaporean strategic concerns and can be summed up as: deterrence through constant presence; defense of critical sea lines of communications (SLOCs) and seaward approaches against foreign aggressors, terrorists and pirates; and support for defense diplomacy, including through multilateral exercises and collective security actions.[50] For deterrence and serious SLOC defense, *Formidable*-class frigates, augmented after 2016 with new S-70B Seahawk anti-submarine warfare helicopters, will remain the RSN's mainstay muscle. The current air-independent propulsion *Archer*-class submarines will be joined by Type 218SG subs commissioned from Germany, which will replace aging boats to preserve and extend the RSN's undersea deterrent.[51] Coastal capabilities will be augmented by the planned "littoral mission vessel," which will replace aging patrol vessels and is suited to peacetime presence and the types of low-end missions and multilateral exercises that Singapore has increased in the last decade.[52] In addition, the SAF have vague plans for a future modified amphibious warship – a landing helicopter dock (LHD) or landing ship tank (LST) – which the Defence Minister has referred to as a "Joint Multi Mission Ship."[53] These types of vessels could provide logistics and C2 for operations from amphibious combat to humanitarian relief, but they could also

provide a nascent airpower projection capability when paired with the U.S. F-35B fighter jet.

The key element of the Republic of Singapore Air Force's (RSAF) succinct mission statement is that it will "be superior in the air and decisively influence the ground and maritime battles."[54] Future improvements to the RSAF have been shrouded in speculation about Singapore's potential purchase of the U.S. F-35, for which it is an international partner. The F-35's purported ability to share a wide range of sensor data through next-level data links may appeal to the imperative for the RSAF to link in with maritime and ground forces. The RSAF will almost certainly be getting its F-16C/Ds, purchased from the United States between 1994 and 2000, upgraded with active electronically scanned array (AESA) radars.[55] This, combined with supplemental F-15s purchased since 2010, has allowed the Ministry of Defence to profess comfort with its fighters for the foreseeable future, and to evaluate the initial blocks of F-35s for cost and capability before buying. However, the plans for an aforementioned flattop that can embark the short-takeoff-and-vertical-landing-capable F-35B variant have given rise to speculation that Singapore is already preparing to field a light aircraft carrier capability.[56] Either way, the RSAF will be increasing its projection capabilities through the purchase of Airbus A-330 multirole tanker-transport aircraft to replace its KC-135 fleet. These vessels can extend patrol ranges for tactical fighters through aerial refueling or provide strategic lift for expeditionary operations. Finally, as more countries in its area acquire airborne strike capabilities, Singapore will improve its air defenses with the European Aster-30 surface-to-air missile (SAM) system.

The Singapore Army's mission is simply "to deter aggression, and should deterrence fail, to secure a swift and decisive victory," although a nod is also given to "the full spectrum of operations."[57] In practice, the army's training engagements in a broad variety of countries and deployments to places such as Afghanistan significantly support alliance needs. In the medium term, ground forces will be augmented through greater application of networking technology to infantry equipment, but no other significant alterations are planned. This is reasonable given the evolving threat profile – while Singapore will likely remain wary of erstwhile parent Malaysia, whose peninsula Singapore shares and on whom it relies for fresh water, the threat of ground invasion seems remote. This quietude is in contrast to the unsettled waters and airspace of the South China Sea. Moreover, because the army comprises the vast majority of nonprofessional conscripts, personnel concerns are more salient than those of equipment. The army places a high value on its respected stature within Singapore, creating a virtuous circle between National Service and the civic unity that underpins much of "Total Defence."

Finally, although often omitted in planning speeches, it can be assumed that, like other countries, Singapore is steadily improving its offensive and defensive cybercapabilities, having set up a joint "cyberarmy" in 2013.[58]

After 2030, besides the next-generation fighter, the proposed amphibious ship and unspecified upgrades to its *Bionix* armored fighting vehicles, Singapore's modernization plans get much murkier. But even what little information the Ministry of Defence has released suggests an increasingly heavy reliance on unmanned or autonomous systems, possibly produced at scale and used in novel ways. Cost pressures, demographics that threaten manpower and broader military-technical trends make this a very attractive option for Singapore, and its defense investments may take a hard turn toward the unmanned. [59]

III. SINGAPORE: AUTONOMOUS POWER?

As a small but wealthy, highly technical, engineering-oriented society, Singapore seems naturally positioned to employ unmanned or autonomous systems.[60] After initial forays in the last decade, the SAF have gradually been introducing unmanned systems into new operational contexts and developing ambitious plans for future use. In coming years and decades, military trends may mesh with underlying societal logic to see Singapore becoming a leader in robotic warfare and developing an entirely new type of force.

The SAF have already been operating indigenous and foreign small reconnaissance drones for more than 30 years, with meaningful acceleration in the last 10.[61] In 2007, the RSAF set up a dedicated unmanned aerial vehicle (UAV) command in a functional reorganization, which reflected "the growing importance of unmanned capabilities in the operations of the 3rd Generation SAF."[62] Between the army and the RSAF, Singapore operates up to half a dozen varieties of drones, including Elbit's Hermes and Skylarks, Israel Aerospace Industries' Herons and Searchers, and iterated classes of Skyblade man-portable micro-UAVs produced domestically by Singapore Technologies Engineering.[63] Some of these systems have been operated to support SAF operations in Afghanistan, while others have been integrated in training with the SAF's most advanced shooter systems.[64] As the SAF acquire more unmanned capabilities, they are integrating them in new ways: U.S.-Australian ScanEagle drones are now launched and recovered from the RSN's *Victory*-class missile corvettes.[65]

Evidence suggests that Singapore's defense establishment, from lawmakers to the military to weapons manufacturers, is focusing on unmanned systems as a key area for future investment growth and is developing new production techniques and tactics to that end.[66] ST Engineering, a privatized Singaporean defense firm, is making UAS a priority in both defense and commercial applications.[67] Meanwhile, DSO National Laboratories, Singapore's version of the Defense Advanced Research Projects Agency, is developing new airborne, ground and underwater autonomous vehicles for everything from urban combat to subsea operations.[68] It also has a spate of international collaborations in the unmanned arena, including with Israel for a fuel-cell-powered UAV, and with the U.S. Navy for robotic underwater vehicles, among others.[69] Indications from senior Singaporean defense officials are that unmanned capabilities such as unmanned underwater vehicles and robotic mules are expected to enter the SAF in the not-too-distant future. The 2030 plans even make provision for a possibly armed "tactical UAV."

Does Singapore's investment in unmanned systems actually align with its strategic priorities and needs? What are UAS good for, today and in the future? Today, by virtue of not being limited by human operator fatigue, unmanned systems – especially in the air, but increasingly on and beneath the surface – provide matchless endurance, allowing more persistent and cost-effective situational awareness in the air and maritime domains. As in the case of the ScanEagles launched from smaller surface vessels, unmanned systems can provide organic ISR to cheap platforms and increase the observable range of existing systems. Aerostats with sophisticated sensors, themselves a kind of unmanned system, can provide constant surveillance in uncontested environments. Augmented eyes and ears are crucial for a country that frets over its lack of strategic depth.

Unmanned systems can also be used for missions beyond ISR that are critical to Singapore's security. The country's economy is in large part dependent on its natural harbor and the surrounding waterways; unmanned surface and underwater vehicles,

due to low cost and no risk to human life, are excellent for interdiction at a distance and thus port security.[70] Unmanned underwater vehicles (UUVs) and unmanned surface vehicles (USVs) are increasingly being applied to complex operations that impinge on port and maritime security, including anti-submarine warfare, intensely laborious mine countermeasures and other operations.[71] These capabilities can be made expeditionary by using conventional platforms – such as the littoral mission vessel, the Joint Multi Mission Ship or the A-330 tanker transport aircraft – as "mother ship" carriers for unmanned systems.

Singapore's strategic logic, cost pressures and societal advantages position it well to be a leader should this regime come to fruition.

All of these capabilities, many of which are readily available for adaptation from existing commercial technologies, can over time obviate costly manned force structure. This is helpful for the army, where most of the personnel reside and which is strained by demographic challenges to Singapore's conscription system.[72] This potential for savings could be amplified by investment in the inchoate concept of multivehicle control, whereby a single operator can control several or perhaps many platforms. This could provide crucial leverage and cost savings for a country that has a small corps of professional military officers.[73]

From a process perspective, unmanned systems – especially when paired with new industrial technology such as 3-D printing – can disrupt and enhance formerly vexatious procurement cycles. Militaries can acquire small numbers of present-day technology and iterate concepts of operation at low cost and without risking obsolescence due to a decades-long development cycle. On the other hand, a country could opt for unmanned systems that are as optimized, exquisite and expensive as legacy manned weapons. Singapore's cost sensitivities and pragmatic reputation on defense procurement lends itself to the former, flexible model, and indeed there is evidence that Singapore's approach to unmanned systems has leveraged these unique advantages.

The ability to improve continually at low cost is especially pronounced in the case of software, which is the key to autonomy and many other processes. Even where upfront development costs are high, constant upgrades and infinite scalability can yield high return on investment. Software is "eating the world," and military operations are no exception.[74] Inchoate experiments in autonomous cyberdefense – self-learning computer programs protecting mission-critical computer programs against enemy computer programs – could revolutionize the cybermissions of militaries such as the SAF.[75]

Forward-leaning military thinkers are beginning to conceive of "a swarm, large numbers of highly autonomous uninhabited systems coordinating their actions on the battlefield. This will enable greater mass, coordination, intelligence and speed than would be possible with networks of human-inhabited or even remotely controlled uninhabited systems."[76]

This concept raises tantalizing possibilities for Singapore and other states like it. As U.S. Deputy Secretary of Defense Robert Work has written:

> Operationally, the ability of smaller states (e.g. Singapore, Qatar, Bahrain, some NATO partners) to leverage additive manufacturing and other advanced industrial techniques may

> enhance their ability to create next generation capabilities, produce them at scale, and field military forces at a level well above historical norms. In fact, a fully realized robotics warfare regime may decouple military power from the population base, traditionally a significant metric of potential military power.[77]

Certainly, these visions rest on some untested assumptions about the trajectories of different technologies. Furthermore, incorporating unmanned systems brings up many unanswered conceptual questions. For instance, it is far from clear that unmanned systems will bolster deterrence, which is one of the SAF's primary missions. The lack of risk to human life may reduce the military's efficacy as a peacetime political implement, as a decision to employ an unmanned system in a given contingency could imply less resolve or political will than an equivalent manned platform. Moreover, war-fighting concepts that depend on secure communications, including putative reconnaissance-strike swarms, may incentivize adversaries to make surprise blinding strikes at the very outset of tensions.[78]

Nevertheless, the potential exists for the world to experience a discontinuity in warfare. The Ministry of Defence seems to recognize the promise: Defence Minister Ng has even referred to the possibility of using swarming tactics. Singapore's

strategic logic, cost pressures and societal advantages position it well to be a leader should this regime come to fruition.

IV. CONCLUSION

Without a doubt, the strategy that Singapore has constructed to address its perceived vulnerability and advance its interests faces many challenges. Senior Singaporean leaders have acknowledged the long-term demographic and other challenges to its developmental model and social system. A future great power conflict between the United States and China, or between some other correlation of increasingly powerful states in the Indo-Pacific, could derail the postwar Asian miracle and threaten Singapore's economic or physical security. On the other hand, an economically and militarily flagging United States combined with intensifying economic dependence on China could see Singapore unmoored from its traditional security partner and increasingly sucked into Beijing's orbit. Black swan events such as natural disasters, nuclear terrorism or pandemic disease could wreak havoc in such a small and densely packed state. But fundamentally, all of these challenges are either unknowable possibilities or outside the purview of foreign policy.

On the other hand, should things continue on present trend lines, Singapore seems well-positioned to continue expanding its strategic space and overall security through continued military modernization and geopolitical balancing achieved through bilateral and multilateral means. Moreover, should certain step-wise jumps be made in the technologies underlying unmanned and autonomous systems, Singapore could harness those changes to exploit its special societal advantages, ease the limiting constraints of its size, leapfrog a region that is spending heavily on legacy systems and possibly become an entirely unprecedented type of power.

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6. Leifer, *Singapore's Foreign Policy: Coping with Vulnerability,* 2.

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14. Singapore Ministry of Defence, "Defence Policy & Diplomacy," October 18, 2012, http://www.mindef.gov.sg/imindef/key_topics/defence_policy.html.

15. Leifer, *Singapore's Foreign Policy: Coping with Vulnerability,* 9.

16. Acharya, *Singapore's Foreign Policy: The Search for Regional Order,* 6-8.

17. Singapore is acutely sensitive to the posture and activities of major powers in its region, including Northeast Asian powers such as Japan and Korea that are further afield but still powerful. Singapore also has a long and fruitful relationship with India. For an illustration of Singapore's recent bilateral security relations with some of these countries, see Patrick M. Cronin et al., "The Emerging Asia Power Web: The Rise of Bilateral Intra-Asian Security Ties" (Center for a New American Security, 2013).

18. Emma Chanlett-Avery, "Singapore: Background and U.S. Relations," RS20490 (Congressional Research Service, July 26, 2013), 4.

19. Bob Carr, *Diary of a Foreign Minister* (Sydney: University of New South Wales Press, August 1, 2014), 335.

20. Leifer, *Singapore's Foreign Policy: Coping with Vulnerability,* 100.

21. This deal had the ancillary benefit to Singapore of enabling greater training opportunities for the SAF with U.S. forces, in Singapore and the United States. Due to its small size, Singaporean diplomacy has long focused on gaining training grounds for the SAF to exercise in different climates. It thus has decades-long bilateral exercises with countries such as Australia, Brunei, India, Malaysia, the United States and others.

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