

## V. Chinese nuclear forces

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As of January 2023 China maintained an estimated total stockpile of about 410 nuclear warheads—around 60 more than SIPRI's estimate for the previous year. China's warheads are assigned to its operational land- and sea-based ballistic missiles and to nuclear-configured aircraft (see table 7.6). Although the Chinese nuclear stockpile is projected to continue growing over the coming decade and the number of Chinese intercontinental ballistic missiles (ICBMs) is likely to reach or even exceed the numbers held by either Russia or the United States, China's overall nuclear warhead stockpile is still expected to remain smaller than that of either of those states.

SIPRI's estimate of 410 warheads relies on publicly available information on the Chinese nuclear arsenal.<sup>1</sup> Since China has never declared the size of its nuclear arsenal, many of the assessments here rely on data from the US Department of Defense (DOD) and must therefore be treated with caution. For example, in its 2022 report to the US Congress on Chinese military and security developments, the US DOD projected that China might field a stockpile of roughly 1500 warheads by 2035.<sup>2</sup> This projection relies, however, on several assumptions about China's future force posture and plutonium production. It remains to be seen how accurate these assumptions are.

This section continues by summarizing the role played by nuclear weapons in China's military doctrine. It then describes the air-delivered, land-based and sea-based nuclear weapons that constitute the three legs of China's nascent nuclear triad.

### The role of nuclear weapons in Chinese military doctrine

The Chinese government's declared aim is to maintain China's nuclear capabilities at the minimum level required to safeguard national security, with the goal of 'deterring other countries from using or threatening to use nuclear weapons against China'.<sup>3</sup> The posture is changing significantly, with hundreds of missile silos being built, additional submarines under construction and new nuclear bombers being added to the force.

<sup>1</sup> Kristensen, H. M. and Korda, M., 'Estimating world nuclear forces: An overview and assessment of sources', SIPRI Commentary, 14 June 2021.

<sup>2</sup> US Department of Defense, *Military and Security Developments Involving the People's Republic of China 2022*, Annual Report to Congress (Office of the Secretary of Defense: Washington, DC, 29 Nov. 2022), p. 98; and Sokolski, H. D. (ed.), *China's Civil Nuclear Sector: Plowshares to Swords?*, Nonproliferation Policy Education Center (NPEC) Occasional Paper no. 2102 (NPEC: Arlington, VA, Mar. 2021).

<sup>3</sup> Chinese State Council, *China's National Defense in the New Era* (Information Office of the State Council: Beijing, July 2019), chapter 2.

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This development has triggered widespread discussions about long-standing elements of Chinese nuclear doctrine, including its stated nuclear ‘no-first-use’ (NFU) policy.<sup>4</sup> In its 2022 report the US DOD assessed that China is implementing an ‘early warning counterstrike’ strategy—akin to a ‘launch-on-warning’ (LOW) posture—using ground- and space-based sensors to enable rapid launch of missiles before an adversary can destroy them.<sup>5</sup> The US DOD noted that, as of 2022, China had deployed at least three early-warning satellites to facilitate this posture.<sup>6</sup>

Despite the continuing increase in the sophistication and size of China’s nuclear arsenal, there is no official public evidence that the Chinese government has deviated from its long-standing core nuclear policies, including its NFU policy.<sup>7</sup> Additionally, in its 2022 report the US DOD stated that China ‘probably believes a LOW posture is consistent with its no first use policy’.<sup>8</sup>

The Chinese nuclear posture has traditionally involved procedures for loading warheads on to launchers in a crisis, but with warheads, missiles and launchers kept separate during peacetime.<sup>9</sup> A transition to a LOW posture, where space-based sensors could detect an incoming attack before impact, does not necessarily require China to keep warheads on delivery vehicles under normal circumstances; doing so would constitute a significant change to the country’s long-held nuclear custodial practices. Nevertheless, missile brigades do still need training to load warheads. According to the US DOD’s 2022 report, the brigades of the People’s Liberation Army (PLA) Rocket Force (PLARF) conduct ‘combat readiness duty’ and ‘high alert duty’ drills, which ‘apparently includes assigning a missile battalion to be ready to launch and rotating to standby positions as much as monthly for unspecified periods of time’.<sup>10</sup> Since at least 2020, the PLARF has also begun to conduct nuclear attack survival exercises that are designed to test troops’ readiness to launch nuclear counterattacks in the event of an imminent detonation.<sup>11</sup> This suggests that China is practising launching missiles in a LOW scenario.

<sup>4</sup> Chinese Ministry of National Defense, ‘China resolutely opposes 2022 Pentagon report on Chinese military: Defense spokesperson’, 6 Dec. 2022.

<sup>5</sup> US Department of Defense (note 2), pp. 99–100.

<sup>6</sup> US Department of Defense (note 2), pp. 99–100.

<sup>7</sup> Santoro, D. and Gromoll, R., ‘On the value of nuclear dialogue with China’, *Pacific Forum, Issues & Insights* (special report), vol. 20, no. 1 (Nov. 2020); and Kulacki, G., ‘Would China use nuclear weapons first in a war with the United States?’, *The Diplomat*, 27 Apr. 2020.

<sup>8</sup> US Department of Defense (note 2), p. 99.

<sup>9</sup> Stokes, M. A., *China’s Nuclear Warhead Storage and Handling System* (Project 2049 Institute: Arlington, VA, 12 Mar. 2010), p. 8; Li, B., ‘China’s potential to contribute to multilateral nuclear disarmament’, *Arms Control Today*, vol. 41, no. 2 (Mar. 2011); and US Department of Defense (note 2), p. 95.

<sup>10</sup> US Department of Defense (note 2), p. 95.

<sup>11</sup> Baughman, J., ‘An assessment of People’s Liberation Army Rocket Force survivability training’, China Aerospace Studies Institute, 15 Aug. 2022; and Lu, Z., Liu, X. and Yue, X., [The missile was successfully launched, but all the personnel were ‘killed’. Is it a victory?], *PLA Daily*, 7 Dec. 2021 (in Chinese).

**Table 7.6.** Chinese nuclear forces, January 2023

All figures are approximate and some are based on assessments by the authors.

| Type/Chinese designation<br>(US designation) | No. of<br>launchers | Year first<br>deployed | Range<br>(km) <sup>a</sup> | Warheads x yield <sup>b</sup> | No. of<br>warheads <sup>c</sup> |
|----------------------------------------------|---------------------|------------------------|----------------------------|-------------------------------|---------------------------------|
| <i>Aircraft</i>                              | 20 <sup>d</sup>     |                        |                            |                               | 20                              |
| H-6K (B-6)                                   | 10                  | 2009                   | 3 100                      | 1 x bomb                      | 10                              |
| H-6N (B-6N)                                  | 10                  | 2020                   | 3 100                      | 1 x ALBM                      | 10                              |
| H-20 (B-20)                                  | –                   | [2028]                 | .. ..                      |                               | –                               |
| <i>Land-based missiles</i>                   | 382                 |                        |                            |                               | 318                             |
| DF-4 (CSS-3)                                 | 6 <sup>e</sup>      | 1980                   | 5 500                      | 1 x 3.3 Mt                    | –                               |
| DF-5A (CSS-4 Mod 2)                          | 6                   | 1981                   | 12 000                     | 1 x 4–5 Mt                    | 6                               |
| DF-5B (CSS-4 Mod 3)                          | 12                  | 2015                   | 13 000                     | 5 x 200–300 kt                | 60                              |
| DF-5C (CSS-4 Mod 4)                          | ..                  | [2024]                 | 13 000                     | [MIRV]                        | ..                              |
| DF-15 (CSS-6)                                | ..                  | 1990                   | 600                        | 1 x . <sup>f</sup>            | ..                              |
| DF-17 (CSS-22)                               | 54 <sup>g</sup>     | 2020                   | >1 800                     | 1 x HGV <sup>h</sup>          | ..                              |
| DF-21A/E (CSS-5 Mod 2/6)                     | 24 <sup>i</sup>     | 2000/2016              | >2 100 <sup>j</sup>        | 1 x 200–300 kt                | 24 <sup>k</sup>                 |
| DF-26 (CSS-18)                               | 162                 | 2016                   | >3 000                     | 1 x 200–300 kt                | 54 <sup>l</sup>                 |
| DF-27 (. .)                                  | –                   | [2026]                 | 5 000–<br>8 000            | 1 x 200–300 kt                | –                               |
| DF-31 (CSS-10 Mod 1)                         | 6                   | 2006                   | 7 200                      | 1 x 200–300 kt                | 6                               |
| DF-31A/AG (CSS-10 Mod 2) <sup>m</sup>        | 84                  | 2007/2018              | 11 200                     | 1 x 200–300 kt                | 84                              |
| DF-41 (mobile version)<br>(CSS-20)           | 28 <sup>n</sup>     | 2020                   | 12 000                     | 3 x 200–300 kt                | 84                              |
| <i>Sea-based missiles (SLBMs)</i>            | 6/72 <sup>o</sup>   |                        |                            |                               | 72                              |
| JL-2 (CSS-N-14)                              | –                   | 2016                   | >7 000                     | 1 x 200–300 kt                | –                               |
| JL-3 (CSS-N-20)                              | 72 <sup>p</sup>     | 2022                   | >10 000                    | [Multiple]                    | 72                              |
| <b>Total stockpile</b>                       | <b>474</b>          |                        |                            |                               | <b>410</b>                      |

.. = not available or not applicable; – = nil or a negligible value; [ ] = uncertain SIPRI estimate; ALBM = air-launched ballistic missile; HGV = hypersonic glide vehicle; kt = kiloton; MIRV = multiple independently targetable re-entry vehicle; Mt = megaton; SLBM = submarine-launched ballistic missile.

<sup>a</sup> For aircraft, the listed range is for illustrative purposes only; actual mission range will vary according to flight profile, weapon payload and in-flight refuelling.

<sup>b</sup> Warhead yields are listed for illustrative purposes. Actual yields are not known, except that older and less accurate missiles were equipped with megaton-yield warheads. Newer long-range missile warheads probably have yields of a few hundred kilotons, and it is possible that some warheads have even lower yield options.

<sup>c</sup> Figures are based on estimates of 1 warhead per nuclear-capable launcher, except for the MIRV-capable DF-5B, which can carry up to 5 warheads, and the MIRV-capable DF-41, which is estimated to carry up to 3 warheads. China's warheads are not thought to be deployed on launchers under normal circumstances but kept in storage facilities. All estimates are approximate.

<sup>d</sup> The number of bombers only counts those estimated to be assigned a nuclear role. H-6 bombers were used to deliver nuclear weapons during China's nuclear weapon testing programme (1 test used a fighter-bomber) and models of nuclear bombs are exhibited in military museums. It is thought (but not certain) that a small number of H-6 bombers previously had a secondary contingency mission with nuclear bombs. The United States Department of Defense (DOD) reported in 2018 that the People's Liberation Army Air Force has been reassigned a nuclear mission, which is expected to revolve primarily around China's new dual-capable ALBM.

<sup>e</sup> The US DOD's 2022 report still listed the old liquid-fuelled DF-4 as an element of China's fixed intercontinental ballistic missile (ICBM) force, but as of Jan. 2023 SIPRI assesses that the DF-4 is in the process of being retired and most likely no longer has an operational nuclear strike role.

<sup>f</sup> The US Central Intelligence Agency concluded in 1993 that China 'almost certainly' had developed a warhead for the DF-15, but it is unclear whether the capability was fielded. As of Jan. 2023 SIPRI assesses that the DF-15 serves an entirely conventional role.

<sup>g</sup> This number is based on the assumption that at least 3 DF-17 brigades were operational as of Jan. 2023.

<sup>h</sup> The DF-17 carries an HGV with an unknown payload. The US DOD's 2021 and 2022 reports to the US Congress noted that the DF-17 is 'primarily a conventional platform' but that it could 'be equipped with nuclear warheads'.

<sup>i</sup> In 2017 the National Air and Space Intelligence Center of the US Air Force (USAF) reported that China had 'fewer than 50' DF-21A launchers. The DF-21E is thought to be a replacement for the DF-21A.

<sup>j</sup> The range of the nuclear-armed DF-21 variants, the DF-21A (CSS-5 Mod 2) and the DF-21E (Mod 6), is thought to be greater than the 1750 km reported for the original DF-21 (CSS-5 Mod 1), which has been retired. The USAF has reported the range as 2150 km.

<sup>k</sup> It is assumed that nuclear launchers do not have any reloads, unlike conventional versions (DF-21C and DF-21D) that are assumed to have 1 reload.

<sup>l</sup> The DF-26 is a dual-capable launcher. It is thought that its mission is primarily conventional and that only some of the launchers (perhaps up to one-third) are assigned nuclear warheads. Only 1 nuclear warhead is assumed for each of the DF-26's missiles that have been assigned a nuclear mission, with any reloads assumed to be conventional.

<sup>m</sup> The DF-31AG is thought to carry the same missile as the DF-31A.

<sup>n</sup> This number assumes that at least 2 brigades were operational as of Jan. 2023.

<sup>o</sup> The first figure is the total number of operational nuclear-powered ballistic missile submarines (SSBNs) in the Chinese fleet; the second is the maximum number of missiles that they can carry.

<sup>p</sup> In Nov. 2022 the commander of the US Pacific Fleet stated that China was replacing its deployed JL-2 SLBMs with JL-3 SLBMs, although it is unknown how many have been replaced. Capaccio, A., 'China has put longer-range ICBMs on its nuclear subs, US says', Bloomberg, 19 Nov. 2022. It is thought that the system is also intended to arm the future Type 096 SSBN, which will not be ready for several years.

*Sources:* US Air Force (USAF), National Air and Space Intelligence Center, *Ballistic and Cruise Missile Threat*, various years; USAF Global Strike Command, various documents; US Central Intelligence Agency, various documents; US Defense Intelligence Agency, various documents; US Department of Defense, *Military and Security Developments Involving the People's Republic of China*, Annual Report to Congress, various years; Kristensen, H. M., Norris, R. S. and McKinzie, M. G., *Chinese Nuclear Forces and US Nuclear War Planning* (Federation of American Scientists/Natural Resources Defense Council: Washington, DC, Nov. 2006); *Bulletin of the Atomic Scientists*, 'Nuclear notebook', various issues; Google Earth satellite imagery; and authors' estimates.

## Aircraft and air-delivered weapons

Chinese medium-range bombers were used to conduct more than 12 atmospheric nuclear tests in the 1960s and 1970s.<sup>12</sup> Until 2018 this capability to deliver nuclear weapons using Hong-6 or H-6 (B-6) bombers was not fully operational and was probably a back-up contingency mission.<sup>13</sup> In 2018, however, the US DOD reported that the PLA Air Force (PLAAF) was ‘newly re-assigned a nuclear mission’.<sup>14</sup> The H-6N (B-6N) is apparently China’s ‘first nuclear-capable air-to-air refuelable bomber’, and it had been operationally fielded by 2020.<sup>15</sup> In addition, the PLAAF has been developing its first long-range strategic bomber, the H-20 (B-20), with an anticipated range of more than 10 000 kilometres, a stealthy design and dual-capability—that is, able to deliver both conventional and nuclear weapons.<sup>16</sup>

To arm the H-6N, China has been developing two new air-launched ballistic missiles (ALBMs), one of which is assessed by the USA to be potentially nuclear-capable.<sup>17</sup> The US DOD stated in its 2022 report that the PLAAF’s operational airborne nuclear capability was still ‘developing tactics and procedures’ to conduct the nuclear mission and noted that this capability gave China a ‘nascent nuclear triad’.<sup>18</sup>

## Land-based missiles

China’s nuclear-capable land-based ballistic missile arsenal has been undergoing significant modernization as China replaces its ageing silo-based,

<sup>12</sup> De Geer, L.-E., ‘Detection by Sweden of Chinese nuclear tests in the atmosphere’, ed. V. Fedchenko, SIPRI, *The New Nuclear Forensics: Analysis of Nuclear Materials for Security Purposes* (Oxford University Press: Oxford, 2015), table 8A.1.

<sup>13</sup> For the aircraft, missiles and submarines discussed here, a designation in parentheses (in this case B-6) following the Chinese designation (in this case H-6) is that assigned by the USA.

<sup>14</sup> US Department of Defense, *Military and Security Developments Involving the People’s Republic of China 2018*, Annual Report to Congress (Office of the Secretary of Defense: Washington, DC, 16 May 2018), p. 75.

<sup>15</sup> US Department of Defense (note 2), pp. 59–60.

<sup>16</sup> US Department of Defense (note 2), p. 83; and US Office of the Deputy Assistant Secretary of Defense for Nuclear Matters, *Nuclear Matters Handbook 2020* (US Department of Defense: Washington, DC, Mar. 2020), figure 1.1, p. 3.

<sup>17</sup> US Department of Defense (note 2), pp. 55–56; Ashley, R., Director, US Defense Intelligence Agency, ‘Worldwide threat assessment’, Statement for the record, US Senate, Armed Services Committee, 6 Mar. 2018, p. 8; US Air Force, National Air and Space Intelligence Center (NASIC), *Ballistic and Cruise Missile Threat 2020* (NASIC: Wright-Patterson Air Force Base, OH, July 2020), p. 7; and Stewart, V. R., Director, US Defense Intelligence Agency, ‘Worldwide threat assessment’, Statement for the record, US Senate, Armed Services Committee, 9 Feb. 2016. See also Kristensen, H. M. and Korda, M., ‘Chinese nuclear forces’, *SIPRI Yearbook 2022*, pp. 384–85.

<sup>18</sup> US Department of Defense (note 2), p. 60.

liquid-fuelled missiles with large numbers of new mobile and silo-based, solid-fuelled models.<sup>19</sup>

### *Intercontinental ballistic missiles*

In 2021 commercial satellite imagery revealed that China had started construction of hundreds of new missile silos across northern China.<sup>20</sup> By January 2023 the number of new silos under construction was approximately 350, spread out among three large fields in northern China and three mountainous areas in east-central China. The northern silo fields are thought to be intended for solid-fuelled Dongfeng (DF) ICBMs—most likely the DF-31A (CSS-10 Mod 2) or the DF-41 (CSS-20)—while the more mountainous sites are expected to be filled with liquid-fuelled DF-5B (CSS-4 Mod 3) ICBMs.<sup>21</sup> By January 2023 silo construction at the northern fields had been largely completed, along with perimeter fences, electrical and radio towers, and air defence systems.<sup>22</sup> Notably, China's new northern silo fields are located deeper inside China than any other known ICBM base, including the new silos in east-central China, making them less vulnerable to long-range conventional strikes.<sup>23</sup>

SIPRI assesses that, as of January 2023, the total number of Chinese ICBM launchers—including training launchers, new launchers under construction and operational launchers—exceeded 450, with approximately 142 of those thought to be operational. It appears that the USA made a similar assessment in December 2022. The US DOD had previously estimated that, as of the end of 2021, China had 300 ICBM launchers with as many missiles in its inventory.<sup>24</sup> This estimate probably included launchers still under construction and missiles in production for them. The jump between the US DOD's assessments of 2021 and 2022 triggered a congressional notification from US Strategic Command that China had surpassed the USA in total ICBM launchers (but not in deployed ICBMs or warheads assigned to ICBMs).<sup>25</sup>

If China eventually fills each of the silos under construction with a single-warhead missile, it would have the capacity to deploy approximately

<sup>19</sup> Missile ranges specified here refer to Western definitions. China defines missile ranges differently: short, <1000 kilometres; medium, 1000–3000 km; long, 3000–8000 km; and intercontinental, >8000 km.

<sup>20</sup> Lewis, J. and Eveleth, D., 'Chinese ICBM silos', Arms Control Wonk, 2 July 2021; Korda, M. and Kristensen, H. M., 'China is building a second nuclear missile silo field', FAS Strategic Security Blog, Federation of American Scientists, 26 July 2021; and Lee, R., 'PLA likely begins construction of an intercontinental ballistic missile silo site near Hanggin Banner', China Aerospace Studies Institute, 12 Aug. 2021.

<sup>21</sup> US Department of Defense (note 2), p. 94; and authors' estimates.

<sup>22</sup> Authors' assessment based on analysis of satellite imagery.

<sup>23</sup> Korda and Kristensen (note 20).

<sup>24</sup> US Department of Defense (note 2), p. 167.

<sup>25</sup> Inhofe, J. (@JimInhofe), Twitter, 5 Dec. 2022, <<https://twitter.com/JimInhofe/status/1599877030299901952>>.

560 warheads on its ICBMs. If each silo were filled with a missile equipped with three multiple independently targetable re-entry vehicles (MIRVs), this number could rise to approximately 1200 warheads. However, as of January 2023 it remained unclear how China ultimately plans to operate the new silos: whether they will all be filled, how many warheads each missile would carry, and whether a portion of them could potentially have conventional strike roles.<sup>26</sup>

China has four basic types of ICBM: the DF-4, the DF-5, the DF-31 and the DF-41, with variants of each type. Most have a single warhead, while a smaller but growing number can deliver multiple warheads.

As of January 2023 SIPRI assesses that China's oldest ICBM system, the DF-4 (CSS-3), is nearing the completion of its gradual retirement from service and probably no longer has an operational nuclear strike role. SIPRI estimates that the number of deployed missiles in the DF-5 (CSS-4) family of ICBMs, the Chinese missiles assumed to have the longest range, has increased slightly as China has probably begun to deploy upgraded versions in the new silos currently under construction in east-central China.

In its 2022 report the US DOD noted that China appeared to be doubling the number of launchers in some mobile ICBM brigades from 6 to 12, although some new bases appear to have only 8 launchers.<sup>27</sup> China is believed to have deployed at least two mobile DF-41 brigades, with a third base nearing completion—totalling around 28 launchers—and appears to be preparing for the integration of additional DF-41 brigades.<sup>28</sup> The US DOD assessed in 2022 that China might ultimately plan to deploy the DF-41 in both road-mobile and silo-based modes, in some or all of China's new missile silo fields, and potentially in a rail-based mode as well.<sup>29</sup>

The US DOD's 2022 report states that China has also begun developing a new missile called the DF-27, which could have a range of 5000–8000 km.<sup>30</sup> However, public information about this new missile is scarce and its purported range can already be covered by China's other ICBMs. This suggests that the DF-27 could eventually be used in a conventional strike role.

After many years of research and development, China has equipped a small number of ICBMs with nuclear MIRVs. The DF-5B can reportedly carry up to five warheads per missile, while the DF-41 can probably carry no more

<sup>26</sup> The conventional strike role is based on circumstantial evidence in Lee, R., 'A case for China's pursuit of conventionally armed ICBMs', *The Diplomat*, 17 Nov. 2021.

<sup>27</sup> US Department of Defense (note 2), p. 65; and Eveleth, D. (@dex\_eve), Twitter, 3 Nov. 2021, <[https://twitter.com/dex\\_eve/status/1456009540982374404](https://twitter.com/dex_eve/status/1456009540982374404)>.

<sup>28</sup> US Department of Defense (note 2), p. 65; and Lee, R. (@roderick\_s\_lee), Twitter, 28 Dec. 2021, <[https://twitter.com/roderick\\_s\\_lee/status/1475885536254599172](https://twitter.com/roderick_s_lee/status/1475885536254599172)>.

<sup>29</sup> US Department of Defense (note 2), p. 65.

<sup>30</sup> US Department of Defense (note 2), p. 65.

than three.<sup>31</sup> The DF-5C (CSS-4 Mod 4) that is believed to be in development might also be able to deliver MIRVs.

In 2021 China reportedly conducted a test of what appeared to be a fractional orbital bombardment system (FOBS) equipped with a hypersonic boost-glide system.<sup>32</sup> In its 2022 report the US DOD assessed that the tested system came close to striking its target after flying completely around the world for approximately 40 000 km and over 100 minutes.<sup>33</sup> While details about this new system are scarce, if the initial reporting is accurate, then it may be intended to counter advances in US missile defences.

### *Intermediate- and medium-range ballistic missiles*

In 2016 the PLARF began deploying the dual-capable DF-26 (CSS-18) intermediate-range ballistic missile (IRBM) with an estimated maximum range exceeding 3000 km. The missile can reach targets in India, the South China Sea and the western Pacific Ocean, probably including US bases on Guam.<sup>34</sup> The missile is equipped with a manoeuvrable re-entry vehicle (MaRV) that can be rapidly swapped with another warhead. This theoretically allows the PLARF to switch the missile's mission between precision conventional strikes and nuclear strikes against ground targets—and even conventional strikes against naval targets—relatively quickly.<sup>35</sup> The majority of the DF-26s are thought to serve a conventional mission, with a smaller number (perhaps up to one-third) assigned a nuclear role. In its 2022 report the US DOD noted that, among China's nuclear forces, the DF-26 is the weapon system that is most likely to be fielded with a lower-yield warhead 'in the near-term', although it remains unclear whether very low-yield options have been produced for China's nuclear forces.<sup>36</sup>

The US DOD estimated in its 2022 report that China might have up to 250 DF-26 launchers and 250 or more DF-26 missiles in its inventory.<sup>37</sup> However, this is significantly more than is indicated by the apparent operational base infrastructure; the US DOD's estimate may thus include launchers that are in production or otherwise not yet fully operational. There were sightings of the missile at several PLARF brigade bases during 2022, and SIPRI assesses that five or six DF-26 brigades appear to be operational, with around

<sup>31</sup> US Department of Defense (note 2), pp. 65, 94; and Lewis, J. G., 'China's belated embrace of MIRVs', eds M. Krepon, T. Wheeler and S. Mason, *The Lure and Pitfalls of MIRVs: From the First to the Second Nuclear Age* (Stimson Center: Washington, DC, May 2016), pp. 95–99.

<sup>32</sup> Sevastopulo, D., 'China conducted two hypersonic weapons tests this summer', *Financial Times*, 20 Oct. 2021. See also Raju, N., 'Developments in space security', *SIPRI Yearbook 2022*, pp. 573–74.

<sup>33</sup> US Department of Defense (note 2), p. 65.

<sup>34</sup> US Department of Defense (note 2), p. 64.

<sup>35</sup> Pollack, J. H. and LaFoy, S., 'China's DF-26: A hot-swappable missile?', *Arms Control Wonk*, 17 May 2020; Deng, X., 'China deploys Dongfeng-26 ballistic missile with PLA Rocket Force', *Global Times*, 26 Apr. 2018; and US Department of Defense (note 2), p. 65.

<sup>36</sup> US Department of Defense (note 2), p. 98.

<sup>37</sup> US Department of Defense (note 2), p. 167.

162 launchers in total, although only about one-third of those are assumed to have a nuclear mission.

The US DOD's 2022 report indicates a sizable increase in China's force of medium-range ballistic missiles (MRBMs), from 150 launchers and 150 or more missiles in 2020 to 250 launchers and 500 or more missiles at the end of 2021.<sup>38</sup> These numbers are probably on the higher end of an estimated range and, as with the above IRBM estimate, could also include launchers and missiles in production. The increase in MRBMs—coupled with the corresponding decrease in China's short-range ballistic missiles (SRBMs)—is most likely due to the replacement of many SRBMs with the new DF-17 (CSS-22) MRBM equipped with a hypersonic glide vehicle (HGV). While China's MRBMs are generally dual-capable, most of them are probably assigned conventional payloads.<sup>39</sup> SIPRI estimates that, as of January 2023, around 24 of the PLARF's MRBMs—the DF-21A/E (CSS-5 Mods 2 and 6)—were assigned nuclear weapons.

### Sea-based missiles

In 2022 China continued to pursue its strategic goal from the early 1980s of developing and deploying sea-based nuclear weapons. The PLA Navy (PLAN) currently fields six Type 094 (Jin class) nuclear-powered ballistic missile submarines (SSBNs), two of which are Type 094As—upgraded variants of the original design.<sup>40</sup> The US DOD's 2022 report assesses that these six operational SSBNs constitute China's 'first credible, sea-based nuclear deterrent'.<sup>41</sup> China's SSBN fleet is based at Hainan Island in the South China Sea.

Each of China's Type 094 submarines can carry up to 12 three-stage, solid-fuelled Julang (JL) submarine-launched ballistic missiles (SLBMs), which exist in two types: the JL-2 (CSS-N-14) and the JL-3 (CSS-N-20). US reports in late 2022 suggested that China had replaced or was in the process of replacing the JL-2 SLBMs with the longer-range JL-3.<sup>42</sup> The JL-3 is capable of carrying multiple warheads and has an estimated range of more than 10 000 km.<sup>43</sup> Unless the range is significantly more than 10 000 km, the JL-3 would not be able to strike continental USA if fired from the South China Sea.

<sup>38</sup> US Department of Defense (note 2), p. 167; and US Department of Defense, *Military and Security Developments Involving the People's Republic of China 2020*, Annual Report to Congress (Office of the Secretary of Defense: Washington, DC, 1 Sep. 2020), p. 166.

<sup>39</sup> US Department of Defense (note 2), p. 65.

<sup>40</sup> Chan, M., 'China's new nuclear submarine missiles expand range in US: Analysts', *South China Morning Post*, 2 May 2021.

<sup>41</sup> US Department of Defense (note 2), p. 53.

<sup>42</sup> Capaccio, A., 'China has put longer-range ICBMs on its nuclear subs, US says', *Bloomberg*, 19 Nov. 2022.

<sup>43</sup> US Air Force (note 17), p. 33.

There has been considerable speculation about whether the missiles on China's SSBNs are routinely fitted with nuclear warheads. The US DOD stated in its 2022 report that China 'likely began near-continuous at-sea deterrence patrols' in 2021.<sup>44</sup> This wording implies that China may have begun intermittent patrols with nuclear weapons onboard, although it is not definitive and would constitute a significant change to the country's long-held practice of keeping nuclear warheads in central storage in peacetime.

China has probably begun construction of its next-generation SSBN, the Type 096.<sup>45</sup> A potential hull section was visible in commercial satellite imagery in February 2021.<sup>46</sup> Reports vary widely on the design parameters, but the new submarine is expected to be larger and quieter than the Type 094 and could potentially be equipped with more missile-launch tubes. Given the expected lifespans of the current Type 094 and the next-generation Type 096 SSBNs, the PLAN is expected to operate both types concurrently.<sup>47</sup> It remains unclear how many SSBNs the PLAN ultimately intends to operate. Satellite imagery from December 2022 shows that China was nearing completion of two new piers at the Longpo Naval Base. This would raise the total number of potential submarine berths at the base from 8 to 12, although some of these could be intended for attack submarines.

<sup>44</sup> US Department of Defense (note 2), p. 96.

<sup>45</sup> US Department of Defense (note 2), p. 96.

<sup>46</sup> Sutton, H. I., 'First image of China's new nuclear submarine under construction', *Naval News*, 1 Feb. 2021.

<sup>47</sup> US Department of Defense (note 2), p. 96.