



Worldwide deployments of nuclear weapons, 2014

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Abstract

As of mid-2014, the authors estimate that there are approximately 16,300 nuclear weapons located at some 98 sites in 14 countries. Roughly 10,000 of these weapons are in military arsenals; the remaining weapons are retired and awaiting dismantlement. Approximately 4,000 are operationally available, and some 1,800 are on high alert and ready for use on short notice. The largest concentrations of nuclear weapons reside in Russia and the United States, which possess 93 percent of the total global inventory. The United States today stores nuclear weapons at 18 sites, including 12 sites in 11 states in the United States and another six sites in five European countries. There is considerable uncertainty about the number of Russian nuclear weapons storage sites, but the authors estimate that Russia today stores nuclear weapons permanently at 40 domestic locations.

Keywords

nuclear arsenals, nuclear deployment, nuclear stockpiles, nuclear weapons sites

As of mid-2014, we estimate that there are approximately 16,300 nuclear weapons located at some 97 sites in 14 countries. Roughly 10,000 of these weapons are in military arsenals; the remaining weapons are retired and awaiting dismantlement. Approximately 4,000 are operationally available, and some 1,800 are on high alert and ready for use on short notice (see Table 1).

By far the largest concentrations of nuclear weapons reside in Russia and the United States, which possess 93 percent of the total global inventory (Kristensen and Norris, 2013a). In addition to the seven other countries with nuclear weapon stockpiles (Britain, France,

China, Israel, India, Pakistan, and North Korea), five non-nuclear NATO allies (Belgium, Germany, Italy, the Netherlands, and Turkey) host about 180 US nuclear bombs at six air bases. (For a listing of all the sites worldwide, see Table 2; it includes sites where there is reason to believe that nuclear weapons are deployed or stored.)¹

United States

The United States today stores nuclear weapons at 18 sites, including 12 sites in 11 states in the United States and another six sites in five European countries.² At the end of the Cold War, the United

Table 1. Estimated global nuclear weapons inventories, 2014

| | |
|---------------|----------------|
| Russia | 8,000* |
| United States | 7,300** |
| France | 300 |
| China | 250 |
| Britain | 225 |
| Israel | 80 |
| Pakistan | 100–120 |
| India | 90–110 |
| North Korea | <10 |
| TOTAL | ~16,300 |

*Approximately 4,300 of the Russian warheads are operational or in military custody. The remaining 3,700 warheads are thought to be excess warheads awaiting dismantlement.

**Approximately 4,760 of the U.S. warheads are in the military stockpile (about 1,980 deployed); 2,540 retired warheads are awaiting dismantlement.

States maintained thousands of nuclear weapons outside of its borders on land and on the high seas.³

Since our previous estimate in 2009, the United States has further consolidated its nuclear weapons into fewer sites. Most significant is the apparent termination of nuclear weapons storage at Nellis Air Force Base in Nevada, which only a decade ago contained one of the world's largest concentrations of nuclear weapons. Similarly, nuclear weapons have been removed from Barksdale Air Force Base, one of three remaining heavy bomber bases,⁴ and from all tactical fighter-bomber bases in the continental United States. All Air Force nuclear warheads are now stored at five locations: three intercontinental ballistic missile (ICBM) bases (F. E. Warren, Malmstrom, Minot), two bomber bases (Minot, Whiteman), and one central storage facility, Kirtland Underground Munitions Storage Complex (KUMSC).

The last naval non-strategic nuclear weapon system—the Tomahawk land-attack cruise missile (TLAM/N)—was eliminated in 2012. The weapons were stored at the Strategic Weapons Facilities at Bangor in Washington and at Kings Bay in Georgia, the only two remaining naval nuclear weapons storage sites.

The United States is the only nuclear-armed state that deploys nuclear weapons in other countries. Approximately 180 non-strategic nuclear bombs are stored in underground vaults beneath 87 aircraft shelters at six bases in five European countries (Belgium, Germany, Italy, the Netherlands, and Turkey) for delivery by US and NATO fighter-bombers.

Russia

There is considerable uncertainty about the number of Russian nuclear weapons storage sites, for several reasons. First,

Table 2. Estimated worldwide locations of nuclear weapons, 2014*

| COUNTRY | BASE/LOCATION | REGION | WEAPON SYSTEM | REMARKS |
|--------------------------|--|--------------------------|--|---|
| <i>Belgium</i> | Kleine Brogel AB | Limburg | B61-3/4 | US bombs for delivery by Belgian F-16s of the 10th Fighter Wing. Weapons in custody of US 701st MUNSS. |
| SUBTOTAL | 1 | | | |
| <i>Britain</i> | Aldermaston Atomic Weapons Establishment | England | British Trident System | Warhead design. Possibly a few warheads present. |
| | Burghfield Atomic Weapons Establishment | England | British Trident System | Warhead assembly, disassembly, and dismantlement. |
| | Coulport Royal Navy Ammunition Depot | Scotland | British Trident System | National-level warhead storage site. |
| | Faslane Royal Navy Base | Scotland | Warheads and Trident II D5 SLBMs | On deployed Vanguard-class SSBNs. |
| SUBTOTAL | 4 | | | |
| <i>China¹</i> | 22 Base (Baoji area) | Shaanxi | Various | Central warhead storage site. |
| | 51 Base (Shenyang area) | Liaoning and Shandong | DF-21/DF-31 SSMs | Regional storage site for 806, 810, 816, and 828 Missile Brigades. |
| | 52 Base (Huangshan and Tunxi areas) | Anhui, Jiangxi, Zhejiang | DF-15/DF-21 SSMs | Regional warhead storage site for 807, 811, 815, 817, 818, 819, and 820 Missile Brigades. |
| | 53 Base (Kunming and Liuzhou areas) | Yunnan, Guangxi | DF-21 SSMs ² | Regional warhead storage site for 802, 808, and 821 Missile Brigades. |
| | 54 Base (Luoyang area) | Henan | DF-4/DF-5A and possibly DF-31 SSMs | Regional warhead storage site for 801, 804, and 813 Missile Brigades. |
| | 55 Base (Huaihua area) | Hunan | DF-4/DF-5A/DF-31A SSMs ³ | Regional warhead storage site for 803, 805, 814, and 824 Missile Brigades. |
| | 56 Base (Xining area) | Gansu and Qinghai | DF-21/DF-31A SSMs | Regional storage site for 809, 812, and 823 Missile Brigades. |
| | Jianggezhuang NSB area | Shandong | JL-1 and JL-2 SLBMs | Possible warhead storage site for JL-1 and JL-2 SLBMs on Xia and Jin SSBNs. |
| | Mianyang | Sichuan | Various | Warhead design. Chinese Academy of Engineering Physics (CAEP). |
| | Pingtung area | Sichuan | Various | Nuclear weapons fabrication. Possible underground storage site deep in the mountains near Mianyang (Institute of Materials). |
| | Longpo (Yulin) NSB area | Hainan | JL-2 SLBMs | Possible warhead storage site for JL-2 SLBMs on Jin SSBNs. |
| | Zitong area | Sichuan | Various | Warhead assembly, disassembly, and dismantlement. Possibly China's "Pantex Plant" — the country's sole facility for such work. ⁴ |
| SUBTOTAL | 12 | | | |
| <i>France</i> | Avord AB | Centre | TNAs, ASMPAs, ALCM | Storage and maintenance facility for ASMPAs. |
| | Centre d'Etudes de Valduc (Lery, north of Dijon) | Bourgogne | TN75, TNAs, TNOs | Warhead assembly, disassembly, and dismantlement. |
| | Ile Longue NSB | Bretagne | TN75, TNO (from 2015), M45 and M51 SLBMs | For 4 Triomphant-class SSBNs. |
| | Istres AB | Provence | TNAs, ASMPAs, ALCMs | For Mirage-2000N fighter-bombers. To be replaced with Rafale K3. |

(continued)

Table 2. Continued

| | | | | |
|--------------------|---|-----------------------|-----------------------|--|
| | Saint-Dizier AB | Champagne-Ardenne | TNAs, ASMPAs, ALCMs | For Rafale K3 fighter-bombers. Might also store weapons for Rafale MK3 on Charles de Gaulle aircraft carrier based in Toulon NB. |
| | Saint-Jean, south of Ile Longue | Bretagne | TN75, (TNO from 2015) | Warhead storage site for M45 and M51 SLBMs at nearby SSBN base. |
| SUBTOTAL | 6 | | | |
| <i>Germany</i> | Büchel AB | Rheinland-Pfalz | B61-3/4 | US bombs for delivery by German PA-200 Tornados of the 33rd Tactical Air Force Squadron. Weapons in custody of US 702nd MUNSS. |
| SUBTOTAL | 1 | | | |
| <i>India</i> | Chandigarh Plant | Punjab | Various | Possible warhead production. |
| | Jodhpur facility | Rajasthan | Prithvi/Agni SSMs | Potential storage for Prithvi and Agni SSMs and warheads. |
| | Unknown Air Force storage facility ⁵ | Unknown | Bombs | For potential use by Jaguar IS at Gorakhpur and Lohegaon ABs and Mirage 2000H at Ambala and Gwalior ABs. |
| | Unknown Army storage facility ⁶ | Unknown | Prithvi/Agni SSMs | For use by 222nd and 333rd Missile Groups (Prithvi) and 334th and 335th Missile Groups (Agni). |
| | Unknown Navy facility ⁷ | Unknown | Dhanush SSMs | For Dhanush ship-launched SSMs. |
| SUBTOTAL | 5 | | | |
| <i>Israel</i> | Dimona site | ? | Various | Negev Nuclear Research Center. Plutonium, tritium, and warhead production. |
| | Sdot Micha missile base | ? | Jericho II SSMs | 25–50 mobile MRBMs in caves. Warheads potentially on base or at Tirosh depot. |
| | Soreq Nuclear Research Center | ? | Various | Possible warhead design, fabrication, and maintenance. |
| | Nevatim AB | ? | Bombs | For potential use by F-16A/B fighter-bombers. Bombs potentially at base or remote depot. |
| | Tel Nof AB | ? | Bombs | For potential use by F-16ls and F-15l fighter-bombers. Bombs possibly on base or remote depot. |
| SUBTOTAL | 5 | | | |
| <i>Italy</i> | Aviano AB | Friuli-Venezia Giulia | B61-3/4 | For delivery by US F-16s of the 31st Fighter Wing. |
| | Gheddi Torre AB | Lombardia | B61-3/4 | US bombs for delivery by Italian PA-200 Tornados of the 6th Fighter Wing. Weapons in custody of US 704th MUNSS. |
| SUBTOTAL | 2 | | | |
| <i>Netherlands</i> | Volkel AB | Noord-Brabant | B61-3/4 | US bombs for delivery by Dutch F-16s of the 1st Fighter Wing. Weapons in custody of US 703rd MUNSS. |
| SUBTOTAL | 1 | | | |
| <i>Pakistan</i> | Khuzdar Depot | Balochistan | Various | Potential underground weapons storage. |
| | Masroor Depot (Karachi) | Sindh | Various | Potential storage of bombs for Mirage Vs at Masroor AB and warheads for SSMs. |
| | National Defense Complex (Fatehjang) | Punjab | SSMs | SSM launcher assembly and potential warhead storage. |
| | Sargodha Depot | Punjab | Various | Possible storage site of bombs for F-16s at nearby Sargodha AB and warheads for SSMs. ⁸ |

(continued)

Table 2. Continued

| | | | | |
|-----------------------------|---|--------------------|------------------------------|---|
| | Shanka Dara Missile Complex | Punjab | SSMs | SSM development and potential warhead storage. |
| | Tarbala Underground Complex | Khyber Pakhtunkhwa | Various | Potential weapon storage. |
| | Wah Ordnance Facility | Punjab | Various | Possible warhead production, disassembly, and dismantlement facility. ⁹ |
| SUBTOTAL | 7 | | | |
| <i>Russia</i> ¹⁰ | Barnaul Missile Division | Altai Krai | SS-25 ICBMs | Warheads for 36 ICBMs. |
| | Borisoglebsk (Voronezh-45) | Voronezh | Various | National-level weapons storage site. |
| | Chazma (Abrek) Bay SLBM Storage Facility | Primorsky | SLBMs/SLCMs/ASWs | Storage site of warheads for SLBMs and other naval weapons. |
| | Chebsara (Vologda-20) | Vologda | Various | National-level weapons storage site. |
| | Dodonovo (Krasnoyarsk-26, sometimes referred to as Shivera) | Krasnoyarsk | Various | National-level weapons storage site. |
| | Dombarovskiy Missile Division | Orenburg | SS-18 ICBMs | Warheads for 18 ICBMs. |
| | Engels AB | Saratov | AS-15 ASM, bombs | For Tu-160 Blackjack and Tu-95 Bear bombers. Weapons storage area south of base. |
| | Golovchino (Belgorod-22) | Belgorod | Various | National-level weapons storage site. |
| | Irkutsk Missile Division | Irkutsk | SS-25 (RS-26 planned) | Warheads for 18 ICBMs. |
| | Karabask (Chelyabinsk-115) | Chelyabinsk | Various | Possible national-level weapons storage site for adjacent Chelyabinsk-70. |
| | Korfovskiy (Khabarovsk-47) | Khabarovsk | Various | National-level weapons storage site. |
| | Korolev (Moscow) | Moscow | Gazelle ABMs | Warheads for 12 interceptors. |
| | Kozelsk Missile Division | Kaluga | SS-19 ICBMs, (RS-24 upgrade) | Warheads for 20 ICBMs. |
| | Krasnoarmeyskoye (Saratov-63) | Saratov | Various | National-level weapons storage site. ¹¹ |
| | Lesnoy (Sverdlovsk-45/16) | Sverdlovsk | Various | One of Russia's two warhead production plants. Sverdlovsk-16 is a national-level weapons storage site 8 kilometers west of the plant. |
| | Lytkarino (Moscow) | Moscow | Gazelle ABMs | Warheads for 16 interceptors. |
| | Mozhaysk-10 | Moscow | Various | National-level weapons storage site. |
| | Nerpichya (Zaozyorsk) Weapons Storage Facility | Kola | Various | Possible storage facility for naval weapons, including for nearby Bolshaya Lopatka Naval Base. |
| | Nizhniy Tagil Missile Division | Sverdlovsk | SS-25 ICBMs, (RS-24 upgrade) | Warheads for 18 ICBMs. |
| | Novosibirsk Missile Division | Novosibirsk | SS-25 ICBMs, (RS-24 upgrade) | Warheads for 27 ICBMs. |

Table 2. Continued

| | | | | |
|----------------------|---|------------------------|--|---|
| | Okolnaya (Severomorsk) Weapons Storage Facility | Kola | Various | Possible storage facility for SLBMs and other naval weapons. |
| | Ramozero (Olenegorsk-2) | Kola | Various | National-level storage sites. |
| | Rybachiy Naval Base | Kamchatka | SS-N-18 SLBMs | Warheads for Delta III-class SSBNs. |
| | Rzhanitsa (Bryansk-18) | Bryansk | Various | National-level weapons storage site. |
| | Selikhino (Komsomolsk-31) | Khabarovsk | Various | National-level weapons storage site. |
| | Shchukozero | Kola | Various | Weapons storage site. |
| | Skhodnya (Moscow) | Moscow | Gazelle ABMs | Warheads for 16 interceptors. |
| | Snezhinsk (Chelyabinsk-70) | Chelyabinsk | Various | Nuclear warhead design laboratory and national-level weapons storage site. |
| | Sofrino (Moscow) | Moscow | Gazelle ABMs | Warheads for 12 interceptors. |
| | Tatishchevo Missile Division | Saratov | SS-27 ICBMs | Warheads for 60 ICBMs. |
| | Teykovo Missile Division | Ivanovo | SS-27 ICBMs | Warheads for 18 ICBMs. |
| | Trekhgorny (Zlatoust-36) | Chelyabinsk | Various | One of Russia's two warhead production plants. National-level warhead storage site 10 kilometers to the east. |
| | Ukrainka AB | Amur | AS-15 ASM, bombs | For Tu-95 Bear bombers. Weapons storage area east of base. |
| | Uzhur Missile Division | Krasnoyarsk | SS-18 ICBMs | Warheads for 28 ICBMs. |
| | Vilyuchinsk Weapon Storage Facility | Kamchatka | SS-N-18 SLBMs | For Delta-III SSBNs. |
| | Vnukovo (Moscow) | Moscow | Gazelle ABMs | Warheads for 12 interceptors. |
| | Vypolzovo Missile Division | Novogorod/Tver | SS-25 ICBMs | Warheads for 18 ICBMs. |
| | Yagelnaya (Gadzhiyev) NB | Kola | SS-N-23 SLBMs (SS-N-32 upgrade) | For Delta IV-class SSBNs (and Borei-class SSBNs in future). Weapons storage east of base. Might also store other naval weapons. |
| | Yoshkar-Ola Missile Division | Mari El | SS-25 ICBMs | Warheads for 18 ICBMs. |
| | Zalari (Irkutsk-45) | Transbaikal | Various | National-level warhead storage site. |
| | SUBTOTAL | 40¹² | | |
| <i>Turkey</i> | Incirlik AB | Adana | B61-3/4 | US bombs for delivery by rotational F-16s from other US bases. No US fighter-wing permanently deployed. |
| | SUBTOTAL | 1 | | |
| <i>United States</i> | Bangor (Kitsap) NSB | Washington | W76-0, W76-1, W88, Trident II D5 SLBMs | For 8 <i>Ohio</i> -class SSBNs of which 6 are normally deployed. |
| | Kings Bay NSB | Georgia | W76-0, W76-1, W88, Trident II D5 SLBM | For 6 <i>Ohio</i> -class SSBNs of which 4 are normally deployed. |

Table 2. Continued

| | | | |
|--|-----------------------------|---|---|
| Kirtland Underground Munitions Storage Complex (KUMSC) ¹³ | New Mexico | B61 (all types), W80-1, B83-1, W78-0, W87 ¹⁴ | Air Force storage site with 40 bays of 300,000 square-feet (28,000 square-meters). |
| Lawrence Livermore National Laboratory | California | (W80-1, B83-1, W87) ¹⁵ | Warhead design, surveillance, and maintenance. |
| Los Alamos National Laboratory | New Mexico | (B61 (all types), W76-0, W76-1, W78-0, W88) ¹⁶ | Warhead design, surveillance, and maintenance. |
| Malmstrom AFB and Missile Field | Montana | W78-0, W87 | Warheads for 150 Minuteman III ICBMs. |
| Minot AFB and Missile Field | North Dakota | W78-0, W80-1, W87 | Warheads for 150 Minuteman III ICBMs and ALCMs for B-52Hs of the 5th Bomb Wing (Minot) and the 2nd Bomb Wing (Barksdale). |
| Pantex Plant | Texas | Various | Assembly, disassembly, and dismantlement of all warhead types. |
| Strategic Weapons Facility Atlantic (Kings Bay NSB) | Georgia | W76-0, W76-1, W88, Trident II D5 SLBMs | Navy warhead storage site. |
| Strategic Weapons Facility Pacific (Bangor NSB) | Washington | W76-0, W76-1, W88, Trident II D5 SLBMs | Navy warhead storage site. |
| Warren AFB and Missile Field | Colorado, Nebraska, Wyoming | W78-0, W87 | Warheads for 150 Minuteman III ICBMs. |
| Whiteman AFB | Missouri | B61-7/11, B83-1 | For B-2As of the 509th Bomb Wing. |
| SUBTOTAL | 12¹⁷ | | |
| TOTAL | 97 | | |

Source: Hans M. Kristensen and Robert S. Norris

* The table lists estimated locations where nuclear bombs or warheads are present. In addition to these sites, a large number of bases have delivery systems that are capable of delivering nuclear bombs or warheads, but nuclear weapons are not present at the bases under normal circumstances.

1. It is thought that China does not deploy nuclear warheads on missiles and aircraft under normal circumstances but stores the warheads in central and regional storage facilities under control of the Central Military Commission (CMC). In a crisis, the CMC would release the warheads to the armed forces for deployment onto delivery systems. Essential sources for analyzing Chinese land-based missile forces include: US Air Force (2013); Mark S. Stokes, *Second Artillery Unit and Leadership Report: 1st Quarter 2012*, Project 2049 Institute, February 21, 2012; Stokes (2010); Thomas C. Reed and Danny B. Stillman, *The Nuclear Express: A Political History of the Bomb and Its Proliferation* (Zenith Press, 2009), pp. 84–113, 220–234, 354–363; Bates Gill, et al., “The Chinese Second Artillery Corps: Transition to Credible Deterrence,” in James C. Mulvenon and Andrew N. D. Yang, eds., *The People’s Liberation Army as Organization: Reference Volume v. 1.0* (RAND, 2002); Arkin et al. (1998); Robert S. Norris, et al., *Nuclear Weapons Databook Volume V: British, French, and Chinese Nuclear Weapons* (Westview Press, 1994); Google Earth; and authors’ research and estimates.

2. Potentially also for DH-10 GLCM in 821 Brigade at Liuzhou. US Air Force intelligence considers the DH-10 to be nuclear-capable.

3. Potentially also for DH-10 GLCM in 824 Brigade at Yichun. US Air Force intelligence considers the DH-10 to be nuclear-capable.

4. This might be the nuclear weapon production and storage facility reported in *The Nuclear Express* on p. 358 as located two-and-a-half hours north of Mianyang near the city of Pingtung.

5. The storage locations for warheads earmarked for use by aircraft are not known.

6. The storage locations for warheads earmarked for use by Prithvi and Agni missiles are not known.

7. The storage locations for warheads earmarked for use by Dhanush missiles are not known.

8. In response to reports about terrorist attacks on suspected nuclear facilities, including Sargodha Depot, Pakistani military spokesman Maj. Gen. Athar Abbas stated, “These are nowhere close to any nuclear facility.” Ishtiaq Mahsud, “Pakistani Officials: Militant Clashes Kill about 70,” Associated Press, August 12, 2009.

9. Ibid.

10. It is thought that Russian warheads for all non-strategic nuclear weapon systems have been placed in central storage and that only warheads for operational ICBMs, SLBMs, and heavy bombers are present at the bases.

Locations listed in this table are based on US Defense Department, “Cooperative Threat Reduction Program Annual Report to Congress” (various years); US Department of State, START Treaty documents (various years); “US Efforts to Secure Russia’s Nuclear Warheads: Background and Issues”; Oleg Bukharin, et al., in *New Perspectives in Russia’s Ten Secret Cities* (Natural Resources Defense Council, October 1999); Joshua Handler, *Russian Nuclear Warhead Dismantlement Rates and Storage Site Capacity: Implications for the Implementation of START II and De-alerting Initiatives* (Princeton University, February 1999); Arkin et al. (1998); Thomas B. Cochran, et al., *Nuclear Weapons Databook Volume IV: Soviet Nuclear Weapons* (Harper & Row, 1989). Other valuable resources include Gunnar Arbman and Charles Thornton, *Russia’s Tactical Nuclear Weapons Part II: Technical Issues and Policy Recommendations* (Swedish Defence Research Agency, February 2005); Pavel Podvig, ed., *Russian Nuclear Forces* (MIT Press, 2001); Sean O’Connor, *IMINT & Analysis*, <http://geimint.blogspot.com/>; Google Earth; author’s research and estimates.

AB: Air Base
 ABM: antiballistic missile
 AFB: Air Force Base
 ALCM: air-launched cruise missile
 ASM: air-to-surface missile
 ASMPA: Air-Sol Moyenne Portee Améliorée
 ASW: anti-submarine warfare
 GLCM: ground-launched cruise missile
 ICBM: intercontinental ballistic missile
 MRBM: medium-range ballistic missile
 MUNSS: Munitions Support Squadron
 NB: Naval Base
 NSB: Naval Submarine Base
 SAM: surface-to-air missile
 SLBM: submarine-launched ballistic missile
 SLCM: sea-launched cruise missile
 SRBM: short-range ballistic missile
 SSBN: nuclear-powered ballistic missile submarine
 SSM: surface-to-surface missile
 TNA: Tête Nucléaire Aéroportée
 TNO: Tête Nucléaire Océanique

Table 2. Continued

11. Gen. Eugene Habiger, the former commander of STRATCOM, visited Saratov, the Russian national storage site, in 1998 and later described being shown strategic and tactical nuclear weapons: "We went to Saratov, a national nuclear weapons storage site, where I saw not only strategic weapons, but tactical weapons ... And they took me into the side of a mountain, a hill, where we went behind two doors that were each several thousands of tons in weight. And you had to open up one door at a time, these sliding, massive doors, in order to get into the inner sanctum. In the inner sanctum, there were five nuclear weapon storage bays. They took me into one of those bays, and we had an interesting discussion." Defense Department news briefing, June 16, 1998.
12. In addition to the storage sites and strategic bases listed here, a significant number of temporary storage sites include railhead and transfer stations. Moreover, it is assumed that all warheads have been removed from non-strategic nuclear weapon bases and units and placed in the national-level central storage sites maintained by the 12th Main Directorate (GUMO). This includes air bases with Tu-22M3 Backfire medium-range bombers, Su-24 Fencer and Su-34 Fullback fighter-bombers, army bases with SS-21 and SS-26 SSMs, naval bases with surface ships, attack-submarines, and anti-submarine warfare aircraft, coastal defense units with SSC-1B launchers, and dozens of air-defense bases with nuclear-capable S-300 surface-to-air units. Some of the GUMO sites are relatively close to bases with operational forces.
13. The nuclear storage mission at Nellis AFB, which until a decade ago contained one of the largest concentrations of nuclear weapons in the world, appears to have been phased out and all remaining weapons consolidated at Kirtland AFB.
14. As a joint storage site, the Kirtland Underground Munitions Storage Complex (KUMSC) might also store some naval warheads, but they are largely thought to be in the US Navy's strategic weapons facilities in Georgia and Washington.
15. Weapons are not normally present but a few weapons or components may occasionally be brought in for surveillance or maintenance.
16. Weapons are not normally present but a few weapons or components may occasionally be brought in for surveillance or maintenance.
17. The United States also deploys nuclear weapons at six facilities in five European countries. See Belgium, Germany, Italy, the Netherlands, and Turkey for details. If including the European bases in the total US count, the United States stores nuclear weapons at 18 facilities.
- Barksdale AFB has nuclear-capable B-52H bombers but their weapons are no longer stored at the base.

the Russian government provides almost no information about its nuclear warhead storage program. Second, Western governments say very little about what they know.⁵ Moreover, estimates vary on what constitutes a "storage site;" some count each fenced storage bunker as a site, even though there may be several individually fenced bunkers within a larger storage complex.

We count each storage complex as one site or storage location and estimate that Russia today stores nuclear weapons permanently at 40 domestic locations. This is a slight reduction from our 2009 estimate, but a significant reduction from the 100 sites in the late-1990s, 250 sites in the mid-1990s, and 500 sites in 1991.⁶

Although the Russian government provides almost no public information about its nuclear weapons storage program, it has occasionally made declarations. For example, at the 2010 Non-Proliferation Treaty Review Conference, Russia declared that "the total number of nuclear weapons storage facilities has been reduced fourfold" since 1991 (Russian Federation, 2010a: 8). At the same

event, the Russian delegation distributed a publication stating that "[a]ll Russian non-strategic nuclear weapons are concentrated in centralized storage bases exclusively ob [sic] the national territory" (Russian Federation, 2010b: 14). Moreover, twice a year under the terms of New START, the Kremlin hands over a detailed list of its strategic force deployments to the US government. Unfortunately, the list is secret.⁷

There is also uncertainty about the status of many nuclear weapon systems, including what constitutes "non-strategic" weapons. For example, medium-range Tu-22M3 Backfire bombers are sometimes described by Russians as more than tactical, but they are not considered strategic in arms control agreements signed by Russia. Consequently, this notebook considers the Tu-22M3 and all other weapons not covered by New START to be non-strategic and to be covered by the Russian declarations that all non-strategic nuclear warheads have been placed in central storage.

Russian permanent nuclear weapon storage locations fall into three main categories: operational warheads at

Strategic Rocket Force, navy and air force bases; non-strategic and reserve/retired warheads at national-level storage sites; and warheads at assembly/disassembly factories.⁸

The storage locations for operational warheads include 11 ICBM fields and garrisons, two nuclear submarine bases, and two heavy bomber bases.⁹ The national-level storage sites include 12 separate storage sites, although the status of a few of these is unclear. The warhead production complexes also have warhead storage facilities.

Britain and France

London and Paris have reduced the size of their arsenals and limited where their weapons are deployed. Britain only has one type of nuclear weapon, the Trident II submarine-launched ballistic missile (SLBM). The missiles and associated warheads are located at two facilities in Scotland, although warheads are also serviced at two factories southwest of London.¹⁰

France has retained two types of nuclear weapons: SLBMs at a submarine base in Bretagne and air-to-surface missiles for land- and carrier-based aircraft. France also has a warhead production and maintenance complex at Valduc. We estimate the French warheads to be at six locations.¹¹

China

Researching Chinese nuclear weapons storage is difficult given the almost complete official secrecy that surrounds China's nuclear forces. Moreover, as is the case with other nuclear-armed states, Western governments say very little about what they know.¹²

Even so, important new information has become available from other sources since our previous estimate was made in 2009. This includes more satellite images on Google Earth that allow the public to monitor developments of Chinese forces. Moreover, a number of publications by Mark Stokes at the Project 2049 Institute have made invaluable new information and analysis available to the public.

One of Stokes's reports describes China's central underground nuclear weapons storage site near Baoji in the western part of Shaanxi province in central China (Stokes, 2010). China's use of underground facilities to conceal and protect military equipment and provide leadership and civil defense shelters has been reported for many years but gained new attention in 2011 due to a Georgetown University study (Karber, 2011).

We cautiously estimate that China may have nuclear warheads at 12 facilities. Nearly all of China's 250 nuclear warheads are concentrated in the central nuclear weapons storage site, known as 22 Base. The Second Artillery missiles intended to deliver these warheads are dispersed across China at approximately 25 brigade bases organized under six Base Headquarters. Each of these Base Headquarters probably has a small number of nuclear warheads in regional storage sites.

The navy has two bases with nuclear-capable missile submarines, each of which might have an adjacent warhead storage facility. The Air Force has a couple of intermediate-range bomber bases that might have a secondary nuclear mission. China has also started deploying ground-launched cruise missiles that US Air Force intelligence characterizes as nuclear-capable.¹³

China has a small number of warhead design, production, and maintenance

facilities, presumably with a small number of warheads present.

Pakistan

Islamabad is quantitatively and qualitatively increasing its arsenal and deploying weapons at more sites, yet the locations are difficult to pinpoint. For example, no reliable public information exists on where Pakistan produces or stores its nuclear weapons. Thus, we have used commercial satellite images, expert studies, and local news reports and articles to make the assumption that nuclear weapons are likely to be at, or near, wherever nuclear-capable weapon systems are deployed. Based on this work, we cautiously estimate that Pakistan stores nuclear weapons at seven locations.

Pakistan has a rapidly expanding nuclear arsenal of 100 to 120 warheads and an increasing portfolio of delivery systems.¹⁴ Pakistan's nuclear weapons are not believed to be fully operational under normal circumstances. We have found no credible information that identifies permanent nuclear weapons storage locations, but there are a few clues.

Former Secretary of State Hillary Clinton told Congress in 2009 that Pakistan's nuclear weapons "are widely dispersed in the country." She said the weapons "are not at a central location" but that Pakistan has "adopted a policy of dispersing their nuclear weapons and facilities" (Clinton, 2009). Senior US officials subsequently said that most of the Pakistani nuclear arsenal was south of Islamabad.¹⁵ One of our suspected sites is the Masroor depot near Karachi.

Former President Pervez Musharraf reportedly told Seymour Hersh of *The New Yorker* that Pakistan had constructed a huge tunnel system for the

transport and storage of nuclear weapons. "The tunnels are so deep that a nuclear attack will not touch them," he said, adding that it was impossible to monitor the movements of nuclear components by satellite (Hersh, 2009). One potential underground facility is near Tarbala in northern Pakistan.

India

As with Pakistan, we have found little reliable information that indicates where India's nuclear warheads are stored. Based on available unclassified sources and satellite imagery, we cautiously estimate that India stores nuclear weapons at five locations.

India is thought to keep its nuclear warheads and bombs in central storage locations rather than on bases with operational forces. Yet India is putting the final touches to its first nuclear submarine, to be able to deploy a secure second strike capability. One of the key questions is whether India will begin to deploy nuclear weapons on its subs under normal circumstances. Although not yet on our list (because it is not complete), the first submarine base is under construction near Rambilli in Andhra Pradesh on the Indian east coast.¹⁶

Israel

Israel is a wild card because of the opacity of its nuclear weapons program. Like other nuclear-armed states, however, Israel has been modernizing its nuclear arsenal and probably also its storage facilities. Israel's nuclear weapons are not believed to be fully operational under normal circumstances, but are estimated to include 80 to 85 warheads.¹⁷ We estimate that Israel might store nuclear warheads at five locations.

North Korea

Although North Korea has conducted three nuclear tests, we are not aware of credible public information that North Korea has weaponized its nuclear weapons capability, much less where those weapons would be stored. We also take note that a 2013 US Air Force intelligence report did not list any of North Korea's ballistic or cruise missiles as nuclear-capable (US Air Force, 2013).

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Notes

1. Valuable open-source reference material for estimating deployments of nuclear weapons include Arkin and Fieldhouse (1985); Arkin et al. (1998); Cochran et al. (2001); Cirincione et al. (2005); the *SIPRI Yearbook*, various issues; the Monterey Institute for International Studies' open-source research database on the Nuclear Threat Initiative website, available at www.nti.org/e_research/profiles/index.html; FAS Nuclear Notebooks in the *Bulletin of the Atomic Scientists*, various issues; Google Earth; and the authors' analysis.
2. For an overview of US nuclear forces, see Kristensen and Norris (2014).
3. For the period of 1951–1977, see Norris et al. (1999, 2000).
4. Some lawmakers from the state where Barksdale AFB is located are trying to have nuclear weapons storage reestablished at the base. See Office of Senator Mary L. Landrieu (2014).
5. According to the US government, "In peacetime, all nuclear munitions except those on deployed ICBMs and SLBMs are stored in nuclear weapons storage sites" (CIA, 2011: 5). The statement does not define "nuclear weapons storage sites," which exist both as large centralized storage sites separated from bases with operational delivery systems and as smaller storage sites at or close to bases. Moreover, with the expiration of the Cooperative Threat Reduction program in 2013, public information about the status of Russia nuclear weapons storage facilities will likely become scarcer. Future US–Russian security cooperation will take place under the 2003 Framework Agreement on a Multilateral Nuclear Environmental Program in the Russian Federation and a related protocol, which do not cover nuclear weapons storage security.
6. For previous estimates of Russian nuclear weapons storage sites, see Arkin, et al. (1998: 26–38); Koch (2000: 2); Norris and Kristensen (2009: 86–87); US Department of Defense, Office of the Secretary of Defense (1997: 43).
7. The New START list is secret, and the United States agreed during the treaty negotiations not to publish the list. During the previous START, which expired in 2010, the US State Department released the list of Russian weapons and warheads counted by the treaty.
8. Weapons are also occasionally present at an unknown number of temporary storage sites when in transit between bases and production facilities.
9. Unlike ICBMs and nuclear submarines, heavy bombers do not carry nuclear weapons under normal circumstances. But we estimate that some nuclear weapons are present in nuclear weapons storage bunkers at the two heavy bomber bases. Many of the medium-range Tu-22M3 Backfire-C bomber bases and some of the Su-22M Fencer-D have nuclear weapons storage facilities, but we estimate that weapons are in central storage alongside all other non-strategic nuclear warheads.
10. For an overview of British nuclear forces, see Kristensen and Norris (2011a).
11. For an overview of French nuclear forces, see Kristensen (2012).
12. During the Obama administration, information published by the U.S. government about Chinese nuclear forces has decreased. An overview of Chinese nuclear missiles previously published in the annual Pentagon report on China's military forces has

- completely disappeared from the publication. See Kristensen (2013).
13. For an overview of Chinese nuclear forces, see Kristensen and Norris (2013b).
 14. For a review of Pakistan's nuclear forces, see Kristensen and Norris (2011b).
 15. See Krarev and Slavin (2009); Sanger (2009).
 16. For an overview of India's nuclear arsenal, see Kristensen and Norris (2012).
 17. For analyses of Israeli nuclear forces, see Cohen (2010); Cohen and Burr (2009); Norris et al. (2002).

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