



National
Defence

Défense
nationale

DEFENCE RESEARCH AND DEVELOPMENT CANADA (DRDC)

RECHERCHE ET DÉVELOPPEMENT POUR LA DÉFENSE CANADA (RDDC)



Defence of North America: Chinese Missile Threat Assessment

Between Hope and Hype: An Assessment of People's Republic of China (PRC) Ambitions and the Reality of Chinese Missile Developments

Kyle Christensen
DRDC – Centre for Operational Research and Analysis

Prepared for: Paul Comeau, Director General Research and Development Programmes (DGRDP);
Marc Bouchard, Director General Military Personnel Research and Analysis (DGMPPRA).

Terms of Release: This document is approved for public release.

Defence Research and Development Canada
Scientific Report
DRDC-RDDC-2022-R162
November 2022

Canada

CAN UNCLASSIFIED

IMPORTANT INFORMATIVE STATEMENTS

This document was reviewed for Controlled Goods by Defence Research and Development Canada (DRDC) using the Schedule to the *Defence Production Act*.

Disclaimer: This publication was prepared by Defence Research and Development Canada an agency of the Department of National Defence. The information contained in this publication has been derived and determined through best practice and adherence to the highest standards of responsible conduct of scientific research. This information is intended for the use of the Department of National Defence, the Canadian Armed Forces ("Canada") and Public Safety partners and, as permitted, may be shared with academia, industry, Canada's allies, and the public ("Third Parties"). Any use by, or any reliance on or decisions made based on this publication by Third Parties, are done at their own risk and responsibility. Canada does not assume any liability for any damages or losses which may arise from any use of, or reliance on, the publication.

Endorsement statement: This publication has been peer-reviewed and published by the Editorial Office of Defence Research and Development Canada, an agency of the Department of National Defence of Canada. Inquiries can be sent to: Publications.DRDC-RDDC@drdc-rddc.gc.ca.

- © His Majesty the King in Right of Canada as represented by the Minister of National Defence, 2022
- © Sa Majesté le Roi du chef du Canada représentée par le ministre de la Défense nationale, 2022

CAN UNCLASSIFIED

Abstract

This Scientific Report focuses on assessing the People's Republic of China's (PRC) recent investment in cruise missile and ballistic missile technologies, investment in hypersonic glide vehicles (HGV), and whether they can hold North America at risk. The study is conducted as part of the Program Activity (PAct) Defence of North America (DNA)_007 project. The DNA_007 PAct aims to conduct a strategic assessment of emerging conventional threats to North America and deterrence and defence concepts/capabilities used to address these potential challenges. For instance, this Report assesses how an adversary such as China might hold North America at risk with conventional strategic weapons. Since the defence, economic, and transportation infrastructure of the United States and Canada are intrinsically interconnected, it is conceivable that Canada could be targeted during a limited conventional attack on North America. In this context, this study ultimately finds that China's conventional cruise missiles (subsonic, supersonic, and hypersonic), HGVs, and conventionally-armed ballistic missiles do not directly threaten North America. The cruise missiles do not have the range to target North America from significant distances; and unless they are mated to intercontinental ballistic missiles (ICBM), HGVs currently deployed on boost-glide or other air- or sea-based delivery systems do not have the range to target North America either.

Significance to Defence and Security

China's evolving missile capabilities aim to deter intervention by an adversary in the western Pacific. Significant threats to North America could emerge if China mates advanced conventional missiles to capable strategic delivery systems. Most concerning are a) the development of nuclear-powered cruise missile submarines (SSGN) on extended deterrence patrols, and b) the development of an actual intercontinental strategic bomber. However, China's evolving missile capabilities are aimed at strengthening its anti-access/area-denial (A2/AD) defences in the western Pacific and creating an ability for China to perform anti-ship missile (ASM) strikes against moving targets at sea.

In the context of hypersonic and boost-glide missile systems, the threat in the western Pacific is compounded by the reduced time available for decision-makers to respond to an incoming attack. Consequently, the greatest threat in this strategic context is a miscalculation. Miscalculation increases because the entanglement of dual-capable missile systems make it challenging to determine if an attack is conventional, nuclear, limited, or full-scale.

Résumé

Le présent rapport scientifique (RS) vise à évaluer les récents investissements de la République populaire de Chine (RPC) dans les technologies de missiles de croisière et de missiles balistiques et les planeurs hypersoniques, et à déterminer s'ils peuvent mettre l'Amérique du Nord en danger. L'étude est menée dans le cadre du projet Défense de l'Amérique du Nord (DNA)_007 de l'activité de programme (AP). L'activité de programme DNA_007 vise à mener une évaluation stratégique des menaces classiques qui pèsent sur l'Amérique du Nord et des concepts/capacités de dissuasion et de défense utilisés pour relever ces défis potentiels. Par exemple, ce rapport fait état de la façon dont un adversaire comme la Chine pourrait mettre l'Amérique du Nord en danger avec des armes stratégiques conventionnelles. Puisque les infrastructures en matière de défense, d'économie et de transport des États-Unis et du Canada sont intrinsèquement liées, il est concevable que le Canada puisse être visé lors d'une attaque conventionnelle limitée contre l'Amérique du Nord. Dans ce contexte, la présente étude révèle que les missiles de croisière conventionnels (subsoniques, supersoniques et hypersoniques), les planeurs hypersoniques et les missiles balistiques conventionnels de la Chine ne menacent pas directement l'Amérique du Nord. Les missiles de croisière n'ont pas la portée nécessaire pour atteindre l'Amérique du Nord à partir de grandes distances et, à moins qu'ils ne soient jumelés à des missiles balistiques intercontinentaux (ICBM), les planeurs hypersoniques actuellement utilisés sur des systèmes de lancement aériens ou maritimes n'ont pas non plus la portée nécessaire pour atteindre l'Amérique du Nord.

Importance pour la défense et la sécurité

L'évolution des capacités de missiles de la Chine vise à dissuader un adversaire d'intervenir dans l'océan Pacifique occidental. Les menaces pour l'Amérique du Nord pourraient devenir sérieuses si la Chine transforme des missiles conventionnels avancés en systèmes de livraison stratégiques performants. Les éléments les plus préoccupants sont a) la mise au point de sous-marins nucléaires lance-missiles de croisière (SSGN) pour des patrouilles de dissuasion prolongées, et b) la mise au point d'un véritable bombardier stratégique intercontinental. Toutefois, la Chine cherche à renforcer ses défenses en matière d'interdiction d'accès et de zone (A2/AD) dans le Pacifique occidental et à se doter des capacités nécessaires pour effectuer des frappes de missiles antinavires (ASM) contre des cibles mobiles en mer.

Dans le contexte des systèmes de missiles et de planeurs hypersoniques, le délai réduit dont disposent les décideurs pour répondre à une attaque imminente ajoute à la menace dans le Pacifique occidental. Par conséquent, la plus grande menace dans ce contexte stratégique est une erreur de calcul. Cette dernière est d'autant plus importante que l'enchevêtrement des systèmes de missiles double capacité rend difficile de déterminer si une attaque est conventionnelle, nucléaire, limitée ou de grande envergure.

Table of Contents

Abstract	i
Significance to Defence and Security.	i
Résumé	ii
Importance pour la défense et la sécurité	ii
Table of Contents	iii
List of Figures	iv
List of Tables	v
Acknowledgements	vi
1 Introduction	1
1.1 Key Points.	2
1.2 Background	3
2 Assessment of Intentions.	5
3 Assessment of Capabilities	10
3.1 People’s Liberation Army Rocket Force	10
3.2 Ballistic Missiles and Cruise Missiles	10
4 Implications for China.	17
4.1 Anti-Access/Area-Denial	17
4.2 Development of a Strategic Nuclear Triad and Use of Dual-Capable Systems	18
4.2.1 The Moderately Effective (Tough) Option: Air-Launched Cruise Missiles	18
4.2.2 The Best (Tough) Option: Nuclear-Powered Cruise Missile Submarines	21
4.2.3 The Least Effective (Easy) Option: Ship-Based Land-Attack Cruise Missiles	22
5 Implications for Continental Defence	23
5.1 The Hypersonic Challenge	23
5.2 Dual-Capable, Entanglement and Miscalculation.	24
6 Conclusion	26
References	28
Annex A Chinese Ballistic and Cruise Missiles	35
List of Symbols/Abbreviations/Acronyms/Initialisms.	40

List of Figures

Figure 1:	First and second island chains.	7
Figure 2:	Required land-based ballistic missile range: China to the United States.	11
Figure 3:	Chinese land-based ballistic missile ranges: China to North America.	12
Figure 4:	The People’s Liberation Army Air Force’s (PLAAF) Mid-Pacific Bomber Gap.	19

Acknowledgements

The author would like to thank Dr. Michael Roi for his assistance in the publication process as Associate Editor and inputs into early manuscripts of this Scientific Report. The author would also like to thank Dr. Nancy Teeple for her contribution to this Report. She was involved in many hours of discussion and exploring of ideas that found their way on to the pages of this Report. Finally, the author would very much like to thank both peer reviewers for their insightful and helpful comments. Their observations and recommendations contributed significantly to the quality of the final draft of this Report.

1 Introduction

In the last year, China has tested more hypersonic weapons than we have in a decade. We've got to fix that.

—Michael D. Griffin, United States Under Secretary of Defense for Research and Engineering.
Speaking at a National Defense Industrial Association event, 13 December 2018.¹

North America is no longer safe! That is the prevailing narrative amongst some defence analysts, academics, and military leaders, and it is a problematic mindset for most North Americans to grasp.² While intercontinental ballistic missiles (ICBM) have threatened North America since 1957³—effectively erasing fortress North America—developments in advanced conventional and dual-capable missile systems (missiles capable of delivering nuclear or conventional warheads), and increasingly aggressive posturing by countries not friendly to the West, have placed North America in an increasingly vulnerable position.

North American Aerospace Defense Command (NORAD), for example, has identified adversaries armed with advanced conventional weapons as an emerging threat because such capabilities could impede and/or prevent the deployment of forces from the United States and Canada. One of the countries purported to be able to hold North America at risk in this way is the People's Republic of China (hereafter PRC or China). As General Terrence J. O'Shaughnessy, Commander NORAD and United States Northern Command (USNORTHCOM) testified to the United States Senate Armed Services Committee:

China is developing...technologies that...seek to hold portions of the homeland at risk with long-range, conventionally armed precision-strike weapons. In a future crisis, China could use these weapons...to attack our logistics nodes in an attempt to frustrate our force flows across the Pacific.⁴

¹ Quoted in Garrett Reim, "Counter hypersonic weapon possible by mid-2020s: DoD," *Flight Global* (2018), <https://www.flightglobal.com/civil-uavs/counter-hypersonic-weapon-possible-by-mid-2020s-dod/130690.article> (accessed 27 September 2021).

² For example, this narrative is found in Michael Beckley, "In Future Wars, the U.S. Military Will Have Nowhere to Hide," *Foreign Policy* (20 November 2019), <https://foreignpolicy.com/2019/11/20/russia-china-increasingly-able-attack-united-states-bases-networks-war/> (accessed 3 October 2022); Andrea Charron and James Fergusson, *Defending the Continent: NORAD Modernization and Beyond*, Policy Perspective (Calgary: Canadian Global Affairs Institute, May 2022), pp. 2–3. Congressional Budget Office, *National Cruise Missile Defense: Issues and Alternatives* (Washington, D.C.: February 2021), pp. 16–17; Tom Karako, Matt Strohmeier, Ian Williams, et al., *North America is a Region, Too: An Integrated, Phased, and Affordable Approach to Air and Missile Defense for the Homeland*, CSIS Missile Defense Project (Washington, D.C.: Center for Strategic and International Studies, July 2022), p. 2; Terrance J. O'Shaughnessy and Peter M. Fesler, *Hardening the Shield: A Credible Deterrent & Capable Defense for North America* (Washington, D.C.: Wilson Center, Canada Institute, September 2020), pp. 2–3; and Glen D. VanHerck, *To Compete Globally, We Must Be Strong at Home*, NORAD and USNORTHCOM Strategy: Executive Summary (NORAD and USNORTHCOM, March 2021), p. 4–5.

³ Royal Museums Greenwich, *Space Race Timeline* (2021), <https://www.rmg.co.uk/stories/topics/space-race-timeline> (accessed 15 May 2022).

⁴ Terrence J. O'Shaughnessy, "Statement of General Terrence J. O'Shaughnessy, United States Air Force Commander United States Northern Command and North American Aerospace Defense Command before the Senate Armed Services Committee" (Washington D.C.: U.S. Senate Committee on Armed Services, 13 February 2020), p. 6.

Consequently, North America is becoming increasingly vulnerable due to the development of a combination of ballistic missiles, hypersonic glide vehicles (HGV),⁵ and next-generation cruise missiles, many of which are dual-capable. The most advanced of these systems can be launched from long ranges and evade early warning detection and missile defences through advances in speed, stealth, and manoeuvrability.

This Scientific Report will focus on assessing the PRC's recent investment in cruise missile and ballistic missile technologies, investment in HGVs, and if they can hold North American assets at risk.⁶ The Report will also explore China's intentions and plans comprising its strategic calculus in deploying these capabilities as a threat to North America, and finds that China's conventional and dual-capable ballistic and cruise missiles, as currently deployed, do not pose a direct threat to North America. Except for nuclear-armed ICBMs, China's current arsenal of conventionally armed missiles does not have the range to attack North America.

This assessment also finds that China's evolving missile capabilities aim to deter intervention by an adversary in the western Pacific. China's evolving missile capabilities are aimed at strengthening its anti-access/area-denial (A2/AD)⁷ defences in the western Pacific and creating an ability for China to perform anti-ship missile (ASM) strikes against moving targets at sea rather than attacking targets in North America.⁸

1.1 Key Points

Ballistic and Cruise Missiles:

- China's conventional cruise missiles (subsonic, supersonic, and hypersonic) do not directly threaten North America. They do not have the range to target North America from significant distances.
- Likewise, China's delivery platforms (aircraft, ships, and submarines) cannot threaten North America with conventionally armed cruise missiles from significant distances either. Conventionally armed cruise missiles would need to be fired from platforms in launch boxes in much closer proximity to the North Pacific.
- Deploying strategic delivery assets close to North America would expose these delivery platforms to counterattack by United States air defence, naval strike, and anti-submarine warfare (ASW) systems.
- Except for nuclear-equipped ICBMs, none of China's conventional or dual-capable ballistic missile systems have the range to reach the continental United States from China.

⁵ Hypersonic is defined as speeds exceeding Mach 5 (approximately 6,116 km/h) and the capability to maneuver (both vertical and horizontal) during the entire flight while travelling at these speeds inside the atmosphere (approximately 90 km). The definition of hypersonic used here is from Stockholm International Peace Research Institute. The definition excludes many ballistic missiles because, while some ballistic missiles are equipped with Maneuverable Re-Entry Vehicles (MaRV) or Maneuverable Independently Re-Targetable Vehicles (MIRV), and travel at speeds exceeding Mach 20 (25,200 km/h), they do not meet the atmospheric prerequisites. However, the definition includes missiles equipped with HGVs utilizing boost-glide trajectories. Kolja Brockmann and Markus Schiller, "A matter of speed? Understanding hypersonic missile systems," *Commentary/Backgrounder* (Stockholm International Peace Research Institute, 4 February 2022), <https://www.sipri.org/commentary/topical-backgrounder/2022/matter-speed-understanding-hypersonic-missile-systems> (accessed 29 April 2022).

⁶ For an assessment of the Russian missile threat to North America, see Nancy Teeple, *Russian Threats to North America: An Assessment of Capabilities and Intentions – Executive Summary*, Defence Research and Development Canada, Scientific Letter, DRDC-RDDC-2022-L044 (February 2022).

⁷ A2 is defined as preventing or restricting a military force's ability to move into a theatre of operations. AD is defined as preventing or denying the freedom of action of forces already in theatre from using bases for operations. See Andrew F. Krepinevich, *Why Air/Sea Battle?* (Washington, D.C.: Center for Strategic and Budgetary Assessments, 19 February 2010), pp. 9–10; and Andrew F. Krepinevich, Barry Watts, and Robert Work, *Meeting the Anti-Access and Area-Denial Challenge* (Washington, D.C.: Center for Strategic and Budgetary Assessments, 2003), p. ii.

⁸ Office of the Secretary of Defense, *Annual Report to Congress: Military and Security Developments Involving the People's Republic of China 2021* (Washington, D.C.: U.S. Department of Defense, 2021), p. 61.

Chinese Intentions:

- While China could attack North America with conventionally armed cruise missiles, in extremis, this is not the principal driver of the Chinese offshore water defence approach and build-up of their missile capabilities.
- Instead, China's current conventional and dual-capable cruise and ballistic missiles are deployed to maintain regional deterrence and dominance in the western Pacific. These missile systems enhance China's A2/AD bastion defence capabilities.
- China's aim is to deter, defend, and defeat adversaries within the first island chain, and project power out into the second island chain.

Potential Long-Term Challenges:

- A challenge to North American defences occurs in an alternative security environment.
- China has or is developing a variety of very capable missile systems. Significant threats to North America could emerge if China mates advanced conventional missiles to capable strategic delivery systems.
- Most concerning are a) the development of nuclear-powered cruise missile submarines (SSGN) on extended deterrence patrols, and b) the development of an actual intercontinental strategic bomber.
- Development and widespread deployment of a conventional Fractional Orbital Bombardment System (FOBS) would also be a significant concern to North America.

1.2 Background

Since the defence, economic, and transportation infrastructure of the United States and Canada are intrinsically interconnected, it is conceivable that Canada could be targeted during a limited conventional attack on North America. In this context, Ottawa must be capable of defending against threats to Canada as well as fulfilling its commitments to the defence of North America through NORAD.⁹

In support of these objectives, this study is conducted as part of the Program Activity (PAct) Defence of North America (DNA)_007 project. The DNA_007 PAct aims to conduct a strategic assessment of emerging conventional threats to North America and answer critical research questions concerning deterrence and defence concepts/capabilities used to address these potential challenges. Critical research questions include a) assessing the deterrence capabilities of North America in the face of changing technologies, including current and evolving regional security dynamics, and b) assessing how adversaries might hold North America at risk with conventional strategic weapons. One of the critical elements of the DNA project is to emphasize the conventional threat to North America. **As such, this Report will focus on conventional and dual-capable ballistic and cruise missiles (including HGVs), and will also consider the conventional capability of the dual-capable systems discussed herein.**

⁹ Canada, Department of National Defence, *Strong, Secure, Engaged: Canada's Defence Policy* (Ottawa: National Defence, 2017), p. 14.

There are two primary reasons for this approach. First, according to the Defense Intelligence Ballistic Missile Analysis Committee, many countries view the development of advanced ballistic and cruise missile systems as symbols of national power.¹⁰ In the past, nuclear weapons and ICBMs were symbols of national power developed by advanced wealthy nations such as the United States, the United Kingdom, France, and the Soviet Union. Today, advanced missile technologies such as HGVs, stealth cruise missiles, and scramjet-powered cruise missiles are becoming increasingly plausible and as such are viewed as symbols of national power. While the proliferation of advanced missile technologies is bringing their access and use to a broader group of regional actors, the most complex of these missile systems will be adopted by the most advanced nations.

Second, the appeal of cruise missiles and ballistic missiles results from various improvements that allow them to be used more effectively when mated with conventional warheads. For instance, significant advancements in missile technologies (heat-tolerant composites, guidance and manoeuvre systems, weight reduction, propulsion), performance improvements (speed, range, accuracy), and improvements in their ability to penetrate missile defence systems has added to their appeal.¹¹ In other words, technological and performance improvements are reinvigorating the air-breathing threat to North America. Unlike previous air-breathing threats that were typically subsonic, had moderate ranges, and nuclear-armed, current systems are much more capable, harder to detect and defend against, more accurate, and possibly conventionally armed.

¹⁰ Defense Intelligence Ballistic Missile Analysis Committee, *Ballistic and Cruise Missile Threat 2020* (Wright-Patterson, OH: National Air and Space Intelligence Center, July 2020), p. 2.

¹¹ *Ibid.*, p. 2.

2 Assessment of Intentions

China's security and defence intentions can be broadly identified in the concept of "active defense." A revised concept of active defense was adopted by the Central Military Commission (CMC) in September 1980, at the end of a month-long meeting to discuss how to counter an attack by the Soviet Union.¹² Prior to 1980, China's concept of active defense was predicated on waiting for an adversary to attack, luring the enemy into its territory, and then counterattacking.¹³ In effect, this was a strategy that set a weaker state such as China against much more powerful states such as the United States and/or the Soviet Union.

After 1980, however, active defense shifted to resisting an invasion by an adversary and preventing a breakthrough using forward defence tactics. The People's Liberation Army (PLA) defined active defense as "using proactive offensive actions to defend against the attacking enemy."¹⁴ While elements of the pre-1980 strategy were retained, such as a weaker country like China engaging and defending itself against a more powerful state, the way in which China would go about defending itself would be different. After 1980, CMC strategic thinking and Chinese Communist Party (CCP) direction would require the PLA to develop the ability to conduct combined arms operations for both defensive and offensive operations, coordinate tank, artillery, and infantry attacks (i.e., coordinated offensive fires), and develop and deploy a layered defensive network. In a very real sense, the embryonic notion of modern A2/AD bastion defence can be found rooted in the CMC's 1980s strategic thinking.

While the broad principles of China's approach to active defense have remained generally consistent since 1980, the CCP began issuing revised strategic military guidelines more regularly following the Cold War, in light of evolving strategic developments. In 1993, for example, Jiang Zemin directed the PLA to prepare to win "local wars" under "high-tech conditions."¹⁵ Jiang Zemin revised the PLA's strategic military guidelines after observing the United States' overwhelming dominance during the 1991 Gulf War, a war the PLA acknowledges it would have been wholly unprepared to defend against.¹⁶

In 2004, Hu Jintao ordered the military to focus on winning "local wars under informationized conditions." In 2014, Xi Jinping placed greater focus on fighting and winning "informatized local wars."¹⁷ Again, these revisions were in response to the growing role and importance of information operations (IO) in places such as Iraq, Afghanistan, Syria, Ukraine, and elsewhere. China's political and military leaders accepted that war had fundamentally changed, and China had to continue to adapt its approach to warfare where a weaker country could engage with and potentially defend itself in a high-tech conflict against the United States.¹⁸

¹² M. Taylor Fravel, *Active Defense: China's Military Strategy Since 1949*, Book 2 (Princeton University Press, April 2019), p. 139.

¹³ *Ibid.*, p. 141.

¹⁴ *Ibid.*, p. 62.

¹⁵ Gurmeet Kanwal, *China's New War Concepts for 21st Century Battlefields* (Institute of Peace and Conflict Studies, 1 July 2007), <http://www.jstor.org/stable/resrep09034> (accessed 29 April 2021).

¹⁶ Qiao Liang and Wang Xiangsui, *Unrestricted Warfare* (Beijing: PLA Literature and Arts Publishing House, February 1999), p. 4.

¹⁷ M. Taylor Fravel, "China's new military strategy: 'Winning informationized local wars,'" *China Brief* Jamestown Foundation, July 2015; 15(13), <https://jamestown.org/program/chinas-new-military-strategy-winning-informationized-local-wars/> (accessed 10 September 2021).

¹⁸ The idea that a weaker country could defend itself in a high-tech conflict against a stronger country was articulated as far back as the late 1990s in Liang and Xiangsui, *Unrestricted Warfare*, op cit.

Commensurate with China's evolving security and defence guidelines, Beijing has continued to modernize its military, developing and building traditional military capabilities in terms of sophistication and reach crucial to fighting and winning modern "informatized" wars.¹⁹ As detailed in the United States Department of Defense's *Annual Report to Congress 2021*, active defense currently adopts the principles of strategic defence in combination with offensive action at the operational and tactical levels. It is rooted in the principle of avoiding initiating armed conflict but responding with force if provoked, or keeping to the stance that "we will not attack unless we are attacked, but we will surely counterattack if attacked."²⁰ For the CCP, conventional military power is essential to threaten the escalation of the use of conventional military force and maintain and safeguard China's core national interests, particularly its sovereignty.²¹

China's military developments also take place within the context of planning for a Taiwan contingency and deterring external powers from interfering in the internal affairs of China. As articulated in the Department of Defense (DoD's) *Annual Report to Congress 2021*:

The PLA's evolving capabilities and concepts continue to strengthen its ability to "fight and win wars" against a "strong enemy" [a likely euphemism for the United States], coerce Taiwan and rival claimants in territorial disputes, counter an intervention by a third party in a conflict along PRC's periphery, and project power globally.²²

If China accomplishes these modernization objectives, it will provide Beijing with a spectrum of military options not only when it comes to invading Taiwan, but pressuring and intervening in Taiwan's affairs as well. Most assessments of China's options when it comes to Taiwan focus on the dichotomy between peace (Taiwan independence) and war (invasion of Taiwan).²³ However, the reality is that Beijing has, or is developing, many options when it comes to placing pressure on Taiwan short of invasion. In addition to traditional show of force and increasing levels of harassment and interdiction, China could decide to blockade Taiwan, subvert or interdict Taiwan's trade routes and supply lines, or seize islands such as Matsu or Kinmen off China's coast. Additionally, China's growing military capabilities could permit it to undertake these actions while holding the United States and other allies at a standoff distance.

China's most recent military strategy under Xi Jinping, while still predicated on the concept of active defense and countering an intervention along its periphery, takes on a much more assertive tone. It characterizes China as being involved in a major international strategic competition with other states, particularly the United States. Significant emphasis is placed on returning China to a position of strength, prosperity, and leadership on the world stage by 2049.²⁴ China's leaders stress the importance of meeting key military transformation milestones so that the PLA can field a world-class military and achieve a "great rejuvenation of the Chinese nation" by 2049.²⁵

¹⁹ James K. Wither, "Making sense of hybrid warfare," *Connections QJ* 2016; 15(2): pp. 73–87; and M. Fravel, "China's new military strategy," op cit.

²⁰ Office of the Secretary of Defense, *Annual Report to Congress 2021*, op cit., p. 33.

²¹ Ibid., p. 13; and *China's National Defense in the New Era* (Beijing: The State Council Information Office of the People's Republic of China, July 2019), p. 7.

²² Office of the Secretary of Defense, *Annual Report to Congress 2021*, op cit., p. 43.

²³ John Culver, "How We Would Know When China Is Preparing to Invade Taiwan," Commentary (Washington, D.C.: Carnegie Endowment for International Peace, 3 October 2022), <https://carnegieendowment.org/2022/10/03/how-we-would-know-when-china-is-preparing-to-invade-taiwan-pub-88053> (accessed 5 October 2022).

²⁴ The year 2049 is important to the CCP because it will mark the centenary of the founding of the PRC.

²⁵ Office of the Secretary of Defense, *Annual Report to Congress 2021*, op cit., pp. 1–4.

In terms of security aspirations, themes extracted from China's national strategy include regional sovereignty and security issues and global power projection aspirations. The PRC's defence policy, for instance, aims to safeguard its sovereignty and security and strengthen its ability to deter, or, if required, defeat an intervention by a third-party during a large-scale theatre campaign (i.e., a Taiwan scenario). As a result, the PLA's A2/AD capabilities are most robust within the first island chain (see Figure 1). However, it is also developing the capabilities and operational concepts necessary to conduct offensive operations within the second island chain, throughout the Pacific and Indian Oceans, and in some cases, globally.



Figure 1: First and second island chains.²⁶

²⁶ Map from Office of the Secretary of Defense, *Annual Report to Congress: Military and Security Developments Involving the People's Republic of China 2011* (Washington, D.C.: U.S. Department of Defense, 2011), p. 23.

In order to highlight the increasingly global character Beijing ascribes to its military power in accordance with its defence policy and military strategy, the PLA is taking a more active role in advancing China's foreign policy.²⁷ The PLA is increasing its capacity to project power globally to realize China's security objectives, secure China's growing overseas goals, and advance and defend China's foreign policy interests. In this regard, China's rise to great power status is intrinsically linked to its military modernization. In effect, CCP leaders believe that China's global activities, including the PLA's growing global presence, are necessary to create a favourable international environment for China's rise to great power status. Most concerning is that the CCP's ambitions include far-reaching efforts to revise the international order on terms favourable to China's national and global aspirations.²⁸

Furthermore, China's leaders are increasingly willing to confront the United States and its allies in areas where vital strategic interests diverge.²⁹ For instance, Beijing's increased level of assertiveness vis-à-vis the United States and others can be identified by four characteristics: their location, their target, their regularity, and their boldness. In the first instance, Beijing's increased level of assertiveness has been taking place mostly within the first island chain, in the areas of the South China Sea, the East China Sea, and the Taiwan Strait. In other words, Beijing's assertiveness is linked to areas where the PLA holds an operational advantage. Second, Beijing's engagements are not targeted solely at the United States, they are targeted at allies and partners such as Japan, Canada, Australia, Vietnam, South Korea, and the Philippines.³⁰ In 2017, for instance, Beijing used economic and diplomatic pressure on South Korea in an attempt to get it to reverse its decision to allow the deployment of the United States' Terminal High-Altitude Area Defense (THAAD) anti-ballistic missile (ABM) system in its territory.³¹ Third, there has been a "statistically significant" increase in the number of PLA engagements and intercepts in these areas over the last five years, reaching unprecedented levels in 2022.³² While exact numbers are not available, according to one Canadian source, there have been approximately 60 intercepts involving Chinese fighter jets since the beginning of 2022, with at least two dozen being deemed "dangerous."³³

²⁷ As discussed in the DoD's *Annual Report to Congress 2021*, "A global PLA military logistics network and PLA military facilities could interfere with United States military operations and support offensive operations against the United States." Office of the Secretary of Defense, *Annual Report to Congress 2021*, op cit., p. 131.

²⁸ Ibid., p. 11.

²⁹ Ibid., p. 1; and *The Guardian*, "Xi Jinping warns China won't be bullied in speech marking 100-year anniversary of CCP" (1 July 2021), <https://www.theguardian.com/world/2021/jul/01/xi-jinping-warns-china-wont-be-bullied-100-year-anniversary-chinese-communist-party-> (accessed 11 September 2021).

³⁰ Ministry of National Defense, the People's Republic of China, "Defense spokesperson answers press question on Canadian military's hype of aircraft encounters" (6 June 2022), http://eng.mod.gov.cn/news/2022-06/06/content_4912402.htm (accessed 5 October 2022).

³¹ Office of the Secretary of Defense, *Annual Report to Congress: Military and Security Developments Involving the People's Republic of China 2022* (Washington, D.C.: U.S. Department of Defense, 2022), p. 23.

³² Jesse Johnson, "'Only a matter of time': Warnings of China-U.S. military miscalculation grow," *Japan Times* (27 July 2022), <https://www.japantimes.co.jp/news/2022/07/27/asia-pacific/china-us-military-miscalculation/> (accessed 5 October 2022).

³³ Sean Boynton, "Why is China 'buzzing' Canadian, Australian planes? Here's what you need to know," *Global News* (8 June 2022), <https://globalnews.ca/news/8904437/china-canada-buzzing-planes-north-korea-explainer/> (accessed 5 October 2022).

Finally, and most concerning is the risk taking and provocative, coercive, aggressive, and irresponsible behaviour of PLA intercepts. As one example, Chinese fighter jets intercepted an Australian surveillance patrol aircraft in international airspace in the South China Sea. The Chinese fighters deployed chaff into the path of the Australian patrol aircraft, causing damage to its engines.³⁴ According to Ely Ratner, Assistant Secretary of Defense for Indo-Pacific Security Affairs, “Beijing is systematically testing the limits of our collective resolve.”³⁵ In this environment of increased tensions, aggressive behaviour, and risk taking, it is felt it is only a matter of time before there is a major incident or accident in the region.³⁶

³⁴ Jesse Johnson, ““Only a matter of time,”” op cit., Chaff is a radar countermeasure, consisting of thin pieces of aluminium or metallized fibreglass, used by aircraft to distract or “spoof” radar-guided missiles.

³⁵ Idrees Ali, David Brunnstrom, and Michael Martina, “U.S. says Beijing’s South China Sea ‘provocations’ risk major incident,” *Reuters* (27 July 2022), <https://www.reuters.com/world/china/us-says-beijings-south-china-sea-provocations-risk-major-incident-2022-07-26/> (accessed 5 October 2022).

³⁶ *The Economist*, “America and China are one military accident away from disaster” (15 January 2022).

3 Assessment of Capabilities

3.1 People's Liberation Army Rocket Force

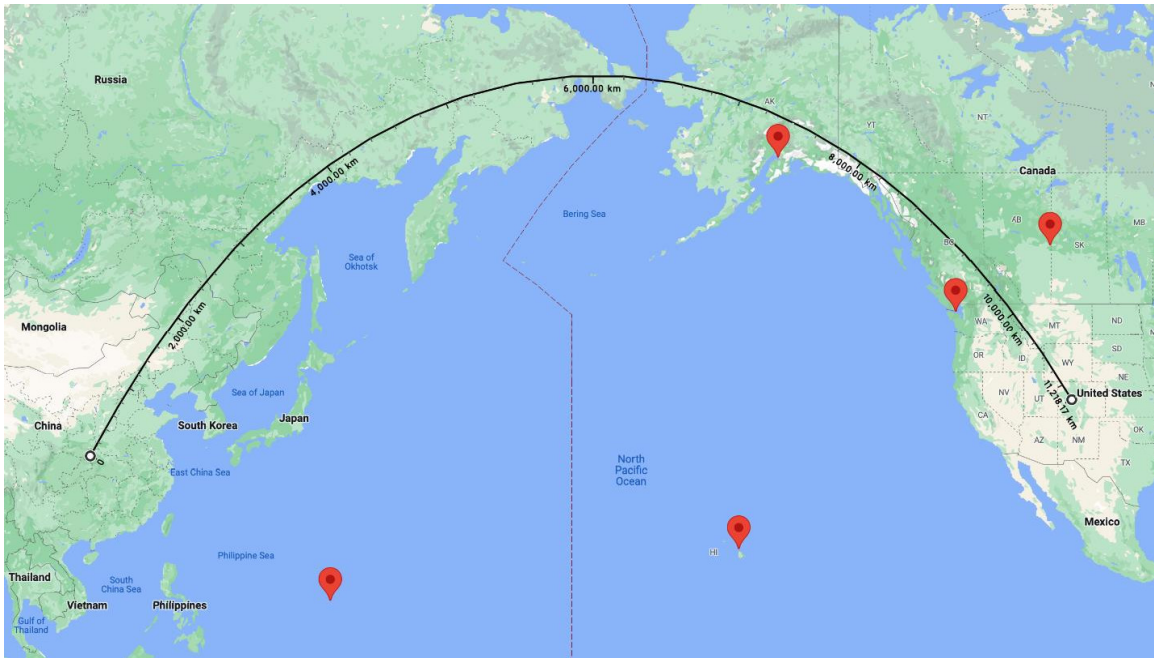
While this analysis focusses on China's non-nuclear, or at least dual-capable missile systems, a brief synopsis of the People's Liberation Army Rocket Force (PLARF) is necessary. For example, the PRC is developing new ICBMs to significantly improve its nuclear-capable missile forces.³⁷ China's nuclear forces will also significantly evolve over the next decade as it modernizes, diversifies, and increases the number of its air-, land-, and sea-based nuclear delivery platforms. However, the PLARF is also responsible for China's conventional missile forces. The PLARF fields a wide variety of conventional mobile ground-launched ballistic missiles and cruise missiles. In fact, the PLARF retains and deploys significantly more conventionally armed ballistic and cruise missiles than nuclear missiles.³⁸

3.2 Ballistic Missiles and Cruise Missiles

If the prevailing logic is that Beijing wants to hold North American assets at risk to prevent/impede their deployment without crossing the nuclear threshold, China's missiles require a range of approximately 9,500–12,200 km to legitimately target assets in North America (see Figure 2). For reference purposes, Figure 2 assumes the target is NORAD Headquarters (HQ) but includes targets such as Guam (Andersen Air Force Base [AFB]), Alaska (Elmendorf AFB), Hawaii (Naval Station Pearl Harbour), British Columbia (Canadian Forces Base [CFB] Esquimalt), and Alberta (CFB Cold Lake). It does not include locations closer to China's mainland, such as South Korea and Japan (Okinawa), because they are within the first island chain.

³⁷ Office of the Secretary of Defense, *Annual Report to Congress 2021*, op cit., p. 60.

³⁸ Matt Korda and Hans M. Kristensen, "China Is Building a Second Nuclear Missile Silo Field," *Federation of American Scientists* (26 July 2021), <https://fas.org/blogs/security/2021/07/china-is-building-a-second-nuclear-missile-silo-field/> (accessed 18 October 2021); Hans M. Kristensen, "China's Expanding Missile Training Area: More Silos, Tunnels, and Support Facilities," *Federation of American Scientists* (24 February 2021), <https://fas.org/blogs/security/2021/02/plarf-jilantai-expansion/> (accessed 28 March 2021); and Carla Babb, "China Nuclear Arsenal Growing Faster Than Previously Thought, Pentagon Says," *VOA News* (3 November 2021), <https://www.voanews.com/a/china-nuclear-arsenal-growing-faster-than-previously-thought-pentagon-says/6298605.html> (accessed 13 November 2021).



*Figure 2: Required land-based ballistic missile range: China to the United States.*³⁹

In this context, China's direct conventional missile threat to North America is non-existent. Except for nuclear-equipped ICBMs such as the DF-4, DF-31, DF-41, and DF-5, none of China's conventional or dual-capable land-based missile systems such as the DF-21 and DF-26 have the range to pose a direct threat to the continental United States (see Figure 3 and Annex A).

³⁹ Google Map of Asia-Pacific Region, *Google Maps* (2022), <https://www.google.ca/maps/> (accessed 11 January 2022).

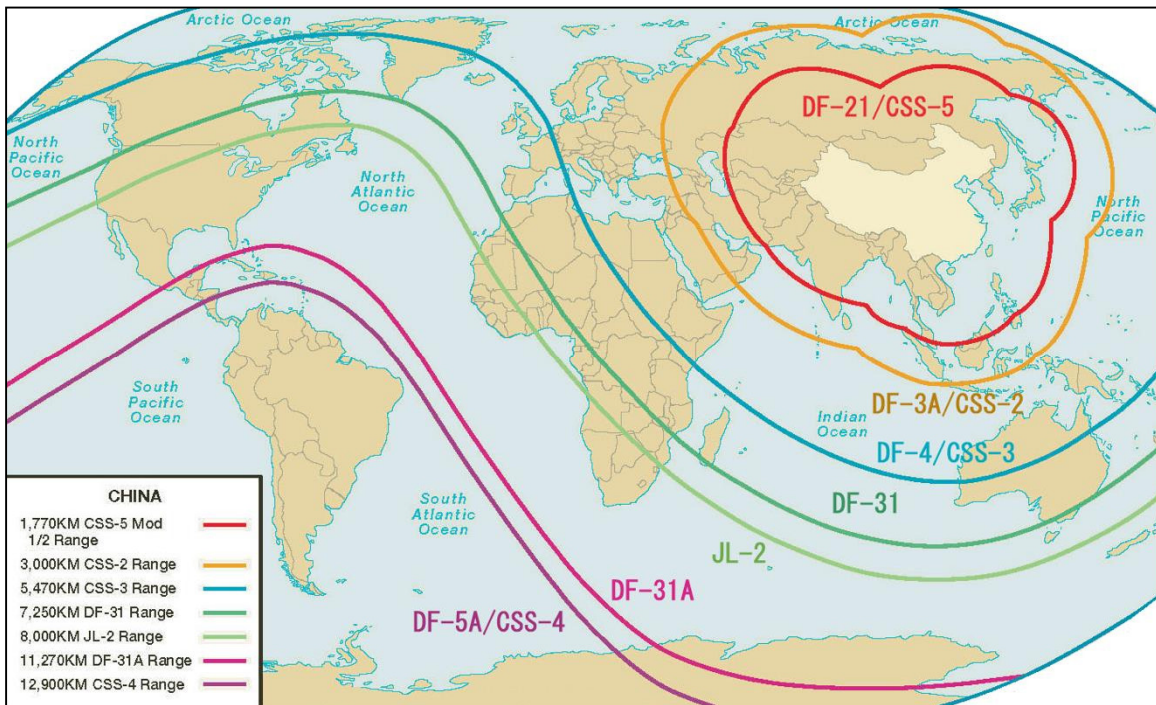


Figure 3: Chinese land-based ballistic missile ranges: China to North America.⁴⁰

China’s longest-range dual-capable ballistic missile that can put assets at risk in the Pacific is the DF-26. The DF-26’s range is between 4,000–5,000 km and can hit targets in Guam.⁴¹ However, targets in Alaska, Hawaii, Canada, and the continental United States remain outside the range of the DF-26 (see Table 1).

Table 1: Distances from China’s missile base areas to United States and Canadian targets in the Asia-Pacific.⁴²

Location	Minimum	Maximum
Guam (Andersen AFB)	3,000 km	6,200 km
Alaska (Elmendorf AFB)	5,700 km	8,400 km
Hawaii (Naval Station Pearl Harbour)	7,300 km	10,400 km
British Columbia (CFB Esquimalt)	7,700 km	10,600 km
Alberta (CFB Cold Lake)	7,900 km	10,600 km
Targets within range of the DF-26		

⁴⁰ Office of the Secretary of Defense, *Annual Report to Congress: Military and Security Developments Involving the People’s Republic of China 2007* (Washington, D.C.: U.S. Department of Defense, 2007), p. 19. See also *The Economist*, “China’s nuclear arsenal was strikingly modest, but that is changing” (23 November 2019).

⁴¹ The DF-26 is known as the “Guam Express” and “one carrier, many warheads” missile. The DF-26C is known as the Guam Express because it is the first conventional (dual-capable) precision strike ballistic missile China has developed with a range of between 4,000–5,000 km that can hit targets in Guam. The DF-26B is known as the one carrier, many warheads missile because it can allegedly perform medium and long-range precision strikes against important moving targets at sea such as aircraft carriers.

⁴² Maximum and minimum distances are determined by which PLARF missile base a particular missile is launched from. See Mark A. Stokes, *Chinas Nuclear Warhead Storage and Handling System* (Arlington, VA: Project 2049 Institute, 12 March 2010), p. 7.

Apart from the fact that China cannot currently attack North America with conventional ballistic or cruise missiles, it is still developing and fielding a formidable array of regionally focused ballistic and cruise missiles.⁴³ The most capable and concerning of these conventional and dual-capable systems include (see Table 2):

Table 2: China’s advanced ballistic and cruise missiles.

Ballistic Missiles	Cruise Missiles
<p>CH-AS-X-13</p> <ul style="list-style-type: none"> • In development. • Dual-capable Air-Launched Ballistic Missile (ALBM) / Anti-Ship Ballistic Missile (ASBM) with 1,500 km range (possible 3,000 km range if combined with an HGV).⁴⁴ • CH-AS-X-13 is essentially an air-launched variant of the DF-21D ASBM. • Current analysis suggests the CH-AS-X-13 would be used in a regional context to bolster China’s A2/AD defences and perform ASM strikes against moving targets.⁴⁵ 	<p>HN-2000/DH-2000</p> <ul style="list-style-type: none"> • In development. • Dual-capable Land-Attack Cruise Missile (LACM) / Anti-Ship Cruise Missile (ASCM) with 4,000 km range. • Stealthy.
<p>DF-26 (DF-26B/DF-26C)</p> <ul style="list-style-type: none"> • Dual-capable Intermediate-Range Ballistic Missile (IRBM) / ASBM with 4,000–5,000 km range. • The DF-26 has been called the “Guam Express” and “one carrier, many warheads” missile. • It can perform medium-range precision strikes against important targets on land and allegedly perform strikes against moving ships at sea.⁴⁶ 	<p>HN-3 (DH-10A)</p> <ul style="list-style-type: none"> • Dual-capable LACM with 2,200–3,000 km range. • HN-2 (CJ-10) • Dual-capable LACM with 1,400–2,000 km range.

⁴³ For a complete list of ballistic and cruise missiles including nuclear systems, see Annex A: Chinese Ballistic and Cruise Missiles, Table A.1 and Table A.2.

⁴⁴ H.I. Sutton, “China’s New Aircraft Carrier Killer Is World’s Largest Air-Launched Missile,” *Naval News* (1 November 2020), <https://www.navalnews.com/naval-news/2020/11/chinas-new-aircraft-carrier-killer-is-worlds-largest-air-launched-missile/> (accessed 18 October 2021).

⁴⁵ Ankit Panda, “Revealed: China’s Nuclear-Capable Air-Launched Ballistic Missile,” *The Diplomat* (10 April 2018), <https://thediplomat.com/2018/04/revealed-chinas-nuclear-capable-air-launched-ballistic-missile/> (accessed 10 September 2021).

⁴⁶ Office of the Secretary of Defense, *Annual Report to Congress 2021*, op cit., p. 44.

Ballistic Missiles	Cruise Missiles
<p>DF-21D</p> <ul style="list-style-type: none"> • Dual-capable Medium-Range Ballistic Missile (MRBM) /ASBM with 1,500 km range. • The DF-21D is used in a regional context to bolster China’s A2/AD defences.⁴⁷ • The DF-21D has MaRVs giving it precision strike capability. It is described as being capable of performing strikes against moving targets at sea such as aircraft carriers in the western Pacific.⁴⁸ <p>DF-21C</p> <ul style="list-style-type: none"> • Dual-capable MRBM with 1,700+ km range. • The DF-21 family is China’s first road-mobile missile to use solid propellant thus significantly increasing mobility while decreasing launch time.⁴⁹ • The DF-21C is reportedly capable of performing precision strikes. 	<p>CJ-20 (KD-20/DF-10)</p> <ul style="list-style-type: none"> • Dual-capable LACM with 2,000–2,200 km range. • The CJ-20 is an advanced version of China’s first long-range cruise missile, the CJ-10. • The CJ-20 contains air- land- and sea-launched variants.⁵⁰

⁴⁷ Harry Kazianis, “China’s Anti-Access Missile,” *The Diplomat* (18 November 2011), <https://thediplomat.com/2011/11/china-anti-access-missile/> (accessed 10 September 2021).

⁴⁸ U.S. Naval Institute, *Report: Chinese Develop Special “Kill Weapon” to Destroy U.S. Aircraft Carriers* (31 March 2009).

⁴⁹ Center for Strategic and International Studies, “DF-21 (CSS-5),” *Missile Defense Project* (28 March 2022), <https://missilethreat.csis.org/missile/df-21/> (accessed 28 March 2022).

⁵⁰ Missile Defense Advocacy Alliance, “Changjian-20 (CJ-20)” (February 2017), <https://missiledefenseadvocacy.org/missile-threat-and-proliferation/todays-missile-threat/china/changjian-20-cj-20/> (accessed 2 August 2021).

Ballistic Missiles	Cruise Missiles
<p>DF-17</p> <ul style="list-style-type: none"> • Dual-capable MRBM with 1,800-2,500 km range. • The DF-17 is mated to the DF-ZF (previously referred to as the WU-14) HGV. • Current analysis suggests the DZ-ZF HGV will initially be used in a regional context to bolster A2/AD defences and could perform ASM strikes against moving targets.⁵¹ • The DF-ZF HGV capability gives China significant leverage over layered ABM defence systems because of the glide vehicle's speed of between Mach 5 and Mach 10 and its manoeuvrability.⁵² 	<p>CJ-100C</p> <ul style="list-style-type: none"> • In development. • Conventional LACM/ASCM with estimated range of 3,500 km. • Mach 8+ hypersonic cruise missile (HCM). • The top speed of Mach 8+ is claimed. Sustained speeds of Mach 8 have not been demonstrated yet.⁵³ <p>CJ-100B</p> <ul style="list-style-type: none"> • In development. • Conventional LACM/ASCM with 2,000–3,000 km range. • Mach 6–6.5 HCM. <p>CJ-100 (DF-100)</p> <ul style="list-style-type: none"> • Revealed in 2019, not much is known. • Likely conventional LACM with estimated 2,000–3,000 km range. • High speed (Mach 1+) but possibly hypersonic (Mach 4–5).⁵⁴ • Each missile in the CJ-100 series, B through C, represents a significant increase in speed.

⁵¹ Bradley Perrett, Bill Sweetman, and Michael Fabey, "U.S. Navy Sees Chinese HGV as Part of Wider Threat," *Aviation Week & Space Technology* (27 January 2014).

⁵² Franz-Stefan Gady, "China Tests New Weapon Capable of Breaching U.S. Missile Defense Systems," *The Diplomat* (28 April 2016), <https://thediplomat.com/2016/04/china-tests-new-weapon-capable-of-breaching-u-s-missile-defense-systems/> (accessed 25 August 2021).

⁵³ Sebastien Roblin, "The DF-100 Is China's Biggest Threat to The U.S. Navy," *The National Interest* (17 April 2020), <https://nationalinterest.org/blog/buzz/df-100-chinas-biggest-threat-us-navy-145172> (accessed 11 January 2022).

⁵⁴ James Holmes, "Is China's DF-100 Missile a Threat to the U.S. Navy?" *The National Interest* (4 November 2019), <https://nationalinterest.org/blog/buzz/chinas-df-100-missile-threat-us-navy-93166> (accessed 11 January 2022); and Sebastien Roblin, "Is China's DF-100 Missile Good Enough to Kill America's Navy?" *The National Interest* (7 November 2019), <https://nationalinterest.org/blog/buzz/chinas-df-100-missile-good-enough-kill-americas-navy-96476> (accessed 11 January 2022).

Ballistic Missiles	Cruise Missiles
	<p>YJ-18/YJ-18A/YJ-18B/YJ-18C</p> <ul style="list-style-type: none"> • Conventional LACM/ASCM with 220–540 km range. • There are reports that the YJ-18C can be containerized.⁵⁵ • Containerization signifies asymmetric and clandestine thinking to delivery options.
	<p>XingKong-2</p> <ul style="list-style-type: none"> • In development/testing. • Powered hypersonic-type prototype vehicle. The XingKong-2 is a “waverider” that uses powered flight after launch and derives lift from its own shockwaves.⁵⁶ • Nuclear-capable, possibly dual-capable. • Mach 6+. • Possibly attached to DF-15 dual-capable Short-Range Ballistic Missile (SRBM).

⁵⁵ See, for example, Bill Gertz, “China Building Long-Range Cruise Missile Launched from Ship Container,” *The Washington Free Beacon* (27 March 2019), <https://freebeacon.com/national-security/china-building-long-range-cruise-missile-launched-from-ship-container/> (accessed 24 February 2022); Alex Hollings, “China’s New Long-Range Cruise Missiles Are Built to be Fired from Containers on Merchant Ships,” *Special Operations Forces Report* (4 April 2019), <https://sofrep.com/news/chinas-new-long-range-cruise-missiles-are-built-to-be-fired-from-containers-on-merchant-ships/> (accessed 28 March 2022); and Tariq Tahir, “China Feared to be Hiding Missiles in Shipping Containers for Trojan Horse-Style Plan to Launch Attack Anywhere in World,” *U.S. Sun* (6 December 2021), <https://www.thesun.co.uk/news/16563733/china-feared-hiding-missile-trojan-horse-containers/> (accessed 28 March 2022).

⁵⁶ Kelley M. Sayler, *Hypersonic Weapons: Background and Issues for Congress*, CRS Report No. R45811 (Washington, D.C.: United States Congressional Research Service, 17 March 2022), p. 17.

4 Implications for China

This assessment highlights that China cannot strike North America with its current conventional or dual-capable ballistic and cruise missiles. From this perspective, China is faced with limited options if it wants to hold North America at risk without crossing the nuclear threshold. China could a) find ways to move its missiles closer to North America, b) improve the range of its missile systems, or c) mate conventional warheads to its strategic delivery systems creating dual-capable options. Mating conventional warheads to strategic delivery systems creating dual-capable options is a viable and likely course of action. However, the reality is that Beijing's military and strategic planning are fundamentally driven by geostrategic considerations along its periphery and regional security concerns,⁵⁷ and China's missile capabilities, research and development, and acquisitions are reflected in those realities. In other words, China's evolving missile capabilities are aimed at strengthening its A2/AD defences in the western Pacific and creating an ability for China to perform ASM strikes against moving targets at sea.

4.1 Anti-Access/Area-Denial

China's conventional ballistic and cruise missile systems are vitally important to Beijing's attempts at developing A2/AD bastions. The DF-21, DF-26, the DF-17 with HGV capability, and the HN-2000, HN-3, and CJ-20 in their air- and sea-launched cruise missile variants have noteworthy ranges in a regional context. China's most effective ballistic and cruise missile modernization efforts aim to build layered, dynamic, impenetrable A2/AD bastions in the South China and East China Seas where it can conduct high-intensity regional military operations.⁵⁸

China is building a military force with a heavy emphasis on ballistic and cruise missiles capable of establishing military superiority over an adversary in specific geographic areas long enough to achieve military and/or political objectives.⁵⁹ Simply put, China seeks to prevent an armed intervention by a third party in situations involving a Taiwan scenario; a scenario involving Japan over the Senkaku (Diaoyu) and Ryukyu Islands; a scenario involving South Korea over Socotra Rock (Ieodo or Suyan Isle); or various disputes in the South China Sea involving the Philippines, Indonesia, Vietnam, and/or Malaysia.⁶⁰ This sort of campaign would seize objectives and force the United States to either accept a *fait accompli* or try to eject Chinese forces from the seized territory in a costly fight.

In a conflict or crisis, China's A2/AD bastions are designed to deter and, if necessary, defeat the United States within the first island chain and ideally allow China to project power out into and beyond the second island chain to limit and hinder the United States' freedom of action. China's ballistic and cruise missile developments target United States aircraft carrier battle groups, nullifying western assets and freedom of action in the western Pacific, and dominating adversaries within the first island chain. They do not, at this point, appear to be directed toward attacking assets in North America.

⁵⁷ Donald A. Neill, *China's Evolving Nuclear Posture: Part I – Background and Benchmark*, Defence R&D Canada – CORA, Technical Memorandum, DRDC CORA TM 2011-148 (September 2011), p. 28.

⁵⁸ Mike Yeo, "China's missile and space tech is creating a defensive bubble difficult to penetrate," *Defense News* (1 June 2020), <https://www.defensenews.com/global/asia-pacific/2020/06/01/chinas-missile-and-space-tech-is-creating-a-defensive-bubble-difficult-to-penetrate/> (accessed 13 November 2021).

⁵⁹ Abraham Denmark and Caitlin Talmadge, "Why China Wants More and Better Nukes: How Beijing's Nuclear Buildup Threatens Stability," *Foreign Affairs* (19 November 2021).

⁶⁰ For a list of China's territorial disputes see Pia Krishnankutty, "Not just India, Tibet – China has 17 territorial disputes with its neighbours, on land & sea," *ThePrint* (15 July 2020), <https://theprint.in/theprint-essential/not-just-india-tibet-china-has-17-territorial-disputes-with-its-neighbours-on-land-sea/461115/> (accessed 27 September 2021); and Office of the Secretary of Defense, *Annual Report to Congress 2021*, op cit., pp. 15–16.

4.2 Development of a Strategic Nuclear Triad and Use of Dual-Capable Systems

According to the DoD's *Annual Report to Congress 2021*, the PLARF is developing a nascent nuclear triad by expanding the number of its air-, land-, and sea-based delivery platforms.⁶¹ The PRC plans to enhance its strategic deterrence capabilities quantitatively and qualitatively through the modernization and diversification of its nuclear and dual-capable missile forces.⁶² The modernization of China's strategic nuclear forces is significant because it can provide Beijing with the means to threaten North America with conventionally armed or dual-capable weapons. For example, one could argue that *Ohio*-class nuclear-powered ballistic missile submarines (SSBN) became more effective and valuable for the United States' power projection capabilities after four of them were converted into SSGNs. They became more effective and valuable because they combined the endurance, stealth, and quick strike options of a nuclear powered submarine with the conventional strike capability of the BGM-109 Tomahawk Land-Attack Missile (TLAM).⁶³ Similarly, rather than being retired because of Strategic Arms Reduction Treaty (START) commitments after the Cold War, the B1-B Lancer was divested of its nuclear delivery capability and used as a conventional strategic bomber. The combination of the B1-B Lancer's extended range, payload capacity, armament diversity, speed, and stealth characteristics are unique in the United States Air Force's inventory. The utility of both of these conventional global power projection capable platforms is found in their strategic nuclear warfighting deoxyribonucleic acid (D.N.A.).

If Beijing's intent is to hold North American assets at risk with conventional missiles, it needs to consider alternative delivery options. Its current land-based conventional and dual-capable missile systems do not have the range to target North America. Outside of placing ballistic or cruise missiles in a country friendly to China in the Western Hemisphere, the likely course of action includes mating conventionally armed cruise missiles or ballistic missiles to existing or future strategic delivery systems.⁶⁴ While these options could provide conventional strike options to CCP leadership, each option is not without challenges and limitations.

4.2.1 The Moderately Effective (Tough) Option: Air-Launched Cruise Missiles

Getting air-launched cruise missiles (ALCM) close enough to North America to pose a threat requires mating them to strategic bombers. However, getting China's strategic bombers close enough to North America to launch ALCMs is problematic. Strategic bombers armed with conventional ALCMs can offer quick response times, flexibility during heightened tensions because they can be recalled, and greater survivability due to their mobility compared to silo-based ICBMs.

However, China is at a geographically disadvantageous position when it comes to attacking North America with ALCMs. For comparison purposes, a strategic bomber from central Russia requires a range of only 7,000–8,000 km (one way) to launch points in North America. Not including the air-to-air refuelling and other support requirements needed to deploy bombers from China to North America, China's strategic bombers require a range of between 9,000 km (also requiring approval to overfly Russian airspace, and flying directly over Elmendorf AFB) and 12,000 km (not requiring the overflight of Russian airspace) to perform the same task. As depicted in Figure 4, this results in what can only be called a "Mid-Pacific Bomber Gap" for China; the gap between where the Xian H-6 reaches its maximum unrefuelled range, and the distance to a launch box in much closer proximity to North America.

⁶¹ *Ibid.*, p. 90.

⁶² *Ibid.*, p. 60.

⁶³ See 28 June 2010 United States SSGN show of force below.

⁶⁴ The development of the CH-AS-X-13 ALBM and DF-ZF HGV are nascent examples of this effort.

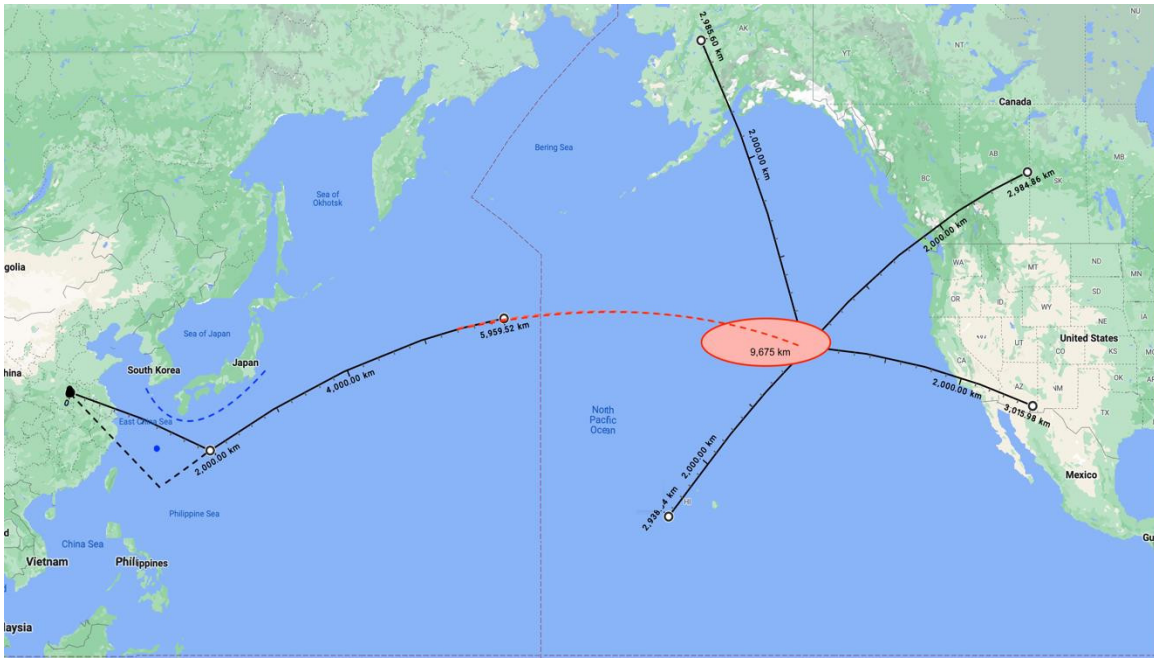


Figure 4: The People's Liberation Army Air Force's (PLAAF) Mid-Pacific Bomber Gap.⁶⁵

To be sure, from the launch box depicted in Figure 4, PLAAF Xian H-6s would be in a commanding position to attack targets on the edges of North America, including Alaska (Elmendorf AFB), British Columbia (CFB Esquimalt), Alberta (CFB Cold Lake), Colorado (NORAD HQ), Nevada (Nellis AFB), California (Naval Base San Diego), and Hawaii (Naval Station Pearl Harbour). However, the Xian H-6 strategic bomber with a range of 6,000 km, and even the proposed Xian H-20 strategic stealth bomber with a range of 8,500 km, are nowhere near capable of performing this task.⁶⁶ In addition, PLAAF strategic bombers must also “run the gauntlet” of squeezing between Okinawa and Japan both departing and returning from their missions.

Comparatively speaking, the United States is in a geostrategically advantageous position vis-à-vis China when deploying strategic assets by having access to bases like Diego Garcia, Guam, and northern Australia. The United States can deploy strategic bombers, submarines, and various surface ships including aircraft carriers from these locations. These bases also provide logistics support for onward power projection. In effect, they create strategic and operational dilemmas for Beijing by opening up and exposing its flanks to attack from multiple directions.⁶⁷

⁶⁵ Google Map of Asia-Pacific Region, *Google Maps* (2022), <https://www.google.ca/maps/> (accessed 10 September 2022).

⁶⁶ Jane's, “Aircraft – Fixed-Wing – Military – Xian H-6,” *All the World's Aircraft: Equipment Profile* (31 March 2021); Franz-Stefan Gady, “China Wants to Develop a New Long-Range Strategic Bomber,” *The Diplomat* (13 July 2015), <https://thediplomat.com/2015/07/china-wants-to-develop-a-new-long-range-strategic-bomber/> (accessed 25 August 2021); and Office of the Secretary of Defense, *Annual Report to Congress 2021*, op cit., p. 85.

⁶⁷ See 28 June 2010 United States SSGN show of force below.

Consequently, China's strategic bombers appear confined to bolstering its A2/AD capabilities. In fact, the PLA's definition of a long-range strategic bomber is a minimum range of 8,000 km without refuelling.⁶⁸ This range limitation would relegate the Xian H-20 to performing ASM strikes against targets in the western Pacific and targeting assets in South Korea, Japan, Guam, and possibly Alaska. One source states that this essentially makes the Xian H-20 a medium-range bomber, and a medium-range bomber "does not fix the PLA's shortcomings in terms of strategic strike and strategic deterrence requirements."⁶⁹ While a bomber such as the Xian H-20 may be capable of attacking targets as far as the second island chain, the PLA still requires an intercontinental strategic bomber capable of penetrating enemy air defences to hold North American assets at risk with ALCMs.

Nevertheless, China appears to be trying to get out from under its strategic confinement in the western Pacific. On 26 May 2022, CCP Foreign Minister Wang Yi and Solomon Islands Foreign Minister Jeremiah Manele acknowledged an official security cooperation agreement between the PRC and the Solomon Islands.⁷⁰ The agreement immediately sparked concerns in Canberra and Washington. Some analysts have asserted that it could result in the PLA building military bases within 1,600 km of Australia. It could also result in China exerting control over surrounding sea lanes and air space, "threatening longitudinal and latitudinal lines of communication between...the United States (U.S.) and its Pacific allies, including Australia."⁷¹

While China and the Solomon Islands have asserted that the agreement aims to help maintain social stability, improve law enforcement capabilities, and safeguard social security, the agreement also aims to protect Chinese citizens and institutions in the Solomon Islands and address regional security challenges.⁷² The problem with the agreement is that it is sufficiently ambiguous in its wording that China can use it to support attempts to gain access to and control of the region. Most of all, the agreement threatens to erode Australia's standing as the Solomon Island's traditional defence partner in the region, stretching back to World War Two.⁷³

At the very least, China has graduated from aggressive island-building activities in the South China Sea (see Section 5.2 below) to creating predatory island-hopping agreements in the broader western Pacific. To highlight the point, China is seeking a deal with 10 Pacific island nations aimed at traditional and non-traditional security issues such as policing, cybersecurity, maritime surveillance, fishing rights, and creating a wider free-trade area.⁷⁴ If China successfully signs a deal with these 10 Pacific island nations, it would permit China to gain more influence in the region and start to fundamentally alter the strategic balance of power in the western Pacific.

⁶⁸ Franz-Stefan Gady, "China Wants to Develop a New Long-Range Strategic Bomber," op cit.

⁶⁹ Agence France-Presse, "State Media: China Needs Long-Range Bomber," *Defense News* (7 July 2015), <https://www.defensenews.com/2015/07/07/state-media-china-needs-long-range-bomber/> (accessed 2 August 2021).

⁷⁰ Ministry of Foreign Affairs, the People's Republic of China, "Wang Yi Expounds on Three Principles of China-Solomon Islands Security Cooperation" (26 May 2022),

https://www.fmprc.gov.cn/eng/zxxx_662805/202205/t20220526_10693195.html (accessed 30 May 2022).

⁷¹ Euan Graham, "Assessing the Solomon Islands' new security agreement with China," *International Institute for Strategic Studies* (5 May 2022), <https://www.iiss.org/blogs/analysis/2022/05/china-solomon-islands> (accessed 30 May 2022).

⁷² Ministry of Foreign Affairs, the People's Republic of China, "Wang Yi Expounds on Three Principles of China-Solomon Islands Security Cooperation," op cit.

⁷³ Michael E. Miller, "China pushes Pacific deal, as Australia scrambles to repair regional ties," *The Washington Post* (26 May 2022), <https://www.washingtonpost.com/world/2022/05/26/solomons-china-wang-yi-pacific-australia/> (accessed 30 May 2022).

⁷⁴ The 10 countries China is seeking a deal with include the Solomon Islands, Kiribati, Samoa, Fiji, Tonga, Vanuatu, Papua New Guinea, the Cook Islands, Niue, and the Federated States of Micronesia. According to reports, Micronesia has already rejected the plan. President David Panuelo has reportedly messaged the leaders of the other Pacific nations warning of serious security implications and China's dominance in the region if Beijing is successful. Dan Novak, "China Seeks Cooperation Deal with 10 Pacific Island Nations," *VOA News* (25 May 2022), <https://learningenglish.voanews.com/a/china-seeks-cooperation-deal-with-10-pacific-island-nations/6588836.html> (accessed 30 May 2022).

4.2.2 The Best (Tough) Option: Nuclear-Powered Cruise Missile Submarines

In this option, China could mate conventional cruise missiles either to its SSBNs or nuclear-powered attack submarines (SSN).⁷⁵ One can argue that the power projection capability of SSGNs is without parallel. They offer stealth, surprise, persistence, and overwhelming firepower. On 28 June 2010, for example, the USS Ohio (SSGN-726), United States Ship (USS) Michigan (SSGN-727), and USS Florida (SSGN-728)—each armed with 154 BGM-109 TLAMs—all surfaced simultaneously in the waters of South Korea, the Philippines, and the Indian Ocean in response to China’s missile testing in the East China Sea.⁷⁶ As highlighted by one analyst, “[T]he three submarines can carry 462 Tomahawks...460-odd Tomahawks is a huge amount of potential firepower in anybody’s language.”⁷⁷ Notwithstanding this fact, simply converting SSBNs into SSGNs does not in and of itself place North America at risk.

A cruise missile-equipped Type-094 *Jin*-class (or the future Type-096) armed with 4,000 km HN-2000 LACMs would still need to deploy to the eastern Pacific off the west coast of North America to place targets in the central United States and Canada at risk. China also needs to build enough submarines and deploy them on regular extended deterrence patrols to keep North America at risk.⁷⁸ While China’s first nuclear deterrence patrol is known to have taken place in December 2015, there is not much evidence to support that China is or can deploy its current Type-094 *Jin*-class SSBNs on regular extended long-range patrols.⁷⁹

China’s SSNs, the Type-093G *Shang*-class in particular, are already equipped with the YJ-18 and/or CJ-10 (both in their LACM/ASCM variants). These cruise missiles are very capable, and their ranges vary between 220–540 km (YJ-18 series) and 1,400–2,000 km (CJ-10). While the CJ-10 offers better strike options than a YJ-18, SSNs would still need to fire these missiles from launch boxes close to North America. China’s SSNs are also constrained by the number of LACMs they can carry. It is unknown how many LACMs the Type-095 SSN will carry, but the Type-093G *Shang*-class SSN can only carry six DF-10 LACMs in a vertical launching system (VLS).⁸⁰ As such, SSNs armed with LACMs have limited utility in a limited conventional attack on North America scenario. They are far more valuable in a regional context by helping bolster China’s A2/AD capabilities. China’s SSNs enhance the People Liberation Army Navy’s (PLAN) anti-surface warfare (ASuW) capability and provide a regional land-attack option when equipped with LACMs.

⁷⁵ It must be noted that there is little (or no) evidence to support that China is either converting SSBNs to SSGNs or plans to mat cruise missiles to its upcoming Type-096 SSBN.

⁷⁶ Eli Fuhrman, “The Navy Surfaced Three Missile Submarines Simultaneously as a Warning to China,” *The National Interest* (25 July 2021), <https://nationalinterest.org/blog/buzz/navy-surfaced-three-missile-submarines-simultaneously-warning-china-190443> (accessed 14 April 2022).

⁷⁷ *Ibid.*

⁷⁸ Estimates suggest a minimum of eight SSBNs would be needed for China to maintain a continuous nuclear deterrence patrol at sea. See Tong Zhao, “Grappling with New Capabilities and Concepts,” *Tides of Change: China’s Nuclear Ballistic Missile Submarines and Strategic Stability* (Washington, D.C.: Carnegie Endowment for International Peace, 24 October 2018), p. 8.

⁷⁹ China Power Team, “Does China Have an Effective Sea-based Nuclear Deterrent?” *China Power* (28 December 2015, updated 26 August 2020), <https://chinapower.csis.org/ssbn/> (accessed 14 April 2021).

⁸⁰ For comparison purposes, the United States’ SSNs carry comparatively fewer LACMs than their SSGN counterparts. For example, United States *Virginia*-class, *Seawolf*-class, and *Los Angeles*-class SSNs can carry between 12 and 50 BGM-109 TLAM, compared with *Ohio*-class SSGNs that carry 154 BGM-109 TLAMs. Lei Zhao, “Navy to get 3 new nuclear subs,” *China Daily USA* (3 April 2015), http://usa.chinadaily.com.cn/china/2015-04/03/content_19989106.htm (accessed 15 May 2022); and Want China Times, “PLA’s Type-093G submarines ‘could destroy Izumo’” (7 April 2015), <http://www.wantchinatimes.com/news-subclass-cnt.aspx?id=20150407000124&cid=1101> (accessed 10 September 2021).

4.2.3 The Least Effective (Easy) Option: Ship-Based Land-Attack Cruise Missiles

The remaining option for Beijing is to maintain the development and placement of surface-to-surface missile (SSM) on its surface fleet vessels. For example, the Type-055 *Renhai*-class destroyer can carry 112 YJ-18 and/or CJ-10 LACMs/ASCMs in its VLS. The Type-052D *Luyang III*-class destroyer can carry 64 YJ-18 LACMs/ASCMs in its VLS.

However, the limitation of this approach is similar to SSNs armed with cruise missiles. The YJ-18, CJ-10, and DF-10 LACMs have ranges of between 220–540 km and 800–1,400 km. As a result, this gives them limited utility in a conventional attack on North America scenario. Additionally, surface fleet vessels suffer from speed constraints and lack of stealth. Not only would United States assets be able to track Chinese surface vessels with relative ease, but their survivability would diminish rapidly once an attack is carried out.

It must be noted that there is evidence that the YJ-18C can be containerized and deployed in commercial shipping containers.⁸¹ To be sure, the clandestine deployment of YJ-18C LACMs in commercial shipping containers is a security concern. However, most containerized missile systems fit between one (Iran’s Fateh-110) and four (Russia’s 3M-54 Klub-K) missiles into a single container.⁸² They are also generally stored in commercial shipping containers, modified into transporter-erector-launchers (TEL) for concealment and movement rather than deployable force projection purposes.⁸³ Consequently, due to the limited number of LACMs contained in a commercial shipping container, and the difficulty in deploying LACMs in this way, it is improbable a peer competitor would attack North America using this method.⁸⁴

⁸¹ Bill Gertz, “China Building Long-Range Cruise Missile Launched from Ship Container,” op cit.

⁸² Ibid; Mark Gunzinger and Christopher Dougherty, *Outside-In: Operating from Range to Defeat Iran’s Anti-Access and Area-Denial Threats* (Washington, D.C.: Center for Strategic and Budgetary Assessments, 2011), p. 46; and Army Recognition, “Iran has developed new containerized Fateh-110 surface-to-surface missile system,” (26 July 2021), https://www.armyrecognition.com/weapons_defence_industry_military_technology_uk/iran_has_developed_new_containerized_fateh-110_surface-to-surface_missile_system.html (accessed 11 November 2021).

⁸³ Tamir Eshel, “Fateh 110 missiles in Iran, Syria and Lebanon,” *Defense Update* (22 November 2014), https://defense-update.com/20141122_fateh-110-missiles-in-iran-syria-and-lebanon.html (accessed 24 February 2022); and Missile Defense Advocacy Alliance, “Fateh-110” (3 June 2021), <https://missiledefenseadvocacy.org/missile-threat-and-proliferation/todays-missile-threat/iran/fateh-110/> (accessed 2 August 2021).

⁸⁴ The Congressional Budget Office outlines a number of difficulties in deploying LACMs using commercial shipping containers for both state and non-state actors. These include Intelligence, Surveillance, Reconnaissance (ISR) requirements, imagery and targeting requirements, and eluding security-screening at embarkation. Congressional Budget Office, *National Cruise Missile Defense*, op cit., pp. 13–17.

5 Implications for Continental Defence

As identified in this Report, China’s current conventional cruise missiles do not directly threaten North America. They do not have the range to target North America, and China’s strategic delivery assets such as the Xian H-6 bomber and Type-094 *Jin*-class SSBN, do not have the demonstrated capability to threaten North America in a meaningful manner armed with conventional cruise missiles. Instead, China’s conventional ballistic and cruise missiles are focused on bolstering its A2/AD bastions in the western Pacific and maintaining regional deterrence.

However, in August 2021, China launched a boost-glide vehicle to low-earth orbit, circling the Earth—otherwise known as a FOBS—before manoeuvring toward its target location, missing its target by only a few dozen kilometres.⁸⁵ While China has asserted that the vehicle was a spacecraft not unlike the United States’ X-37B orbital test vehicle (OTV) and not a missile, some observers have still referred to this as a “hypersonic Sputnik moment.”⁸⁶

The critical aspect of the August 2021 test is not that China is in the process of fielding a FOBS, but rather what it represents. China has shown its prowess at exploring all aspects of missile research and development, testing, and in some cases, fielding of advanced missile systems. As one analyst has noted, “China, again and again, has proven that if it is possible within physics, they will do it, or at least attempt to do it.”⁸⁷ China’s challenge is not an immediate and direct threat to North American security, but rather a future and regional threat to North American interests. As China explores what is within the art of the possible, defence planners will be confronted by two primary challenges. The first is the evolving hypersonic missile challenge. The second is the increased use of dual-capable systems that can lead to miscalculation during a crisis.

5.1 The Hypersonic Challenge

Hypersonic cruise missiles and HGVs could threaten North America in certain circumstances. However, unless existing systems are mated to boost-glide capable ballistic missiles or capable delivery systems such as strategic bombers or submarines, they do not constitute a challenge to North American defences. It must also be highlighted that the desired performance characteristics of HCMs and HGVs require overcoming a range of significant technical challenges before they could pose a threat to North America.⁸⁸

That said, China’s missile development and modernization programs appear motivated by concerns that the United States could conduct a pre-emptive decapitating strike on China’s nuclear arsenal and supporting command and control infrastructure. As expressed by Tong Zhao, a fellow at the Carnegie-Tsinghua Centre for Global Policy, “[M]ost experts argue that the most important reason to prioritize hypersonic technology development [in China] is the necessity to counter specific security threats from increasingly sophisticated military technology from the United States.”⁸⁹ As such, China’s missile developments, particularly the development of hypersonic missiles, appear directed toward implementing an A2/AD strategy within its first island chain.

⁸⁵ Demetri Sevastopulo and Kathrin Hille, “China tests new space capability with hypersonic missile,” *The Financial Times* (16 October 2021), <https://www.ft.com/content/ba0a3cde-719b-4040-93cb-a486e1f843fb> (accessed 18 October 2021).

⁸⁶ Theresa Hitchens, “After China’s ‘Hypersonic’ Test, U.S. Alarm and Many Unanswered Questions,” *Breaking Defense* (19 October 2021), <https://breakingdefense.com/2021/10/questions-linger-over-chinas-reported-hypersonic-space-weapon-test/> (accessed 14 April 2022).

⁸⁷ *Ibid.*

⁸⁸ Brockmann and Schiller, “A matter of speed?” *op cit.*

⁸⁹ Tong Zhao, “Conventional Challenges to Strategic Stability: Chinese Perceptions of Hypersonic Technology and the Security Dilemma,” in Lawrence Rubin and Adam N. Stulberg (eds.), *The End of Strategic Stability? Nuclear Weapons and the Challenge of Regional Rivalries* (Georgetown University Press, 2018), p. 16.

Hypersonic missiles are valuable to China in a regional context because they are perceived as being nearly impossible to intercept. Technologies such as directed energy weapons, lasers, electromagnetic railguns, particle beams, and enhanced performance missile interceptors could be candidates for an effective defence against hypersonic missiles, but they do not yet currently exist. The manoeuvrability and speed of hypersonic missiles make them ideal for challenging the United States' naval operations in the western Pacific, in particular its Aegis Integrated Air Defense System (IADS).

In a regional context, hypersonics make it easier to overcome the defences of heavily defended targets such as aircraft carriers and make it easier to engage time-critical targets where the speed of hypersonic weapons is valuable. China currently has, or has in development, two additional HCMs and two ballistic missiles mated to HGVs.⁹⁰ Some analysts have submitted that China may be planning to mate conventionally armed HGVs to the DF-21 and DF-26 ballistic missiles in support of its A2/AD strategy.⁹¹ These systems would collectively provide Beijing with hypersonic capabilities with ranges of between 1,700–4,000 km.

If western militaries want to maintain their freedom of action in the western Pacific, they will have to address hypersonic missile defence in a regional power projection context. Developing technologies and tactics to defeat hypersonic missiles in an A2/AD environment could be a higher priority than defending against a conventional HCM attack on North America. The benefit of approaching hypersonic missile defence from a regional perspective is that the technologies and tactics needed to defeat hypersonics in a regional context could be transferable to a North American context if the threat materializes. Additionally, the wide-area defence of North America would be prohibitively costly, if not impossible.⁹² Therefore, a plausible option would be to defend specific high-value targets within North America by pursuing a layered missile defence architecture that handles threats to specific targets rather than attempting to develop a comprehensive continent-wide defence architecture.

5.2 Dual-Capable, Entanglement and Miscalculation

China will continue with the modernization of its nuclear forces. As it does, it will evolve from a nascent nuclear triad to a more modern and capable nuclear triad.⁹³ When it does, it may choose to mate conventional HGVs to these strategic assets. If it does, it will push out into the western Pacific armed with dual-capable air- and sea-launched missiles that create entanglement and miscalculation issues.⁹⁴

Dual-capable hypersonic systems exacerbate discrimination challenges. How does one know if the incoming threat is conventional or nuclear? In fact, the dual-capable DF-26C and DF-21C already raise the risk of misunderstandings and unintended escalation in a crisis.⁹⁵ Launching these missiles armed with a conventional warhead against one of the United States' bases in the region, such as Guam, could be misinterpreted as a nuclear weapon launch and trigger an escalatory nuclear response. Hypersonic cruise missiles and boost-glide HGVs compound the threat by reducing the time available for decision-makers to respond to the incoming attack.⁹⁶

⁹⁰ Jane's, "Spreadsheet: Offensive Weapons Inventory," *Strategic Weapon Systems* (16 January 2020). See also Annex A: Chinese Ballistic and Cruise Missiles.

⁹¹ Saylor, *Hypersonic Weapons*, op cit., p. 16.

⁹² Congressional Budget Office, *National Cruise Missile Defense*, op cit., p. 2.

⁹³ Office of the Secretary of Defense, *Annual Report to Congress 2021*, op cit., p. 90.

⁹⁴ See James M. Acton, "Escalation through Entanglement: How the Vulnerability of Command-and-Control Systems Raises the Risks of an Inadvertent Nuclear War," *International Security* Summer 2018; 43(1): pp. 56–99; and James M. Acton, *China's Advanced Weapons*, Testimony before the U.S.-China Economic and Security Review Commission (Washington, D.C.: Carnegie Endowment for International Peace, 23 February 2017).

⁹⁵ Hans M. Kristensen and Matt Korda, "Chinese Nuclear Forces 2020," *Bulletin of the Atomic Scientists* 2020; 76(6): pp. 443–457.

⁹⁶ Partyard Military, "Hypersonic Missiles: What Are They and Can They Be Stopped?" (10 May 2019), <https://partyardmilitary.com/hypersonic-missiles-what-are-they-and-can-they-be-stopped/> (accessed 24 February 2022).

The risk of miscalculation and unintended escalation is compounded in the South China and East China Seas where Beijing is building militarized island bases and embarking on military coercive actions that threaten deterrence and escalation control.⁹⁷ According to Michael Roi and Peter Lyon, strategic analysts at Defence Research and Development Canada (DRDC) – Centre for Operational Research and Analysis, China’s actions in the South China Sea are consistent with Thomas C. Schelling’s concept of “salami tactics,”⁹⁸ where Beijing has progressively militarized South China Sea islands. This tactic aims to obscure China’s activities in the South China Sea to dominate and control the region and complicate the United States’ response options.⁹⁹

In the East China Sea, the authors argue that China has become increasingly confrontational and belligerent in its air and maritime operations. While these activities reflect China’s more assertive security and defence guidelines designed to confront the United States and other countries in areas where its strategic interests diverge,¹⁰⁰ the actions are escalatory and could cross the threshold to armed conflict due to miscalculation. There is a significant concern in areas where China has disputes with its neighbours, particularly with Japan over the Senkaku and Ryukyu Islands; South Korea over Socotra Rock; or a China-Taiwan conflict.¹⁰¹

In both cases, the authors argue that the United States and its allies will be required to deter and possibly even confront China’s activities in the South China and East China Seas. In order to prevent an escalation to armed conflict, unambiguous redlines need to be articulated.¹⁰² A clearly marked redline should include a warning that a military attack by China in the South China and/or East China Sea using hypersonic dual-capable strategic systems could be misinterpreted. Advanced dual-capable systems can threaten escalation control. Mitigating their use is necessary to prevent accidental, inadvertent escalation during a crisis.

⁹⁷ Mallory Shelbourne, “U.S. Admiral: China Can ‘Keep Pouring Money’ Into Anti-Ship Ballistic Missiles,” *U.S. Naval Institute* (27 January 2021), <https://news.usni.org/2021/01/27/u-s-admiral-china-can-keep-pouring-money-into-anti-ship-ballistic-missiles> (accessed 14 April 2022).

⁹⁸ Thomas C. Schelling, *Arms and Influence* (New Haven, CT: Yale University Press, 2008), pp. 66–67.

⁹⁹ Michael Roi and Peter Lyon, *China’s Militarized Island-Bases in the South China Sea: A Case Study of Escalation and Deterrence in the “Grey Zone,”* Defence Research and Development Canada, Scientific Report, DRDC-RDDC-2021-R115 (August 2021), p. 27.

¹⁰⁰ Office of the Secretary of Defense, *Annual Report to Congress 2021*, op cit., p. 1.

¹⁰¹ Michael Roi and Peter Lyon, *Chinese Military Coercion in the East China Sea: A Case Study of Escalation and Deterrence in the “Grey Zone,”* Defence Research and Development Canada, Scientific Report, DRDC-RDDC-2021-R135 (August 2021), pp. 16–17.

¹⁰² Roi and Lyon, *China’s Militarized Island-Bases in the South China Sea*, op cit., p. i; and *Ibid.*, p. i.

6 Conclusion

China's missile force continues to grow quantitatively and qualitatively. China's ballistic and cruise missile systems are becoming more survivable, reliable, and accurate while also achieving longer ranges. However, to suggest China's conventional cruise missiles currently pose a threat to North America is an overstatement. While China can already target North America with a relatively small force of ICBMs, these systems are nuclear-capable only.

Beijing finds itself at a strategic crossroads. China can optimize the use of dual-capable systems by placing advanced missiles on mobile strategic platforms or vastly modernize and improve the capabilities of its current missile systems. However, to threaten North America with conventional missiles, China would be required to pursue the development of strategic delivery systems and mate conventional warheads to them. Dual-capable systems include developing and deploying H-6/H-20 strategic bombers capable of delivering ALCM or ALBM or placing conventional cruise missiles on nuclear-powered submarines (i.e., creating SSGNs).

Since the approach taken by Beijing appears to be a combination of developing mobile dual-capable assets and developing advanced missile capabilities, China's suite of next-generation strategic weapons could potentially exploit vulnerabilities and capability gaps in North American defences. There is also a concern because China has articulated a much more assertive defence and foreign policy. Elements of that assertiveness include emphasizing a more significant global role for itself in accordance with its defence policy and military strategy, pursuing "predatory" economic policies in trade agreements,¹⁰³ pursuing far-ranging efforts to expand its ability to project power globally, and even revising the international order.¹⁰⁴

Outside of nuclear-equipped ICBMs, China's current missile capabilities are linked to regional deterrence, dominance, and control. Although the focus, trajectory, and intent of China's conventional missile developments could eventually place North America at risk, available evidence regarding missile developments and CCP statements support that China's primary motivation is building a "great iron wall of steel" out to the first island chain to deter foreign powers from becoming involved in any future regional conflict.¹⁰⁵ Deterrence activities also include projecting power into the second island chain to target and destroy any forces entering the region to prevent their involvement in operations close to China's shores.

¹⁰³ Predatory economic policies are mercantilist economic policies pursued by China that establish financing schemes or agreements often for large infrastructure projects that saddle recipient countries with unsustainable debt and could even compromise their sovereignty. Matthew P. Goodman, "Predatory Economics and the China Challenge," *Global Economics Monthly* (Center for Strategic and International Studies, 21 November 2017); VI(11): pp. 1–2.

¹⁰⁴ See Office of the Secretary of Defense, *Annual Report to Congress 2021*, op cit., p. 30.

¹⁰⁵ BBC News Services, "Xi warns China will not be 'oppressed' in anniversary speech," (1 July 2021), <https://www.bbc.com/news/world-asia-china-57648236> (accessed 11 November 2021); and Bernard D. Cole, *The Great Wall at Sea: China's Navy Enters the 21st Century* (U.S. Naval Institute Press, 2001).

As China's interests and capabilities grow and China's actions in the western Pacific become emboldened, it will only be a matter of time before its interests and someone else's interests collide and crisis-level tensions result. When they do, China will be armed with accurate, high-speed, long-range regional missiles that compress time and space for China's opponents. From this perspective, hypersonic missiles will play a huge role in China's military and defence policy pursuits in the years to come. Hypersonic glide vehicles delivered by ballistic missile boosters are a threat that will pose challenges to missile defence systems and operations in the western Pacific.¹⁰⁶ Consequently, the greatest threat in this strategic context is a miscalculation.¹⁰⁷ Miscalculation increases because dual-capable missile systems and entanglement make it challenging to determine if an attack is conventional, nuclear, limited, or full-scale. Therefore, western nations must focus on deterring the use of dual-capable systems in the western Pacific, and send unambiguous messaging that dual-capable systems are destabilizing and hinder escalation control, particularly during a crisis.

¹⁰⁶ Defense Intelligence Ballistic Missile Analysis Committee, *Ballistic and Cruise Missile Threat 2020*, op cit., p. 38.

¹⁰⁷ Joseph Henrotin, "Hypersonic Weapons: What Are the Challenges for the Armed Forces?" *Briefings de l'Ifri* (Paris, France: Institut français des relations internationales, 18 June 2021), <https://www.ifri.org/en/publications/briefings-de-lifri/hypersonic-weapons-what-are-challenges-armed-forces-0> (accessed 27 September 2021).

References

- Acton, James M. “Escalation through Entanglement: How the Vulnerability of Command-and-Control Systems Raises the Risks of an Inadvertent Nuclear War.” *International Security*. Summer 2018; 43(1): pp. 56–99.
- Acton, James M. *China’s Advanced Weapons*. Testimony before the U.S.-China Economic and Security Review Commission. Washington, D.C.: Carnegie Endowment for International Peace, 23 February 2017.
- Agence France-Presse. “State Media: China Needs Long-Range Bomber.” *Defense News*. 7 July 2015, <https://www.defensenews.com/2015/07/07/state-media-china-needs-long-range-bomber/>. Accessed 2 August 2021.
- Ali, Idrees., Brunstrom, David., and Martina, Michael. “U.S. says Beijing’s South China Sea ‘provocations’ risk major incident.” *Reuters*. 27 July 2022, <https://www.reuters.com/world/china/us-says-beijings-south-china-sea-provocations-risk-major-incident-2022-07-26/>. Accessed 5 October 2022.
- Army Recognition. “Iran has developed new containerized Fateh-110 surface-to-surface missile system.” 26 July 2021, https://www.armyrecognition.com/weapons_defence_industry_military_technology_uk/iran_has_developed_new_containerized_fateh-110_surface-to-surface_missile_system.html. Accessed 11 November 2021.
- Babb, Carla. “China Nuclear Arsenal Growing Faster Than Previously Thought, Pentagon Says.” *VOA News*. 3 November 2021, <https://www.voanews.com/a/china-nuclear-arsenal-growing-faster-than-previously-thought-pentagon-says/6298605.html>. Accessed 13 November 2021.
- BBC News Services. “Xi warns China will not be ‘oppressed’ in anniversary speech.” 1 July 2021, <https://www.bbc.com/news/world-asia-china-57648236>. Accessed 11 November 2021.
- Beckley, Michael. “In Future Wars, the U.S. Military Will Have Nowhere to Hide.” *Foreign Policy*. 20 November 2019, <https://foreignpolicy.com/2019/11/20/russia-china-increasingly-able-attack-united-states-bases-networks-war/>. Accessed 3 October 2022.
- Boynton, Sean. “Why is China ‘buzzing’ Canadian, Australian planes? Here’s what you need to know.” *Global News*. 8 June 2022, <https://globalnews.ca/news/8904437/china-canada-buzzing-planes-north-korea-explainer/>. Accessed 5 October 2022.
- Brockmann, Kolja., and Schiller, Markus. “A matter of speed? Understanding hypersonic missile systems.” *Commentary/Backgrounder*. Stockholm International Peace Research Institute, 4 February 2022, <https://www.sipri.org/commentary/topical-backgrounder/2022/matter-speed-understanding-hypersonic-missile-systems>. Accessed 29 April 2022.
- Canada, Department of National Defence. *Strong, Secure, Engaged: Canada’s Defence Policy*. Ottawa: National Defence, 2017.
- Center for Strategic and International Studies. “DF-21 (CSS-5).” *Missile Defense Project*. 28 March 2022, <https://missilethreat.csis.org/missile/df-21/>. Accessed 28 March 2022.
- Charron, Andrea., and Fergusson, James. *Defending the Continent: NORAD Modernization and Beyond*, Policy Perspective. Calgary: Canadian Global Affairs Institute, May 2022.

China Power Team. "Does China Have an Effective Sea-based Nuclear Deterrent?" *China Power*. 28 December 2015, updated 26 August 2020, <https://chinapower.csis.org/ssbn/>. Accessed 14 April 2021.

China's National Defense in the New Era. Beijing: The State Council Information Office of the People's Republic of China, July 2019.

Cole, Bernard D. *The Great Wall at Sea: China's Navy Enters the 21st Century*. U.S. Naval Institute Press, 2001.

Congressional Budget Office. *National Cruise Missile Defense: Issues and Alternatives*. Washington, D.C.: February 2021.

Culver, John. "How We Would Know When China Is Preparing to Invade Taiwan," Commentary. Washington, D.C.: Carnegie Endowment for International Peace, 3 October 2022, <https://carnegieendowment.org/2022/10/03/how-we-would-know-when-china-is-preparing-to-invade-taiwan-pub-88053>. Accessed 5 October 2022.

Defense Intelligence Ballistic Missile Analysis Committee. *Ballistic and Cruise Missile Threat 2020*. Wright-Patterson, OH: National Air and Space Intelligence Center, July 2020.

Denmark, Abraham., and Talmadge, Caitlin. "Why China Wants More and Better Nukes: How Beijing's Nuclear Buildup Threatens Stability." *Foreign Affairs*. 19 November 2021.

Eshel, Tamir. "Fateh 110 missiles in Iran, Syria and Lebanon." *Defense Update*. 22 November 2014, https://defense-update.com/20141122_fateh-110-missiles-in-iran-syria-and-lebanon.html. Accessed 24 February 2022.

Fravel, M. Taylor. "China's new military strategy: 'Winning informationized local wars.'" *China Brief*. Jamestown Foundation, July 2015; 15(13), <https://jamestown.org/program/chinas-new-military-strategy-winning-informationized-local-wars/>. Accessed 10 September 2021.

Fravel, M. Taylor. *Active Defense: China's Military Strategy Since 1949*. Book 2. Princeton University Press, April 2019.

Fuhrman, Eli. "The Navy Surfaced Three Missile Submarines Simultaneously as a Warning to China." *The National Interest*. 25 July 2021, <https://nationalinterest.org/blog/buzz/navy-surfaced-three-missile-submarines-simultaneously-warning-china-190443>. Accessed 14 April 2022.

Gady, Franz-Stefan. "China Tests New Weapon Capable of Breaching U.S. Missile Defense Systems." *The Diplomat*. 28 April 2016, <https://thediplomat.com/2016/04/china-tests-new-weapon-capable-of-breaching-u-s-missile-defense-systems/>. Accessed 25 August 2021.

Gady, Franz-Stefan. "China Wants to Develop a New Long-Range Strategic Bomber." *The Diplomat*. 13 July 2015, <https://thediplomat.com/2015/07/china-wants-to-develop-a-new-long-range-strategic-bomber/>. Accessed 25 August 2021.

Gertz, Bill. "China Building Long-Range Cruise Missile Launched from Ship Container." *The Washington Free Beacon*. 27 March 2019, <https://freebeacon.com/national-security/china-building-long-range-cruise-missile-launched-from-ship-container/>. Accessed 24 February 2022.

Goodman, Matthew P. "Predatory Economics and the China Challenge." *Global Economics Monthly*, Center for Strategic and International Studies 21 November 2017; VI(11): pp. 1–2.

Google Map of Asia-Pacific Region. *Google Maps*. 2022, <https://www.google.ca/maps/>. Accessed 11 January 2022.

Google Map of Asia-Pacific Region. *Google Maps*. 2022, <https://www.google.ca/maps/>. Accessed 11 September 2022.

Graham, Euan. "Assessing the Solomon Islands' new security agreement with China." *International Institute for Strategic Studies*. 5 May 2022, <https://www.iiss.org/blogs/analysis/2022/05/china-solomon-islands>. Accessed 30 May 2022.

Gunzinger, Mark., and Dougherty, Christopher. *Outside-In: Operating from Range to Defeat Iran's Anti-Access and Area-Denial Threats*. Washington, D.C.: Center for Strategic and Budgetary Assessments, 2011.

Henrotin, Joseph. "Hypersonic Weapons: What Are the Challenges for the Armed Forces?" *Briefings de l'Ifri*. Paris, France: Institut français des relations internationales, 18 June 2021, <https://www.ifri.org/en/publications/briefings-de-lifri/hypersonic-weapons-what-are-challenges-armed-forces-0>. Accessed 27 September 2021.

Hitchens, Theresa. "After China's 'Hypersonic' Test, U.S. Alarm and Many Unanswered Questions." *Breaking Defense*. 19 October 2021, <https://breakingdefense.com/2021/10/questions-linger-over-chinas-reported-hypersonic-space-weapon-test/>. Accessed 14 April 2022.

Hollings, Alex. "China's New Long-Range Cruise Missiles Are Built to be Fired from Containers on Merchant Ships." *Special Operations Forces Report*. 4 April 2019, <https://sofrep.com/news/chinas-new-long-range-cruise-missiles-are-built-to-be-fired-from-containers-on-merchant-ships/>. Accessed 28 March 2022.

Holmes, James. "Is China's DF-100 Missile a Threat to the U.S. Navy?" *The National Interest*. 4 November 2019, <https://nationalinterest.org/blog/buzz/chinas-df-100-missile-threat-us-navy-93166>. Accessed 11 January 2022.

Jane's. "Aircraft – Fixed-Wing – Military – Xian H-6." *All the World's Aircraft: Equipment Profile*. 31 March 2021.

Jane's. "Spreadsheet: Offensive Weapons Inventory." *Strategic Weapon Systems*. 16 January 2020.

Johnson, Jesse. "'Only a matter of time': Warnings of China-U.S. military miscalculation grow." *Japan Times*. 27 July 2022, <https://www.japantimes.co.jp/news/2022/07/27/asia-pacific/china-us-military-miscalculation/>. Accessed 5 October 2022.

Kanwal, Gurmeet. *China's New War Concepts for 21st Century Battlefields*. Institute of Peace and Conflict Studies, 1 July 2007, <http://www.jstor.org/stable/resrep09034>. Accessed 29 April 2021.

Karako, Tom., Strohmeier, Matt., Williams, Ian., et al. *North America Is a Region, Too: An Integrated, Phased, and Affordable Approach to Air and Missile Defense for the Homeland*. CSIS Missile Defense Project. Washington, D.C.: Center for Strategic and International Studies, July 2022.

Kazianis, Harry. "China's Anti-Access Missile." *The Diplomat*. 18 November 2011, <https://thediplomat.com/2011/11/china-anti-access-missile/>. Accessed 10 September 2021.

Korda, Matt., and Kristensen, Hans M. "China Is Building a Second Nuclear Missile Silo Field." *Federation of American Scientists*. 26 July 2021, <https://fas.org/blogs/security/2021/07/china-is-building-a-second-nuclear-missile-silo-field/>. Accessed 18 October 2021.

Krepinevich, Andrew F. *Why AirSea Battle?* Washington, D.C.: Center for Strategic and Budgetary Assessments, 19 February 2010.

Krepinevich, Andrew F., Watts, Barry., and Work, Robert. *Meeting the Anti-Access and Area-Denial Challenge*. Washington, D.C.: Center for Strategic and Budgetary Assessments, 2003.

Krishnankutty, Pia. “Not just India, Tibet – China has 17 territorial disputes with its neighbours, on land & sea.” *ThePrint*. 15 July 2020, <https://theprint.in/theprint-essential/not-just-india-tibet-china-has-17-territorial-disputes-with-its-neighbours-on-land-sea/461115/>. Accessed 27 September 2021.

Kristensen, Hans M. “China’s Expanding Missile Training Area: More Silos, Tunnels, and Support Facilities.” *Federation of American Scientists*. 24 February 2021, <https://fas.org/blogs/security/2021/02/plarf-jilantai-expansion/>. Accessed 28 March 2021.

Kristensen, Hans M., and Korda, Matt. “Chinese Nuclear Forces 2020.” *Bulletin of the Atomic Scientists* 2020; 76(6): pp. 443–457.

Liang, Qiao., and Xiangsui, Wang. *Unrestricted Warfare*. Beijing: PLA Literature and Arts Publishing House, February 1999.

Miller, Michael E. “China pushes Pacific deal, as Australia scrambles to repair regional ties.” *The Washington Post*. 26 May 2022, <https://www.washingtonpost.com/world/2022/05/26/solomons-china-wang-yi-pacific-australia/>. Accessed 30 May 2022.

Ministry of Foreign Affairs, the People’s Republic of China. “Wang Yi Expounds on Three Principles of China-Solomon Islands Security Cooperation.” 26 May 2022, https://www.fmprc.gov.cn/eng/zxxx_662805/202205/t20220526_10693195.html. Accessed 30 May 2022.

Ministry of National Defense, the People’s Republic of China. “Defense spokesperson answers press question on Canadian military’s hype of aircraft encounters.” 6 June 2022, http://eng.mod.gov.cn/news/2022-06/06/content_4912402.htm. Accessed 5 October 2022.

Missile Defense Advocacy Alliance. “Changjian-20 (CJ-20).” February 2017, <https://missiledefenseadvocacy.org/missile-threat-and-proliferation/todays-missile-threat/china/changjian-20-cj-20/>. Accessed 2 August 2021.

Missile Defense Advocacy Alliance. “Fateh-110.” 3 June 2021, <https://missiledefenseadvocacy.org/missile-threat-and-proliferation/todays-missile-threat/iran/fateh-110/>. Accessed 2 August 2021.

Neill, Donald A. *China’s Evolving Nuclear Posture: Part I – Background and Benchmark*. Technical Memorandum, DRDC-CORA-TM-2011-148. Ottawa: Defence R&D Canada – CORA, September 2011.

Novak, Dan. “China Seeks Cooperation Deal with 10 Pacific Island Nations.” *VOA News*. 25 May 2022, <https://learningenglish.voanews.com/a/china-seeks-cooperation-deal-with-10-pacific-island-nations/6588836.html>. Accessed 30 May 2022.

O’Shaughnessy, Terrence J. “Statement of General Terrence J. O’Shaughnessy, United States Air Force Commander United States Northern Command and North American Aerospace Defense Command before the Senate Armed Services Committee.” Washington D.C.: U.S. Senate Committee on Armed Services, 13 February 2020.

O'Shaughnessy, Terrance J., and Fesler, Peter M. *Hardening the Shield: A Credible Deterrent & Capable Defense for North America*. Washington, D.C.: Wilson Center, Canada Institute, September 2020.

Office of the Secretary of Defense. *Annual Report to Congress: Military and Security Developments Involving the People's Republic of China 2007*. Washington, D.C.: U.S. Department of Defense, 2007.

Office of the Secretary of Defense. *Annual Report to Congress: Military and Security Developments Involving the People's Republic of China 2011*. Washington, D.C.: U.S. Department of Defense, 2011.

Office of the Secretary of Defense. *Annual Report to Congress: Military and Security Developments Involving the People's Republic of China 2021*. Washington, D.C.: U.S. Department of Defense, 2021.

Office of the Secretary of Defense. *Annual Report to Congress: Military and Security Developments Involving the People's Republic of China 2022*. Washington, D.C.: U.S. Department of Defense, 2022.

Panda, Ankit. "Revealed: China's Nuclear-Capable Air-Launched Ballistic Missile." *The Diplomat*. 10 April 2018, <https://thediplomat.com/2018/04/revealed-chinas-nuclear-capable-air-launched-ballistic-missile/>. Accessed 10 September 2021.

Partyard Military. "Hypersonic Missiles: What Are They and Can They Be Stopped?" 10 May 2019, <https://partyardmilitary.com/hypersonic-missiles-what-are-they-and-can-they-be-stopped/>. Accessed 24 February 2022.

Perrett, Bradley., Sweetman, Bill., and Fabey, Michael. "U.S. Navy Sees Chinese HGV as Part of Wider Threat." *Aviation Week & Space Technology*. 27 January 2014.

Reim, Garrett. "Counter hypersonic weapon possible by mid-2020s: DoD." *Flight Global*. 2018, <https://www.flightglobal.com/civil-uavs/counter-hypersonic-weapon-possible-by-mid-2020s-dod/130690.article>. Accessed 27 September 2021.

Roblin, Sebastien. "Is China's DF-100 Missile Good Enough to Kill America's Navy?" *The National Interest*. 7 November 2019, <https://nationalinterest.org/blog/buzz/chinas-df-100-missile-good-enough-kill-americas-navy-96476>. Accessed 11 January 2022.

Roblin, Sebastien. "The DF-100 Is China's Biggest Threat to The U.S. Navy." *The National Interest*. 17 April 2020, <https://nationalinterest.org/blog/buzz/df-100-chinas-biggest-threat-us-navy-145172>. Accessed 11 January 2022.

Roi, Michael., and Lyon, Peter. *China's Militarized Island-Bases in the South China Sea: A Case Study of Escalation and Deterrence in the "Grey Zone."* Defence Research and Development Canada, Scientific Report, DRDC-RDDC-2021-R115. August 2021.

Roi, Michael., and Lyon, Peter. *Chinese Military Coercion in the East China Sea: A Case Study of Escalation and Deterrence in the "Grey Zone."* Defence Research and Development Canada, Scientific Report, DRDC-RDDC-2021-R135. August 2021.

Royal Museums Greenwich. *Space Race Timeline*. 2021, <https://www.rmg.co.uk/stories/topics/space-race-timeline>. Accessed 15 May 2022.

Rubin, Lawrence., and Stulberg, Adam N., eds. *The End of Strategic Stability? Nuclear Weapons and the Challenge of Regional Rivalries*. Georgetown University Press, 2018.

Sayler, Kelley M. *Hypersonic Weapons: Background and Issues for Congress*. CRS Report No. R45811. Washington, D.C.: United States Congressional Research Service, 17 March 2022.

Schelling, Thomas C. *Arms and Influence*. New Haven, CT: Yale University Press, 2008.

Sevastopulo, Demetri., and Hille, Kathrin. “China tests new space capability with hypersonic missile.” *The Financial Times*. 16 October 2021, <https://www.ft.com/content/ba0a3cde-719b-4040-93cb-a486e1f843fb>. Accessed 18 October 2021.

Shelbourne, Mallory. “U.S. Admiral: China Can ‘Keep Pouring Money’ Into Anti-Ship Ballistic Missiles.” *U.S. Naval Institute*. 27 January 2021, <https://news.usni.org/2021/01/27/u-s-admiral-china-can-keep-pouring-money-into-anti-ship-ballistic-missiles>. Accessed 14 April 2022.

Stokes, Mark A. *Chinas Nuclear Warhead Storage and Handling System*. Arlington, VA: Project 2049 Institute, 12 March 2010.

Sutton, H.I. “China’s New Aircraft Carrier Killer Is World’s Largest Air-Launched Missile.” *Naval News*. 1 November 2020, <https://www.navalnews.com/naval-news/2020/11/chinas-new-aircraft-carrier-killer-is-worlds-largest-air-launched-missile/>. Accessed 18 October 2021.

Tahir, Tariq. “China Feared to be Hiding Missiles in Shipping Containers for Trojan Horse-Style Plan to Launch Attack Anywhere in World.” *U.S. Sun*. 6 December 2021, <https://www.thesun.co.uk/news/16563733/china-feared-hiding-missile-trojan-horse-containers/>. Accessed 28 March 2022.

Teeple, Nancy. *Russian Threats to North America: An Assessment of Capabilities and Intentions – Executive Summary*. Defence Research and Development Canada, Scientific Letter, DRDC-RDDC-2022-L044. February 2022.

The Economist. “America and China are one military accident away from disaster.” 15 January 2022.

The Economist. “China’s nuclear arsenal was strikingly modest, but that is changing.” 23 November 2019.

The Guardian. “Xi Jinping warns China won’t be bullied in speech marking 100-year anniversary of CCP.” 1 July 2021, <https://www.theguardian.com/world/2021/jul/01/xi-jinping-warns-china-wont-be-bullied-100-year-anniversary-chinese-communist-party->. Accessed 11 September 2021.

The White House. *FACT SHEET: Implementation of the Australia – United Kingdom – United States Partnership (AUKUS)*. 5 April 2022, <https://www.whitehouse.gov/briefing-room/statements-releases/2022/04/05/fact-sheet-implementation-of-the-australia-united-kingdom-united-states-partnership-aukus/>. Accessed 31 May 2022.

The White House. *Joint Leaders Statement on AUKUS*. 15 September 2021, <https://www.whitehouse.gov/briefing-room/statements-releases/2021/09/15/joint-leaders-statement-on-aukus/>. Accessed 31 May 2022.

U.S. Naval Institute. *Report: Chinese Develop Special “Kill Weapon” to Destroy U.S. Aircraft Carriers*. 31 March 2009.

VanHerck, Glen D. *To Compete Globally, We Must Be Strong at Home*. NORAD and USNORTHCOM Strategy: Executive Summary. NORAD and USNORTHCOM, March 2021.

Want China Times. "PLA's Type-093G submarines 'could destroy Izumo.'" 7 April 2015, <http://www.wantchinatimes.com/news-subclass-cnt.aspx?id=20150407000124&cid=1101>. Accessed 10 September 2021.

Wither, James K. "Making sense of hybrid warfare." *Connections QJ* 2016; 15(2): pp. 73–87.

Yeo, Mike. "China's missile and space tech is creating a defensive bubble difficult to penetrate." *Defense News*. 1 June 2020, <https://www.defensenews.com/global/asia-pacific/2020/06/01/chinas-missile-and-space-tech-is-creating-a-defensive-bubble-difficult-to-penetrate/>. Accessed 13 November 2021.

Zhao, Lei. "Navy to get 3 new nuclear subs." *China Daily USA*. 3 April 2015, http://usa.chinadaily.com.cn/china/2015-04/03/content_19989106.htm. Accessed 15 May 2022.

Zhao, Tong. "Grappling with New Capabilities and Concepts." *Tides of Change: China's Nuclear Ballistic Missile Submarines and Strategic Stability*. Washington, D.C.: Carnegie Endowment for International Peace, 24 October 2018.

Annex A Chinese Ballistic and Cruise Missiles

Ballistic missiles are typically classified by their range: ICBM; IRBM; MRBM; SRBM; and CRBM. Ballistic missiles can further be identified by their launch platform: missile silos; submarines; road- and rail-mobile launchers; and aircraft. Mobile missiles provide greater pre-launch survivability (see Table A.1).

*Table A.1: Chinese nuclear, dual-capable, and conventional ballistic missile inventory.*¹⁰⁸

Ballistic Missiles	Designation	Type ^{109, 110}	Range ¹¹¹	Warhead	Notes
Air-based ballistic missile	CH-AS-X-13	ALBM/ ASBM	3,000 km	Dual-capable	In development, based on DF-21D/DF-17, hypersonic
Land-based ballistic missile	DF-5C	ICBM	-	Nuclear	
Land-based ballistic missile	DF-5B	ICBM	13,000 km	Nuclear	
Land-based ballistic missile	DF-5A	ICBM	13,000 km	Nuclear	
Land-based ballistic missile	DF-5	ICBM	12,000 km	Nuclear	

¹⁰⁸ Jane’s, “Spreadsheet,” op cit.

Nuclear
Dual-Capable
Conventional

¹⁰⁹ Air-launched ballistic missile (ALBM)
 Air-launched cruise missile (ASCM)
 Anti-ship ballistic missile (ASBM)
 Anti-ship cruise missile (ASCM)
 Close-range ballistic missile (CRBM)
 Intercontinental ballistic missile (ICBM)

Intermediate-range ballistic missile (IRBM)
 Land-attack cruise missile (LACM)
 Medium-range ballistic missile (MRBM)
 Manoeuvrable re-entry vehicles (MaRV)
 Short-range ballistic missile (SRBM)
 Surface-to-surface missile (SSM)

¹¹⁰ Missile range classifications taken from Defense Intelligence Ballistic Missile Analysis Committee, *Ballistic and Cruise Missile Threat 2020*, op cit., p. 8.

¹¹¹ Range estimates for China’s ballistic and cruise missiles vary from source to source. The most common and reasonable figures are cited in this Report.

CAN UNCLASSIFIED

Ballistic Missiles	Designation	Type <small>109, 110</small>	Range¹¹¹	Warhead	Notes
Land-based ballistic missile	DF-41	ICBM	11,200 km	Nuclear	
Land-based ballistic missile	DF-31B/ DF-31AG	ICBM	11,200 km	Nuclear	
Land-based ballistic missile	DF-31A	ICBM	10,000–12,000 km	Nuclear	Can target continental United States
Land-based ballistic missile	DF-31	ICBM	7,250 km	Nuclear	Can target Hawaii
Land-based ballistic missile	DF-4	ICBM	5,500 km	Nuclear	Can target Alaska
Land-based ballistic missile	DF-26 (DF-26B/ DF-26C)	IRBM/ ASBM	4,000–5,000 km	Dual-capable	“Guam Express” “one carrier, many warheads”
Land-based ballistic missile	DF-21/ DF-21A	MRBM	1,700–2,150 km	Nuclear	
Land-based ballistic missile	DF-17	MRBM	1,800–2,500 km	Dual-capable	DF-ZF HGV
Land-based ballistic missile	DF-21C	MRBM	1,700 km	Dual-capable	
Land-based ballistic missile	DF-21D	MRBM/ ASBM	1,500 km	Dual-capable	MaRV, “carrier-killer”
Land-based ballistic missile	DF-16	SRBM/ MRBM	1,000 km	Conventional	
Land-based ballistic missile	DF-11A	SRBM	>825 km	Dual-capable	
Land-based ballistic missile	DF-15/ DF-15A/ DF-15B	SRBM	600–800 km	Dual-capable	MaRV
Land-based ballistic missile	DF-11	CRBM	300 km	Dual-capable	
Land-based ballistic missile	CM-401 (YJ-21)	CRBM/ ASBM	290 km	Conventional	Hypersonic

Ballistic Missiles	Designation	Type ^{109, 110}	Range ¹¹¹	Warhead	Notes
Land-based ballistic missile	BP-12A/ BP-12B	CRBM	280–400 km	Conventional	
Land-based ballistic missile	B-611	CRBM	250–280 km	Conventional	MaRV
Land-based ballistic missile	P-12	CRBM	150 km	Conventional	
Land-based ballistic missile	DF-12	CRBM	100–420 km	Conventional	
Land-based ballistic missile	B-611M	CRBM	80–260 km	Conventional	
Sea-based ballistic missile	JL-3	SLBM	12,000–14,000 km (est.)	Nuclear	
Sea-based ballistic missile	JL-2	SLBM	8,000 km	Nuclear	
Sea-based ballistic missile	CM-401 (YJ-21)	CRBM/ ASBM	290 km	Conventional	Hypersonic

Cruise missiles are typically categorized by their intended mission: either LACM or ASCM. Cruise missiles can further be categorized by their launch platform: aircraft, ship, submarine, or ground launcher (see Table A.2).

*Table A.2: Chinese conventional and dual-capable cruise missile inventory.*¹¹²

Cruise Missiles	Designation	Type	Range	Warhead	Notes
Air-launched cruise missile	HN-2000/DH-2000	LACM/ ASCM	4,000 km	Dual-capable	In development, stealthy, supersonic
Air-launched cruise missile	CJ-100C	LACM/ ASCM	3,500 km (est.)	Conventional	In development, hypersonic
Air-launched cruise missile	HN-3 (DH-10A)	LACM	2,200–3,000 km	Dual-capable	
Air-launched cruise missile	CJ-100B	LACM/ ASCM	2,000–3,000 km	Conventional	In development, hypersonic

¹¹² Jane's, "Spreadsheet," op cit.
DRDC-RDDC-2022-R162

CAN UNCLASSIFIED

Cruise Missiles	Designation	Type	Range	Warhead	Notes
Air-launched cruise missile	CJ-100 (DF-100)	LACM	2,000–3,000 km	Conventional	Supersonic, possibly hypersonic
Air-launched cruise missile	CJ-20 (KD-20/DF-10)	LACM	2,000–2,200 km	Dual-capable	
Air-launched cruise missile	HN-2 (CJ-10)	LACM	1,400–2,000 km	Dual-capable	
Air-launched cruise missile	YJ-100	ASCM	800 km	Dual-capable	In development
Air-launched cruise missile	HN-1	LACM	600–650 km	Conventional	
Land-based SSM and cruise missile	HN-2000/DH-2000	LACM/ ASCM	4,000 km	Dual-capable	In development, stealthy, supersonic
Land-based SSM and cruise missile	CJ-100C	LACM/ ASCM	3,500 km (est.)	Conventional	In development, hypersonic
Land-based SSM and cruise missile	HN-3 (DH-10A)	LACM	2,200–3,000 km	Dual-capable	
Land-based SSM and cruise missile	CJ-100B	LACM/ ASCM	2,000–3,000 km	Conventional	In development, hypersonic
Land-based SSM and cruise missile	CJ-100 (DF-100)	LACM	2,000–3,000 km	Conventional	Supersonic, possibly hypersonic
Land-based SSM and cruise missile	DF-10 (CJ-20/DH-20)	LACM	2,000 km	Dual-capable	
Land-based SSM and cruise missile	DF-10A	LACM/ ASCM	1,500–2,000 km	Dual-capable	
Land-based SSM and cruise missile	HN-2 (CJ-10)	LACM	1,400–2,000 km	Dual-capable	
Land-based SSM and cruise missile	CF-2	LACM	800 km	Dual-capable	
Land-based SSM and cruise missile	HN-1	LACM	600–650 km	Conventional	
Land-based SSM and cruise missile	Mobile Coast (YJ-18)	LACM/ ASCM	400 km	Conventional	In development
Land-based SSM and cruise missile	CF-1	LACM	400 km	Dual-capable	
Land-based SSM and cruise missile	CF-2000	-	150 km	Conventional	
Sea-based SSM and cruise missile	HN-2000/DH-2000	LACM/ ASCM	4,000 km	Dual-capable	In development, stealthy, supersonic
Sea-based SSM and cruise missile	HN-3 (DH-10A)	LACM	2,200–3,000 km	Dual-capable	
Sea-based SSM and cruise missile	DF-10 (CJ-20/DH-20)	LACM	2,000 km	Dual-capable	

CAN UNCLASSIFIED

Cruise Missiles	Designation	Type	Range	Warhead	Notes
Sea-based SSM and cruise missile	HN-2 (CJ-10)	LACM	1,400–2,000 km	Dual-capable	
Sea-based SSM and cruise missile	YJ-100	ASCM	800 km	Dual-capable	In development
Sea-based SSM and cruise missile	HN-1	LACM	600–650 km	Conventional	
Sea-based SSM and cruise missile	YJ-18/YJ-18A/ YJ-18B/YJ-18C	LACM/ ASCM	220–540 km	Conventional	YJ-18C possibly containerized?

List of Symbols/Abbreviations/Acronyms/Initialisms

A2/AD	anti-access/area-denial
ABM	anti-ballistic missile
AFB	Air Force Base
ALBM	air-launched ballistic missile
ALCM	air-launched cruise missile
ASBM	anti-ship ballistic missile
ASCM	anti-ship cruise missile
ASM	anti-ship missile
ASuW	anti-surface warfare
ASW	anti-submarine warfare
AUKUS	Australia, the United Kingdom, and the United States
BBC	British Broadcasting Corporation
CCP	Chinese Communist Party
CFB	Canadian Forces Base
CMC	Central Military Commission
CRBM	close-range ballistic missile
CRS	Congressional Research Service
CSIS	Centre for Strategic and International Studies
D.N.A.	deoxyribonucleic acid
DNA	Defence of North America
DoD	Department of Defense
DRDC	Defence Research and Development Canada
FOBS	Fractional Orbital Bombardment System
HCM	hypersonic cruise missile
HGV	hypersonic glide vehicle
HQ	Headquarters
IADS	Integrated Air Defense System
ICBM	intercontinental ballistic missile
IO	information operations
IRBM	intermediate-range ballistic missile
LACM	land-attack cruise missile
MaRV	manoeuvrable re-entry vehicle

CAN UNCLASSIFIED

MIRV	manoeuvrable independently re-targetable vehicle
MRBM	medium-range ballistic missile
NORAD	North American Aerospace Defense Command
OTV	orbital test vehicle
PAct	Program Activity
PLA	People's Liberation Army
PLAAF	People's Liberation Army Air Force
PLAN	People's Liberation Army Navy
PLARF	People's Liberation Army Rocket Force
PRC	People's Republic of China
R&D	Research and Development
SRBM	short-range ballistic missile
SSBN	nuclear-powered ballistic missile submarine
SSGN	nuclear-powered cruise missile submarine
SSM	surface-to-surface missile
SSN	nuclear-powered attack submarine
START	strategic arms reduction treaty
TEL	transporter-erector-launcher
THAAD	Terminal High-Altitude Area Defense
TLAM	Tomahawk land-attack missile
U.S.	United States
USNORTHCOM	United States Northern Command
USS	United States Ship
VLS	vertical launching system
VOA	Voice of America

CAN UNCLASSIFIED

DOCUMENT CONTROL DATA		
*Security markings for the title, authors, abstract and keywords must be entered when the document is sensitive		
1. ORIGINATOR (Name and address of the organization preparing the document. A DRDC Centre sponsoring a contractor's report, or tasking agency, is entered in Section 8.) DRDC – Centre for Operational Research and Analysis Defence Research and Development Canada Carling Campus, 60 Moodie Drive, Building 7S.2 Ottawa, Ontario K1A 0K2 Canada	2a. SECURITY MARKING (Overall security marking of the document including special supplemental markings if applicable.) CAN UNCLASSIFIED	
	2b. CONTROLLED GOODS NON-CONTROLLED GOODS DMC A	
3. TITLE (The document title and sub-title as indicated on the title page.) Defence of North America: Chinese Missile Threat Assessment: Between Hope and Hype: An Assessment of People's Republic of China (PRC) Ambitions and the Reality of Chinese Missile Developments		
4. AUTHORS (Last name, followed by initials – ranks, titles, etc., not to be used) Christensen, K.		
5. DATE OF PUBLICATION (Month and year of publication of document.) November 2022	6a. NO. OF PAGES (Total pages, including Annexes, excluding DCD, covering and verso pages.) 47	6b. NO. OF REFS (Total references cited.) 92
7. DOCUMENT CATEGORY (e.g., Scientific Report, Contract Report, Scientific Letter.) Scientific Report		
8. SPONSORING CENTRE (The name and address of the department project office or laboratory sponsoring the research and development.) DRDC – Centre for Operational Research and Analysis Defence Research and Development Canada Carling Campus, 60 Moodie Drive, Building 7S.2 Ottawa, Ontario K1A 0K2 Canada		
9a. PROJECT OR GRANT NO. (If appropriate, the applicable research and development project or grant number under which the document was written. Please specify whether project or grant.) DNA_007	9b. CONTRACT NO. (If appropriate, the applicable number under which the document was written.)	
10a. DRDC PUBLICATION NUMBER (The official document number by which the document is identified by the originating activity. This number must be unique to this document.) DRDC-RDDC-2022-R162	10b. OTHER DOCUMENT NO(s). (Any other numbers which may be assigned this document either by the originator or by the sponsor.)	
11a. FUTURE DISTRIBUTION WITHIN CANADA (Approval for further dissemination of the document. Security classification must also be considered.) Public release		
11b. FUTURE DISTRIBUTION OUTSIDE CANADA (Approval for further dissemination of the document. Security classification must also be considered.)		
12. KEYWORDS, DESCRIPTORS or IDENTIFIERS (Use semi-colon as a delimiter.) Defence of North America; deterrence; ballistic missiles; hypersonic cruise missile; cruise missiles; Chinese missile developments; hypersonic glide vehicle; NORAD; continental defence; People's Republic of China (PRC); anti-access/area-denial (A2/AD); Western Pacific; escalation		

13. ABSTRACT (When available in the document, the French version of the abstract must be included here.)

This Scientific Report focuses on assessing the People's Republic of China's (PRC) recent investment in cruise missile and ballistic missile technologies, investment in hypersonic glide vehicles (HGV), and whether they can hold North America at risk. The study is conducted as part of the Program Activity (PAct) Defence of North America (DNA)_007 project. The DNA_007 PAct aims to conduct a strategic assessment of emerging conventional threats to North America and deterrence and defence concepts/capabilities used to address these potential challenges. For instance, this Report assesses how an adversary such as China might hold North America at risk with conventional strategic weapons. Since the defence, economic, and transportation infrastructure of the United States and Canada are intrinsically interconnected, it is conceivable that Canada could be targeted during a limited conventional attack on North America. In this context, this study ultimately finds that China's conventional cruise missiles (subsonic, supersonic, and hypersonic), HGVs, and conventionally-armed ballistic missiles do not directly threaten North America. The cruise missiles do not have the range to target North America from significant distances; and unless they are mated to intercontinental ballistic missiles (ICBM), HGVs currently deployed on boost-glide or other air- or sea-based delivery systems do not have the range to target North America either.

Le présent rapport scientifique (RS) vise à évaluer les récents investissements de la République populaire de Chine (RPC) dans les technologies de missiles de croisière et de missiles balistiques et les planeurs hypersoniques, et à déterminer s'ils peuvent mettre l'Amérique du Nord en danger. L'étude est menée dans le cadre du projet Défense de l'Amérique du Nord (DNA)_007 de l'activité de programme (AP). L'activité de programme DNA_007 vise à mener une évaluation stratégique des menaces classiques qui pèsent sur l'Amérique du Nord et des concepts/capacités de dissuasion et de défense utilisés pour relever ces défis potentiels. Par exemple, ce rapport fait état de la façon dont un adversaire comme la Chine pourrait mettre l'Amérique du Nord en danger avec des armes stratégiques conventionnelles. Puisque les infrastructures en matière de défense, d'économie et de transport des États-Unis et du Canada sont intrinsèquement liées, il est concevable que le Canada puisse être visé lors d'une attaque conventionnelle limitée contre l'Amérique du Nord. Dans ce contexte, la présente étude révèle que les missiles de croisière conventionnels (subsoniques, supersoniques et hypersoniques), les planeurs hypersoniques et les missiles balistiques conventionnels de la Chine ne menacent pas directement l'Amérique du Nord. Les missiles de croisière n'ont pas la portée nécessaire pour atteindre l'Amérique du Nord à partir de grandes distances et, à moins qu'ils ne soient jumelés à des missiles balistiques intercontinentaux (ICBM), les planeurs hypersoniques actuellement utilisés sur des systèmes de lancement aériens ou maritimes n'ont pas non plus la portée nécessaire pour atteindre l'Amérique du Nord.