

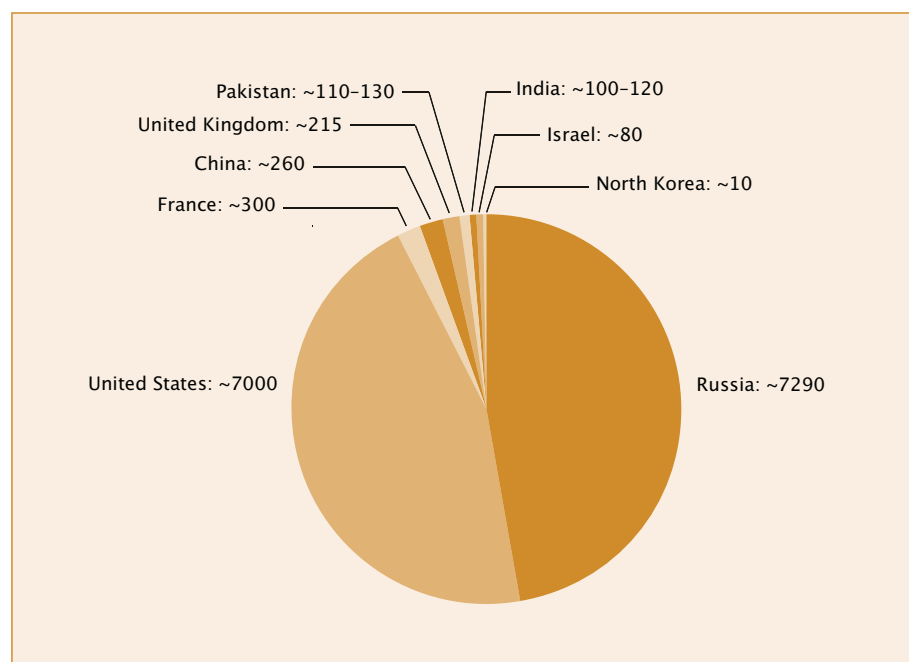
# TRENDS IN WORLD NUCLEAR FORCES, 2016

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## OVERVIEW

As of January 2016, nine states—the United States, Russia, the United Kingdom, France, China, India, Pakistan, Israel and the Democratic People’s Republic of Korea (DPRK, North Korea)—possessed approximately 4120 operationally deployed nuclear weapons (see table 1). If all nuclear weapons are counted, these states together possessed a total of approximately 15 395 nuclear weapons (see figure 1), compared to approximately 15 850 in 2015. While the overall number of nuclear weapons in the world continues to decline, none of the nuclear weapon-possessing states are prepared to give up their nuclear arsenals for the foreseeable future.

Global nuclear weapon inventories have been declining since they peaked at nearly 70 000 nuclear warheads in the mid-1980s. The decline has been due primarily to cuts made in the Russian and US nuclear forces as a result of three arms limitation treaties since 1991 as well as unilateral force reductions. However, the pace of their reductions appears to be slowing compared with a decade ago, and neither Russia nor the USA—which together account for nearly 93 per cent of nuclear weapons in the world—has made significant reductions in its deployed strategic nuclear forces since the bilateral Treaty



**Figure 1.** World nuclear forces, share of world total by country, 2016

Note: All figures are approximate.

## KEY FACTS

- At the start of 2016 nine states—the United States, Russia, the United Kingdom, France, China, India, Pakistan, Israel and the Democratic People’s Republic of Korea (DPRK, North Korea)—possessed approximately 15 395 nuclear weapons.
- None of the nuclear weapon-possessing states are prepared to give up their nuclear arsenals for the foreseeable future. All of these states are either developing or deploying new weapon systems or have announced their intention to do so.
- India and Pakistan are expanding their military fissile material production capabilities. China appears to be increasing the number of its deployed nuclear warheads.
- Despite the US Administration’s stated commitment to pursuing a world free of nuclear weapons, the USA plans to spend \$348 billion over the period 2015–24 on maintaining and comprehensively modernizing its land-, sea- and air-based nuclear forces.
- By some estimates US force modernization programmes may cost up to \$1 trillion over the next 30 years.
- North Korea has devoted considerable resources to its military nuclear programme and is estimated to have built up to 10 nuclear warheads. However, there is no open-source evidence that North Korea has produced or deployed operational nuclear weapons.



**Table 1.** World nuclear forces, January 2016

All figures are approximate. The estimates presented here are based on public information and contain some uncertainties, as reflected in the table notes.

Country	Year of first nuclear test	Deployed warheads <sup>a</sup>	Stored warheads <sup>b</sup>	Other warheads	Total inventory
USA	1945	1 930 <sup>c</sup>	2 570 <sup>d</sup>	2 500 <sup>e</sup>	7 000
Russia	1949	1 790	2 700 <sup>f</sup>	2 800 <sup>g</sup>	7 290
UK	1952	120	95	—	215
France	1960	280	10	10	300
China	1964	—	260	—	260
India	1974	—	100–120	..	100–120
Pakistan	1998	—	110–130	..	110–130
Israel	..	—	80	..	80
North Korea	2006	—	..	(10) <sup>h</sup>	(10)
<b>Total<sup>i</sup></b>		<b>4 120</b>	<b>5 965</b>	<b>5 310</b>	<b>15 395</b>

.. = not applicable or not available; — = zero; () = uncertain figure  
<sup>a</sup> ‘Deployed’ means warheads placed on missiles or located on bases with operational forces.  
<sup>b</sup> These are warheads in central storage that would require some preparation (e.g. transport and loading on launchers) before they become fully operationally available.  
<sup>c</sup> In addition to strategic warheads, this figure includes approximately 180 non-strategic (tactical) nuclear weapons deployed in Europe.  
<sup>d</sup> This figure includes several hundred strategic cruise missiles and bombs and some 300 tactical nuclear bombs.  
<sup>e</sup> This figure is for retired warheads and warheads awaiting dismantlement.  
<sup>f</sup> This figure includes nearly 700 warheads for bombers and nuclear-powered ballistic missile submarines (SSBNs) in overhaul and nearly 2000 non-strategic nuclear weapons for use by short-range naval, air force and air defence forces.  
<sup>g</sup> This figure is for retired warheads and warheads awaiting dismantlement.  
<sup>h</sup> Despite four nuclear test explosions and considerable efforts, there is no open-source evidence that North Korea has produced or deployed operational nuclear warheads. Data for North Korea is not included in overall totals.  
<sup>i</sup> Sum assumes highest estimate when a range is given.

on Measures for the Further Reduction and Limitation of Strategic Offensive Arms (New START) entered into force in February 2011 (see figure 2). Furthermore, both Russia and the USA have extensive and expensive modernization programmes under way for their existing nuclear delivery systems, warheads and production facilities.

The nuclear arsenals of the other nuclear weapon-possessing states are considerably smaller (see figure 3), but all are either developing or deploying new weapon systems or have announced their intention to do so. China has embarked on a long-term modernization programme focused on making qualitative improvements to its nuclear forces rather than on significantly increasing their size. India and Pakistan are both expanding their nuclear weapon stockpiles as well as developing land-, sea- and air-based missile delivery systems. Israel, which neither officially confirms nor denies that it possesses nuclear weapons, is testing a long-range nuclear-capable ballistic missile. North Korea continues to prioritize its military nuclear and ballistic missile programmes, but

there is no open-source evidence that North Korea has produced or deployed operational nuclear weapons.

This Fact Sheet estimates the nuclear weapon inventory of the nine nuclear-weapon possessing states and highlights some key aspects of the states’ recent nuclear-force developments.

**US NUCLEAR FORCES**

As of January 2016, the USA maintained a stockpile of approximately 4500 operational nuclear warheads. This included approximately 1930 deployed nuclear warheads, consisting of roughly 1750 strategic and 180 non-strategic (tactical) warheads. In addition to this deployed arsenal, about 2570 warheads were held in reserve, and another roughly 2500 retired warheads were scheduled for dismantlement, for a total US stockpile of approximately 7000 warheads.

Over the period 2015–24, the USA plans to spend \$348 billion on maintaining and comprehensively modernizing its triad of land-, sea- and air-based nuclear forces and the facilities that support them. This will include a next-



generation intercontinental ballistic missile (ICBM), known as the ground-based strategic deterrent (GBSD), that is scheduled to begin replacing the Minuteman III in 2028; a next-generation nuclear-powered ballistic missile submarine (SSBN) to replace the current Ohio class, which is expected to begin patrols in 2031; a new nuclear-capable long-range bomber, known as B-21, that will replace existing B-52H and B-1B bombers during the 2030s and 2040s; and a new stealthy nuclear-armed air-launched cruise missile, known as the LRSO (long-range standoff missile), that will have greater range and accuracy than the current system.

The USA has programmes under way to modernize its inventory of nuclear warheads and bombs. These include the replacement of current B61 tactical nuclear gravity bombs, beginning in 2022, with the new B61-12 guided bomb. The B61-12 is equipped with a guided tail kit that will increase its accuracy and may give it expanded nuclear strike options. The USA is also planning significant redesigns of the nuclear warheads carried by ballistic missiles, known as interoperable warheads (IWs), which mix components from different types of existing warheads into new designs.

In addition to these programmes, the USA has plans to invest in its nuclear infrastructure. These include modernizing nuclear command and control facilities and building new nuclear weapon production and simulation facilities.

## **RUSSIAN NUCLEAR FORCES**

As of January 2016, Russia maintained an arsenal of approximately 4490 nuclear warheads assigned to nuclear-capable delivery vehicles. About 2540 of these are strategic warheads, of which around 1790 are deployed on ballistic missiles and at bomber bases. Russia also possessed nearly 1950 non-strategic (tactical) nuclear warheads, all of which are in central storage. A further 2800 warheads are in reserve or retired and awaiting dismantlement, for a total Russian stockpile of roughly 7290 warheads.

Russia is in the middle of a long transition from ageing Soviet-era nuclear forces to newer weapon systems. Russia's nuclear modernization is motivated by the need to replace old systems, maintain rough overall parity with the USA, enhance weapon survivability and efficiency, and enhance national prestige. The size of Russia's nuclear arsenal will probably decline further over the next decade, even without a follow-on arms reduction treaty, due to financial constraints.

Russia's ICBM force is undergoing significant transformation due to the gradual replacement of Soviet-era missiles with fewer but newer ICBMs. By the end of 2015, approximately half of the force had been upgraded, and all of the remaining Soviet-era ICBMs will be retired by 2024. To keep rough parity with the USA's larger ICBM force, Russia is prioritizing the deployment of multiple independently targetable re-entry vehicles (MIRVs) on its new RS-24 Yars mobile ICBMs. Russia is also developing a new liquid-fuel, silo-based 'heavy' ICBM, known as the RS-28 (Sarmat) that reportedly will be equipped with advanced countermeasures designed to penetrate US missile defence systems.

To replace its ageing fleet of Soviet-era SSBNs by the end of the next decade, Russia is building eight Borei class SSBNs (Project 955), of which three had



entered service by the end of 2015. The new Borei class submarines will each carry 16 Bulava sea-launched ballistic missiles (SLBMs) carrying multiple warheads.

Russia's next-generation strategic bomber programme has experienced lengthy delays. Russia is currently modernizing a small number of its ageing Tu-95MS and has decided to resume production of the Tu-160, with at least 50 aircraft to be procured beginning in 2023.

### **BRITISH NUCLEAR FORCES**

As of January 2016, the British nuclear stockpile consisted of approximately 215 warheads. In its 2015 Strategic Defence and Security Review (SDSR), the British Government reaffirmed plans to cut the size of the nuclear arsenal. The stockpile of operationally available nuclear warheads has already been reduced from 180 to the new limit of 120. The overall size of the nuclear stockpile, including non-deployed warheads, will decrease to no more than 180 by the mid-2020s.

The British nuclear deterrent consists exclusively of a sea-based component: four Vanguard class Trident SSBNs that can be armed with up to 16 Trident II D5 SLBMs leased from the US Navy. In a posture known as continuous at-sea deterrence (CASD), one submarine is on patrol at all times. However, under limits set out in the 2010 SDSR, the submarine on patrol is now armed with no more than 8 operational missiles and a total of 40 nuclear warheads.

The British Government announced in 2015 that it intended to replace the four Vanguard class Trident SSBNs with a new class of four submarines, currently known as Successor. The new submarine will be similar to the Vanguard class and will carry Trident II D5 SLBMs. However, its entry into service will be delayed as part of an extended development and acquisition programme. The retirement of the current Trident submarines, which was due to begin in 2028, has been put back to the early 2030s. The replacement of the current warhead for the Trident II D5 missiles has been similarly postponed, until at least the late 2030s.

### **FRENCH NUCLEAR FORCES**

France's nuclear arsenal comprises approximately 300 warheads. These are earmarked for delivery by SLBMs and aircraft-launched cruise missiles.

The main component of France's nuclear arsenal consists of four Triomphant class SSBNs. The French Navy is modernizing the Triomphant class submarines to carry the M51 SLBM, with the work expected to be completed by 2019. An enhanced version of the missile will be armed with a new warhead that features a more robust design for improved reliability and a longer lifespan. France has also begun preliminary design work on a next-generation SSBN. The goal is to have a successor submarine to the Triomphant class in service by 2035.

The airborne component of the French nuclear forces consists of the land-based Mirage 2000N and Rafale F3 combat aircraft; and the aircraft carrier-based Rafale MK3. The aircraft are equipped with the ASMP-A (air-sol moyenne portée-améliorée, medium-range air-to-surface-improved)



missile, which is scheduled to begin a mid-life refurbishment programme in 2022.

### CHINESE NUCLEAR FORCES

China maintains an estimated total stockpile of about 260 nuclear warheads, a number that has remained relatively stable over many years but is slowly increasing. Of China's planned triad of land-, sea- and air-based nuclear forces, only the land-based ballistic missiles and nuclear-configured aircraft are currently considered operational (with aircraft only in a secondary nuclear role). About 190 warheads are assigned to these forces. The remaining warheads are assigned to reserves and non-operational forces, including new systems that are under development.

China's nuclear-capable land-based ballistic missile arsenal is undergoing gradual modernization as ageing silo-based, liquid-fuelled missiles are replaced with more survivable, mobile solid-fuelled models. China is developing the DF-41, a new road-mobile ICBM with a range that will reportedly allow it to strike targets throughout the continental USA, but it is unclear when the missile will enter into service. After many years of development work, China has also reportedly deployed MIRVs on a small number of ICBMs as a response to expanded US missile defence capabilities.

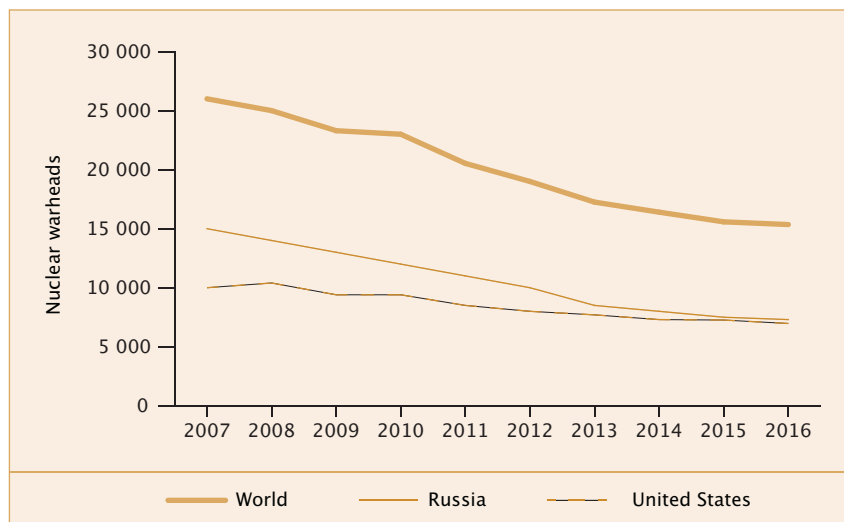
China is developing a sea-based nuclear deterrent consisting of a fleet of Type 094 SSBNs. The Type 094 SSBN will eventually be armed with up to 12 JL-2 SLBMs, but the missile programme has encountered delays due to technical difficulties and the missile has not yet entered operational service. China has invested considerable resources in building the naval infrastructure needed to support the SSBN fleet.

In 2015, China published its latest biennial defence white paper, which reaffirmed that China's nuclear strategy is defensive in nature and that its nuclear forces have only two purposes—'strategic deterrence and nuclear counterattack'. These forces are maintained at the minimum level required for safeguarding China's sovereignty and national security. The 2015 defence white paper also reaffirmed China's long-standing nuclear no-first-use (NFU) policy as a cornerstone of its deterrence posture.

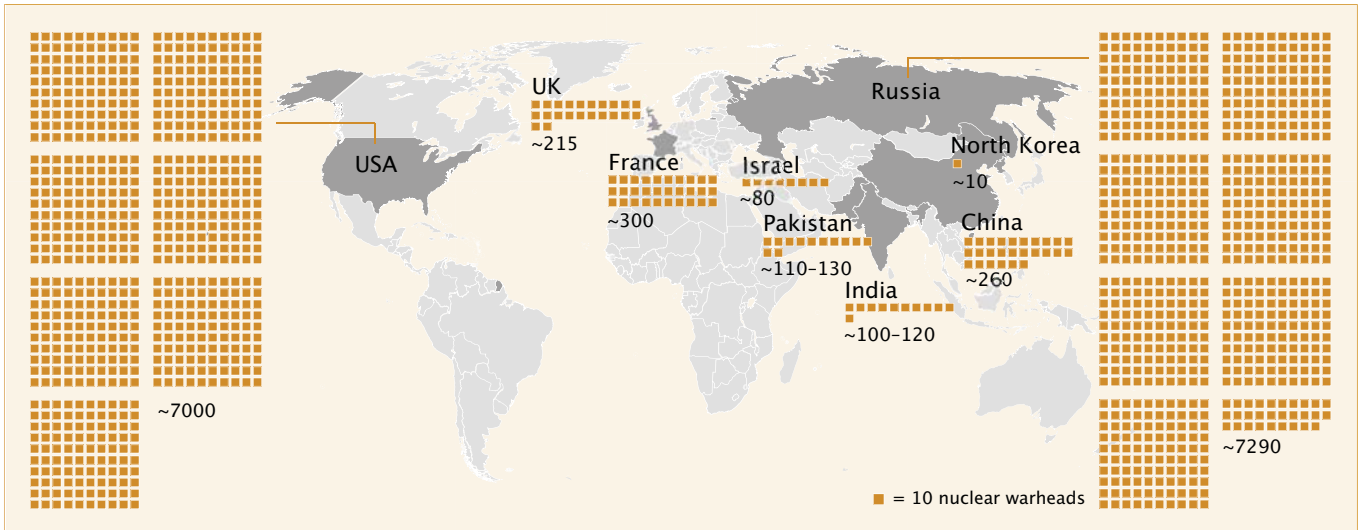
### INDIAN NUCLEAR FORCES

At the beginning of 2016 India was estimated to have an arsenal of 100–120 nuclear weapons. This estimate is an increase in the size of the Indian nuclear stockpile from the 90–110 warheads estimated in January 2015.

India's nuclear forces consist of a mix of land-, sea- and air-based capabilities. India continues to prioritize work on the Agni family of land-based



**Figure 2.** Total warhead holdings of all nuclear-weapon possessing states (the United States, Russia, the United Kingdom, France, China, India, Pakistan, Israel and North Korea), 2007–16



**Figure 3.** Total warhead holdings of all nuclear-weapon possessing states (the United States, Russia, the United Kingdom, France, China, India, Pakistan, Israel and North Korea), 2016

Note: All figures are approximate.

nuclear-capable ballistic missiles. It is currently conducting flight tests of a new road-mobile, canister-launched missile, the Agni V, which reportedly will have a near-intercontinental range and be capable of reaching targets throughout China. The missile is expected to be inducted into service in 2017.

India continues to develop the naval dimension of its triad of nuclear forces in pursuit of an assured second-strike capability. The Indian Navy plans to induct its first indigenously built SSBN, *INS Arihant*, into service in 2016. The new class of submarines will initially carry the 700-km range K-15 missile, which is currently undergoing launch tests. India is also developing a more advanced SLBM with a reported range of up to 3500 km.

Aircraft remain the most mature delivery system. It is widely believed that the Mirage 2000H multi-role combat aircraft and Jaguar IS fighter-bombers have been assigned a nuclear delivery role.

India’s nuclear weapon programme is based primarily on plutonium. It plans to build six fast-breeder reactors, which will significantly increase its capacity to produce plutonium for weapons. A prototype fast-breeder reactor is nearing completion and is expected to achieve first criticality in 2016. India is also currently expanding its uranium enrichment capabilities. A new unsafeguarded gas centrifuge facility appears to be under construction near Mysore. India’s expanded centrifuge enrichment capacity has been motivated by plans to build new naval propulsion reactors, but the potential excess capacity could also signify its intent to move towards thermonuclear weapons.

**PAKISTANI NUCLEAR FORCES**

As of January 2016 Pakistan was estimated to possess a stockpile of 110–130 warheads. This marked an increase from the 100–120 warheads estimated for 2015.

While aircraft constitute Pakistan’s most mature nuclear delivery system, the government has prioritized the development of nuclear-capable land-



based ballistic and cruise missiles. Pakistan currently deploys two types of road-mobile short-range ballistic missiles and has developed two types of medium-range ballistic missiles. One longer-range variant under development, the Shaheen-III missile, will be capable of reaching targets throughout India.

Pakistan has developed nuclear-capable short-range missiles that appear to be intended for tactical nuclear roles and missions. The development of so-called battlefield nuclear weapons reflects the pursuit of what officials from Pakistan describe as a ‘full-spectrum deterrence’ posture. Their purpose is to offset India’s superior conventional forces in limited conflict scenarios.

Pakistan has acknowledged that it is seeking to match India’s nuclear triad by developing a sea-based nuclear force. There has been considerable speculation that the sea-based force will initially consist of nuclear-armed, submarine-launched cruise missiles (SLCMs) deployed on submarines or on surface ships.

Due to Pakistan’s ongoing expansion of its capabilities to produce fissile materials for nuclear weapons, the size of its nuclear arsenal may increase significantly over the next decade. Pakistan’s current warhead designs are believed to use highly enriched uranium (HEU), which is produced at two centrifuge facilities. At the same time, Pakistan has been expanding its main plutonium production complex at Khushab, Punjab (which consists of four operational heavy water nuclear reactors and a heavy water production plant) as well as constructing a new reprocessing plant at another site. However, it is unclear whether Pakistan will have sufficient capacity to reprocess spent fuel or an adequate supply of uranium reactor fuel—factors which may constrain the growth of its arsenal.

## **ISRAELI NUCLEAR FORCES**

Israel continues to maintain its long-standing policy of nuclear opacity. It neither officially confirms nor denies that it possesses nuclear weapons. Israel is estimated to have approximately 80 nuclear weapons. Of these, approximately 30 are gravity bombs for delivery by aircraft. The remaining 50 weapons are for delivery by Jericho II medium-range ballistic missiles, which are believed to be based together with their mobile launchers in caves at a military base east of Jerusalem. The status of a new Jericho III intermediate-range ballistic missile is unknown.

There are unconfirmed reports that Israel may be equipping its fleet of six German-built Dolphin class diesel-electric submarines with SLCMs. Israel has consistently denied these reports, and the reliability of many of them is uncertain.

## **NORTH KOREAN NUCLEAR FORCES**

North Korea maintains an active but highly opaque nuclear weapon programme. It is estimated that North Korea may have built up to 10 nuclear warheads, although there is no open-source evidence that it has produced or deployed operational weapons. The estimate is based primarily on calculations of the amount of plutonium that may have been produced by the graphite-moderated reactor located at the Yongbyon nuclear centre.

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There has been considerable speculation that North Korea is seeking to build nuclear weapons using HEU as the fissile material in order to overcome the constraints imposed by its limited stock of weapon-grade plutonium. North Korea is known to have at least one uranium centrifuge enrichment plant, located at Yongbyon, and may have at least one other undeclared facility. However, whether North Korea has made HEU for use in a nuclear weapon and, if so, how much remain unclear.

North Korea currently deploys or is developing four types of indigenously produced long-range land-based ballistic missiles that are widely believed to have possible nuclear delivery roles. These are thought to be derived from older Soviet missile designs and technologies. North Korea is also developing a capability to launch ballistic missiles from submarines and has conducted a series of submerged test-launches since 2015 with mixed results. There is considerable uncertainty about the technical capabilities and operational readiness of North Korea's ballistic missile force, since it carries out only a small number of test- and training-launches of the missiles before declaring them to be operational.

North Korea claims to have designed and built a nuclear warhead that is sufficiently compact and robust for delivery by a ballistic missile. However, there is no open-source evidence to indicate whether it has actually done so.

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