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Abstract

The number of weapons in China's nuclear arsenal is slowly growing, and the capability of those weapons is also increasing. The authors estimate that China has approximately 250 warheads in its stockpile for delivery by nearly 150 land based ballistic missiles, aircraft, and an emerging submarine fleet. China is assigning a growing portion of its warheads to long range missiles. The authors estimate that China's arsenal includes as many as 60 long range missiles that can reach some portion of the United States. The US intelligence community predicts that by the mid 2020s, China could have more than 100 missiles capable of threatening the United States.

Keywords

Chinese nuclear arsenal, Chinese nuclear forces, Second Artillery

China has a nuclear weapons modernization program under way that involves upgrading its nuclear capable land , sea , and air based delivery vehicles. The size of the nuclear arsenal is increasing, though at a slow rate.

We estimate that China has approxi mately 250 warheads in its stockpile for delivery by nearly 150 land based ballistic missiles, aircraft,[1] and an emerging bal listic submarine fleet (see Table 1). Each missile in the Chinese arsenal is equipped to carry a single warhead, but warheads are not mated with missiles under nor mal circumstances, instead being kept separate in central storage facilities.[2]

China is the only one of the five ori ginal nuclear weapon states that is quan titatively increasing its nuclear arsenal, although the pace of growth is slow. The capability of the arsenal is also increasing, with liquid fuel and rela tively inaccurate maneuverable missiles being replaced by solid fuel and more accurate road mobile missiles. China is assigning a growing portion of its war heads to long range missiles, and the US intelligence community predicts that by the mid 2020s, China could "more than double" the number of war heads on missiles that are capable of threatening the United States to "well over 100" (Burgess, 2012: 19; US Air Force, 2013: 3). We estimate that China's current arsenal includes as many as 60 long range missiles that can reach the United States, including 12 DF 4 s, 20 DF 5As, 8 DF 31 s, and 20 DF 31As; how ever, of these, only 40 the DF 5As and DF 31As can strike the continental United States.[3]

Table 1. Chinese nuclear forces, 2013

Type	NATO Designation	Number of launchers	Year deployed	Range (kilometers)	Warhead x yield (kilotons)	Number of warheads
Land-based ballistic missiles						
DF-3A	CSS-2	~8	1971	3,000	1 x 3,300	~8
DF-4	CSS-3	~12	1980	5,500+	1 x 3,300	~12
DF-5A	CSS-4	~20	1981	13,000+	1 x 4,000–5,000	~20
DF-15	CSS-6	~100[a]	1990	600	1 x ?	?
DF-21	CSS-5 Mods 1, 2	~80[b]	1991	2,150	1 x 200–300	~80
DF-31	CSS-10 Mod 1	~8	2006	7,000+	1 x 200–300?	~8
DF-31A	CSS-10 Mod 2	~20	2007	11,000+	1 x 200–300?	~20
Subtotal:		*248*				*~148*[c]
Submarine-launched ballistic missiles[d]						
JL-1	CSS-NX-3	(12)	1986	1,000+	1 x 200–300	n.a.
JL-2	CSS-NX-14	(36)	(2013)	7,000+	1 x 200–300?	n.a.
Subtotal:		*(48)*				*n.a*
Aircraft[e]						
H-6	B-6	~20	1965	3,100+	1 x bomb	~20
Fighters	?	?	?	–	1 x bomb	~20
Cruise missles[f]						
DH-10	CJ-10	~250	2006?	1,500?	1 x ?	?
DH-20	CJ-20?	?	?	?	1 x ?	?
Total						**~190**[g]

[a] The CIA concluded in 1993 that China "almost certainly" had developed a warhead for the DF-15.
[b] This table only counts nuclear versions DF-21 (CSS-5 Mod 1) and DF-21A (CSS-5 Mod 2), each of which has fewer than 50 launchers deployed. The conventional DF-21C and DF-21D are not counted.
[c] The missile and warhead inventory may be larger than the number of launchers, some of which can be reused to fire additional missiles.
[d] Neither the JL-1 nor the JL-2 SLBM is fully operational, although warheads probably are available. The JL-2 is under development.
[e] China is thought to have a small stockpile of nuclear bombs with yields between 10 kilotons and 3 megatons. Figures are for only those aircraft that are estimated to have a secondary nuclear mission. Aircraft range is equivalent to combat radius, which for some H-6 bombers can be extended with air refueling.
[f] US Air Force intelligence lists the ground-launched DH-10 land-attack cruise missile as "conventional or nuclear." US Air Force Global Strike Command also lists the air-launched CJ-20 ALCM as nuclear-capable, but it is unclear whether that is a coordinated intelligence assessment.
[g] An estimated 60 additional warheads include those produced for SLBMs and others awaiting dismantlement, for a total inventory of approximately 250 warheads.

The US government has complained for years that China is too opaque regard ing its military forces and budgets and that it needs to be more transparent. It was therefore surprising and some what paradoxical that in its 2011 report on China's military one of the most widely used public sources for following Chinese nuclear developments the Pentagon chose to eliminate numbers of individual missile types from a table enumerating the Chinese missile arsenal. In the 2013 report, the table was completely deleted. The Pentagon's omission inadvertently assists Chinese nuclear secrecy.

Land-based missiles

China is in the middle of a significant mod ernization of its land based ballistic missile force, with older, transportable liquid fuel missiles being replaced with longer range, road mobile, solid fuel mis siles based at new or upgraded Second Artillery garrisons. As a result of this

effort, a greater portion of China's future land based missile force will have longer ranges and be more survivable.

The current force has nearly 150 nuclear capable land based missiles of seven types with mainly short and medium ranges; the number of long range missiles is increasing slowly.

The oldest missile in China's inventory, the DF 3A (CSS 2), is nearing retirement and being replaced by the DF 21. The liquid fueled, single stage DF 3A intermediate range ballistic missile can deliver a 3.3 megaton warhead up to 3,000 kilometers (km). Only one brigade of perhaps eight transportable launchers remains operational, and it is expected to be replaced by solid fuel, road mobile DF 21s in the near future.

A single brigade also remains for China's second oldest missile, the DF 4 (CSS 3) intercontinental ballistic missile (ICBM). The two stage, liquid fueled missile can deliver a 3.3 megaton warhead more than 5,500 km. The brigade has approximately 12 transportable launchers for targeting against Russia. The DF 4 is being replaced by the DF 31, a solid fuel, road mobile ICBM.

China's DF 5A (CSS 4) a liquid fueled, two stage, silo based ICBM has a range that exceeds 13,000 km and has apparently been targeted against the United States and Russia since the early 1980s. It is unclear whether China will replace its DF 5As with the DF 31A or maintain both. We estimate that China has 20 DF 5As.

China's primary regional nuclear missile is the two stage, solid fuel, road mobile DF 21 (CSS 5) medium range ballistic missile (MRBM). The DF 21 exists in two nuclear versions: the DF 21 (CSS 5 Mod 1) and the newer DF 21A (CSS 5 Mod 2). The Mod 1 version has a range of 1,750 plus km, but the new version probably has a longer range of about 2,150 km. The US intelligence community estimates that China's inventory of DF 21s grew between 2006 and 2011, from 19 to 50 missiles at the start of that time period to 75 to 100 missiles in 2011 (Defense Department, 2006, 2011). Today there are fewer than 50 launchers of each type deployed, with an estimated 80 to 90 launchers in total (US Air Force, 2013). China has also started deploying conventionally armed versions of the DF 21 (the DF 21C, and the DF 21D which is an anti ship missile), a potentially dangerous mix of nuclear and conventional missiles that creates risks of misunderstanding, miscalculation, and mistaken nuclear escalation in a crisis.[4]

Deployment of the new DF 31 (CSS 10 Mod 1) ICBM, first introduced in 2006, appears to have stalled for the time being with fewer than 10 launchers and an equal number of missiles deployed. The three stage, road mobile DF 31, which is transported on a six axle TEL (transporter erector launcher) in a 15 meter long canister, has a range of more than 7,000 km, which is insufficient to target the continental United States. The DF 31 may assume the regional targeting of Russia, India, and Guam from the DF 4. Reasons for the slow introduction of the DF 31 are unclear.

The DF 31A (CSS 10 Mod 2) a solid fueled, three stage, road mobile ICBM is an extended range version of the DF 31, yet its range (11,000 plus km) and payload of a single 200 to 300 kiloton warhead are smaller than those of the DF 5A ICBM. We estimate that China deploys about 20 DF 31A ICBMs in three brigades. Ten years ago, the US intelligence community estimated that by 2015, China would have 75 to 100

ICBMs (DF 31As and DF 5As) targeted primarily against the United States (CIA, 2001). This prediction seems unlikely to come true in the next two years; of China's 50 to 75 ICBMs, fewer than 50 can target the continental United States.

Although a map in the Defense Department's 2013 annual report indicates that the entire continental United States is within reach of the DF 31A, this is misleading because the range is measured from the Chinese outer border rather than actual deployment sites inside the country. The report states that the DF 31A can reach "most locations" within the continental United States (Defense Department, 2013: 6), but apparently not all. Some targets on the US East Coast would still require use of the longer range DF 5A. From the 812 Brigade Base at Tianshui (Gansu) and the launch battalion near Datong (Qinghai), for example, a range of 12,600 plus km would be needed to hold at risk Washington, DC.

The US intelligence community has consistently assessed all of these missile types as single warhead weapons. For more than a decade, the Pentagon has estimated that China has the capability to develop MIRVs for its silo based missiles (DF 5A), and the intelligence community is now asserting that "China may also be developing a new road mobile ICBM, possibly capable of carrying a multiple independently targetable re entry vehicle (MIRV)" (Defense Department, 2013: 6). If the US ballistic missile defense system is expanded or improved, it could potentially trigger China to deploy missiles that have MIRVs or decoys, though the heavier payload created by either of these missions would significantly reduce the range of the missiles.

Land-based short-range missiles

Of China's many types of short range ballistic missiles, one is thought to be nuclear capable: the DF 15 (CSS 6). After reporting that the nuclear test conducted on August 16, 1990 "may be related to development of a warhead for a Chinese short range ballistic missile" (CIA, 1990: 1), the CIA concluded in September 1993 "that China will begin to field nuclear armed CSS X 6's next year. China almost certainly has already developed the warhead for this system. Testing might be needed for formal weaponization or for additional warhead options" (CIA, 1993: 5). Despite nuclear capability, most of the DF 15 units are thought to be for conventional missions.

Submarines and sea-based missiles

China has two types of submarine launched ballistic missiles (SLBMs) developed for two types of nuclear powered ballistic missile submarines: the JL 1 and JL 2. Neither missile is operational.

The 1,700 km range, two stage JL 1 (CSS NX 3) SLBM developed for a single old Xia class (Type 092) submarine first entered service in 1986 and is not considered operational. The Xia is based at the North Fleet Base near Qingdao in the Shandong province. The submarine underwent a lengthy shipyard overhaul in 2005–2006 but appears to have stayed in port since then. The Xia/JL 1 weapon system is expected to be retired soon.

Development of the new JL 2 (CSS NX 14) SLBM for the second generation Jin class (Type 094) submarine is nearing completion. After several setbacks, China appears to have overcome

technical difficulties and successfully test launched the JL 2 in 2012–2013. The US intelligence community expects the JL 2 may reach initial operational capability in 2013 or 2014.[5]

The JL 2 is a modified version of the DF 31. Equipped with a single warhead and, possibly, penetration aids, the JL 2 has never been flight tested to its full range but is estimated to have a range of 7,000 plus km. Such a range is sufficient to target Alaska, Guam, Russia, and India from waters near China but unless the submarine sails significantly eastward, not the continental United States.

Three Jin class submarines are in service (without missiles), and the US intelligence community speculates that China may build a total of five before proceeding to develop a third generation (Type 096) over the next decade.

With 12 missile launch tubes per submarine, three Jin class boats could carry 36 missiles with an equal number of warheads a significant increase from the 12 SLBMs that the sole Xia class submarine carried.

The Pentagon asserts that the Jin/JL 2 weapon system "will give the PLA Navy its first credible sea based nuclear deterrent" (Defense Department, 2013: 6). While that may be true in theory, a Chinese nuclear powered submarine fleet faces several doctrinal, technical, and operational constraints in practice. Under current doctrine, China's Central Military Commission does not allow the military services to have warheads deployed on missiles under normal circumstances. Handing over custody of nuclear warheads to deployed submarines in peacetime would constitute a significant change of Chinese doctrine.

Moreover, no Chinese ballistic missile submarine has ever sailed on a deterrent patrol, so China's navy and the Central Military Commission have essentially no experience in operating a submarine force during realistic military operations. Developing this capability will require development of new command and control technologies and procedures.

But even if China deployed warheads on submarines and sent them to sea in a crisis, where would they sail? For a JL 2 to reach the continental United States, a Jin class submarine would have to sail through the East China Sea and well into the Pacific Ocean, through dangerous choke points where it would be vulnerable to hostile antisubmarine warfare.[6]

China's main concern is the survivability of its minimum nuclear deterrent, and it spends considerable resources on dispersing and hiding its land based missiles. This makes its submarine program puzzling, for it is much riskier to deploy nuclear weapons at sea, where submarines can be sunk by unfriendly forces, than to deploy them on land.

Cruise missiles

China produces and fields a number of cruise missiles, including land attack cruise missiles that may have a nuclear capability. The CIA concluded in 1995 that a Chinese test scheduled for that year "may include warhead testing for . . . a cruise missile" (CIA, 1995: 11), but the evidence for Chinese nuclear cruise missiles is sketchy and should be viewed with caution.

The first potentially nuclear capable cruise missile is the DH 10 (CJ 10) land attack cruise missile (LACM), which is thought to have a range of perhaps 1,500 km. US Air Force intelligence lists the DH 10 as "conventional or nuclear," indicating that it is a dual capable

weapon (US Air Force, 2013: 29). The DH 10 is launched from a four axle triple box launcher. The number of deployed DH 10s is uncertain, in part because the Pentagon has stopped releasing numbers for Chinese missiles. In 2011, the estimate was 40 to 55 launchers with 200 to 500 missiles (Defense Department, 2011).

China is also developing an air launched land attack cruise missile known as the CJ 20 for delivery by modified H 6 bombers. An Air Force Global Strike Command briefing in 2013 asserted that the CJ 20 is nuclear capable (Kristensen, 2013). The Air Force "Ballistic and Cruise Missile Threat" document does not list the CJ 20 at all (US Air Force, 2013: 29), but the annual Pentagon report includes a map showing the combined range of the "B 6 [H 6] and LACM" (Defense Department, 2013: 81).

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Notes

1. Given its history of nuclear tests using weapons dropped by short- and medium-range aircraft, China is likely to have a small quantity of nuclear bombs that would be delivered by H-6 bombers. China's nuclear bomber capability is minor and involves secondary missions for only a small number of aircraft.
2. Nuclear weapons are stored in central facilities under the control of the Central Military Commission. Should China come under nuclear threat, the weapons would be released to the Second Artillery Corps to enable missile brigades to go on alert and prepare to retaliate. For a description of the Chinese alerting concept, see Kristensen (2009a). For more on warhead storage in China, see Norris and Kristensen (2010).
3. US territories include Alaska, Hawaii, Guam, American Samoa, and many other tiny Pacific islands. The "continental United States," as used here, includes the 48 lower states and not Alaska or Hawaii.
4. The Second Artillery's organization of DF-21s is unclear, but it is thought that nuclear and conventional units are kept separate. For insightful studies of China's missile force, see Stokes (2010) and Stokes (2012).
5. The Pentagon predicts initial operational capability in 2013 (Defense Department, 2013), while the Defense Intelligence Agency (2013) predicts initial operational capability in 2014.
6. Chinese nuclear submarines are apparently very noisy (Kristensen, 2009b).

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