

India

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Since 1998, India has been gradually increasing its stockpile of nuclear warheads and diversifying the number of vehicles it could use to deliver these warheads. In addition to aircraft, there are also a range of land-based and naval-launched missiles. The latter can be launched from ships and a nuclear-powered submarine that was deployed a couple of years ago. India's stockpile of fissile materials to make nuclear weapons has also been increasing concomitantly. In addition to nuclear weapons, India's expenditures on conventional military arms and imports of weapons from other countries have continued to expand. India is not a signatory to any multilateral treaty related to nuclear weapons. Over the years, the levels of public discourse have become very militaristic and the current government has been following very aggressive policies in the disputed region of Kashmir.

Current status

India has a fast growing nuclear arsenal and its size has increased significantly in the over two decades since the 1998 nuclear weapon tests. The latest figure is from the Federation of American Scientists (FAS), which, based on publicly available information about India's delivery vehicles and strategy, estimated in 2020 that the country might have 150 nuclear warheads.¹ In comparison, FAS estimated 60-80 assembled nuclear warheads in 2010 and 30-35 warheads in 2002.² Alongside the increase in the numbers of warheads, India's nuclear arsenal has also been undergoing other changes.

Delivery vehicles

The main focus of modernisation and enhancement of the nuclear arsenal has been on developing new and longer-range delivery vehicles. In particular, the deployment of a nuclear powered and armed submarine over the last five years has allowed India to justifiably claim that it now possesses the "triad of aircraft, mobile land-based missiles and sea-based assets" that was called for in the country's 1999 Draft Nuclear Doctrine.³

Aircraft

India's first operational nuclear delivery vehicle was the Mirage 2000 aircraft. Although India had purchased these aircraft from France in the 1980s,

it was only in the mid-1990s that its use for delivering nuclear weapons was operationalised; a similar effort involving the Jaguar was unsuccessful "because of the low ground clearance between the aircraft and the nuclear weapon container".⁴ However, after the 1998 nuclear weapon tests and further refinements in weapon design, the Jaguar might indeed have been capable of use as a nuclear delivery vehicle.

The Mirage 2000H was retired in the summer of 2018, and is undergoing upgrades to extend its service life and enhance its capabilities; the modernised version is called Mirage 2000I.⁵ Most of the changes involve upgrades in sensing equipment, such as radars and receivers, navigation and communication systems, and data management systems.⁶ While these might not affect the nuclear delivery capability as such, it enhances the ability of the aircraft to carry out such a task without being intercepted.

India also signed a deal with France for purchasing Rafale aircraft.⁷ The choice of aircraft was reportedly due to its capacity for nuclear weapons delivery and, in the words of a former Indian ambassador to France, "because the French had no problem with the Rafale being modified to carry a nuclear payload".⁸ Newspaper reports suggest that it will be used to deliver nuclear weapons and conventional weapons; the first squadron of aircraft are to be based in the eastern part of the country, suggesting that their primary targets will be in China.⁹

Land-based missiles

India's main land-based missiles that are designed for delivering nuclear weapons are the Prithvi and Agni series of missiles. The Prithvi is the shorter range missile that is fueled with a liquid propellant and is originally derived from a Soviet Surface to Air Missile. Of the two land-based variants developed, only the Prithvi II has been inducted into service as a nuclear delivery vehicle. Its range is said to be 250 to 350 kilometres, depending on the payload. It is regularly tested by its "users", the Strategic Forces Command, and the annual reports of India's Ministry of Defence record two tests in 2015, three in 2016, one in 2017, and two in 2018.¹⁰

Agni missiles also come in multiple versions, and are longer in range compared to Prithvi, going all the way from 700 km to over 5000 km. At least four of these have

been delivered to the Strategic Forces Command, and the annual reports of India's Ministry of Defence record them carrying out "user trials" for Agni I (two in 2016, two in 2018), II (one in 2017, one in 2018), III (one in 2017), and IV (one in 2017).

The longest range version of the Agni is Agni-V, a three-stage, solid-fueled, rail-mobile, ballistic missile that is capable of delivering a warhead to 5,000 kilometres or more. Agni-V was successfully tested in December 2018 and has been inducted into the Indian army.¹¹ In October 2021, Agni-5 underwent its first user test by the Strategic Forces Command after its induction into the armed forces.¹² A special feature of the Agni-V is that it has been tested from a canister rather than a fixed concrete launch pad. The canister design allows for missiles to be launched quickly and for the missile to be transported by trucks on roads, hence making it harder to locate.

The latest in the Agni series, Agni-P, also is designed to be launched from a canister that allows more movement and launch options.¹³ It is said to have a range of between 1,000 and 2,000 kilometres, but lighter compared to other Agni missiles, more accurate and maneuverable.

India's Defence Research and Development Organisation (DRDO) was also reported to be developing a longer range Agni-VI, which was said to be capable of carrying multiple independently targetable re-entry vehicles or MIRVs.¹⁴ This claim was repeated in the government's Press Information Bureau website in December 2016, according to which the Agni-VI was to have "have a strike-range of 8,000–10,000 kilometers".¹⁵ However, this missile has not been tested so far. It is conceivable that the missile has been designed and could be tested at some future date. At the same time, it is possible that Indian leaders might be concerned that testing such a long-range missile would lead to a strong reaction from the United States (US), whose analysts have long warned about the threat from an Indian intercontinental ballistic missile (ICBM).¹⁶

India is also embarking on developing hypersonic missiles and tested a "hypersonic technology demonstrator vehicle (HSTDV) that will have futuristic applications for next generation missiles and aerial systems" in June 2019.¹⁷ Some reports described the test as a failure, while others reported it as a success and predict that it will be used for furthering India's ballistic missile defence program and developing longer range cruise missiles.¹⁸

India has also developed a cruise missile, which is described as nuclear capable, with a range of over 1,000 km called Nirbhay, which had its first successful test in November 2017 after several failures, and subsequently successfully tested again in April 2019.¹⁹

Sea-based missiles and submarines

The naval variant of the Prithvi is called the Dhanush, with a range of around 350 or 400 km. Like Prithvi-II, it has been deployed and is regularly tested by its "users", the Strategic Forces Command, and the annual reports of India's Ministry of Defence record two tests in 2015, two in 2016, and two in 2018.

The focus of development in the last few years, however, has been on two submarine-launched ballistic missiles (SLBM), the K-15 and the K-4. The first missile, K-15, which is also termed the B-5 or the Sagarika, is a nuclear-capable SLBM with a range of 750 kilometres and was reportedly tested thrice by users from a submarine that was "positioned nearly 20-meter deep in the sea, about 10-km off the" eastern coast of India in August 2018.²⁰ Since then, the missile has reportedly been deployed on India's nuclear submarine, the Arihant, that was described as having gone on a "deterrent patrol" in 2018.²¹ The Arihant's four launch tubes will reportedly be capable of carrying 12 K-15s.²²

For many years, Indian naval planners have bemoaned the short range of the K-15 and pressed for longer range missiles that would allow them to target China from the Bay of Bengal or the Arabian Sea. The missile capable of those attacks is the 3,000 km range K-4 missile, which was first tested in March 2014.²³ It has subsequently been tested many times, including from an underwater platform.²⁴

Subsequently, there was a media report that the DRDO is designing a 5,000km-range submarine-launched missile based on the Agni-V missile design; however, the media report goes on to quoting an unnamed senior official as saying "the final decision lies with the government. And no such sanction has been either sought or approved", thus making the status of this missile uncertain.²⁵

The K-4 and K-15 missiles are intended for deployment on India's first nuclear-powered ballistic missile submarine, or SSBN, the Arihant. As mentioned earlier, that submarine was reported as having been on "deterrence patrol" suggesting that it has been loaded with nuclear weapons and deployed.²⁶

A second SSBN, variously called Arighat and Aridhaman, was reportedly under construction and expected to be commissioned in 2021.²⁷ A news report from November 2021 said that it is "likely to be commissioned within the next few months".²⁸

India is also in the process of constructing nuclear powered attack submarines, with news reports suggesting that six of them will be built.²⁹ However, the timeline for this construction will stretch well into the next decade

and, as of June 2019, the project had only been given seed money to work on a new special alloy for the hull.³⁰

The proliferation of nuclear submarines raises the possibility of accidents and concerns about command and control.³¹ The Arihant, according to one report, has already been in an accident.³² The veracity of this report has been questioned, and India's defence ministry refused to answer a question asked in Parliament about the extent of the damage and the cost of repairs.³³

Fissile materials

India's nuclear weapons are based on plutonium. Although the country produces highly enriched uranium (HEU), the other fissile material commonly used in nuclear weapons, all the HEU produced in the country is believed to be earmarked for the nuclear submarine programme described earlier.

India has historically produced weapons-grade plutonium at two production reactors, CIRUS and Dhruva, both at the Bhabha Atomic Research Centre (BARC), in Mumbai.³⁴ CIRUS was shut down in 2010 but Dhruva continues to operate. Spent fuel from the reactor is reprocessed to separate out the plutonium contained the Trombay reprocessing plant. BARC is also where most of the nuclear weapons work in the country is carried out; for example, metallurgical activities involving plutonium.³⁵

On the basis of the limited amount of publicly available information and reasonable assumptions, and after accounting for material that would have been used in nuclear weapons tests and other purposes, India is estimated to have a net stockpile of weapon-grade plutonium of 0.69 ± 0.14 tons of weapon-grade plutonium as of the end of 2019.³⁶ In comparison, in the 2012

edition of Assuring Destruction Forever, the estimated stockpile was around 0.43 tons. The 2019 stockpile should suffice for about 140 nuclear weapons.

There is also the possibility of using reactor-grade plutonium to make nuclear weapons. While there is no official confirmation of this possibility, there has been speculation that one of the devices tested in 1998 used reactor-grade plutonium.³⁷ If this is the case, then India's nuclear arsenal could potentially be much larger. The estimated stockpile of separated plutonium from power reactors, as of December 2019, is around 7.7 ± 4.1 tons of reactor grade plutonium, of which about 0.4 tons are under IAEA safeguards.³⁸ Assuming that about eight kilograms of the material is required for a weapon, this stockpile could be used to make 400 to 1400 weapons.

The HEU used to fuel nuclear submarines comes from the Rare Materials Plant in the state of Karnataka. The HEU is said to be enriched to a level between 30 and 45 per cent of uranium-235, which is significantly less than what can be used to make weapons. Assuming an enrichment level of 30 per cent, India might have produced 5.2 ± 1.8 tons of HEU as of the end of 2019 with a uranium-235 content of 1.6 ± 0.5 tons.³⁹

Economics

According to the Stockholm International Peace Research Institute (SIPRI) database on military expenditures, India's military spending has traditionally been around 2.5 to 3.0 per cent of its GDP. Other sources record lower percentages but it is not clear what expenditures are included. For example, the International Institute for Strategic Studies database puts the figures closer to 2 per cent.⁴⁰

Table 1: Military expenditure (local currency, current prices for calendar years)

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Military Expenditure (bn Rs)	2316	2523	2778	3107	3291	3805	4209	4529	5030	5391
Military Expenditure (bn constant 2017 USD)	54.6	54.3	53.9	56.8	56.8	62.6	67.7	69.3	71.5	73.0

Source: SIPRI Military Expenditure Database, <https://www.sipri.org/databases/milex>.

India, however, is one of the world's largest arms importers. Between 2016 and 2020, it was the world's second largest importer of major arms and accounted for 9.5 per cent of the global total.⁴¹ Traditionally, the majority of its imports came from Russia but in recent years the share of imports from Israel and France have been increasing.

Practically all of these arms imports are in the realm of conventional military capabilities. These increases in conventional military capabilities do have a bearing on the risk of nuclear war because they are aimed at the two countries that Indian political leaders point to as their nuclear rivals: Pakistan and China. With regard to Pakistan, the primary purpose of enhanced military capabilities are to credibly threaten to fight limited wars before Pakistan might consider using nuclear weapons, or "under the nuclear threshold" as strategists term such plans. In the case of China, the primary purpose is to try and match China's much larger military capabilities.

In addition to arms imports, one of Prime Minister Narendra Modi's stated priorities is to increase exports of weapons. In February 2020, at a large defence exhibition (which involved over 1,000 companies, including 172 foreign ones) he announced that India was looking to achieve defence exports worth Rs 350 billion (or roughly US \$5 billion) in the next five years.⁴² This has implications for weapons development. The short range (200 km) missile called Pranash that is under development has been described as attractive because it "is outside the purview of the Missile Technology Control Regime (MTCR), which places export restrictions on missiles with ranges of more than 300km" and can therefore be exported to other countries.⁴³

The current government is, as a matter of stated policy, promoting the privatisation of public sector companies involved in the defence sector.⁴⁴ Increasingly, manufacture for defence is also contracted to private companies, either singly or as public-private partnerships. Some of the companies that are benefitting from this trend are those that have been closely associated with the Prime Minister. For example, the Reliance Group was involved in a controversial deal involving the imports of Rafale jets from France.⁴⁵ Another closely associated company belonging to the Adani group came close to being awarded a Rs. 450 billion contract for building submarines, which eventually went to another private company, Larsen & Toubro, that had been traditionally associated with the construction of the Arihant nuclear submarine.⁴⁶

Both these trends—the privatisation of the defence industry and the focus on exports—are worrying and will likely set the course of ever-increasing build-ups of weapons, including nuclear weapons and allied systems.

International law and doctrine

India has not signed either the nuclear Non-Proliferation Treaty (NPT) or Comprehensive Test Ban Treaty (CTBT). Officially, India is "committed to maintaining...the policy of no-first use of nuclear weapons".⁴⁷ But there have been signs that this commitment might not be reliable.⁴⁸ In parallel, India's development of nuclear missiles in sealed canisters and the deployment of its first nuclear powered and armed submarine, Arihant, raise the possibility of military officials being in a position to launch nuclear weapons without authorisation from the highest political authorities.⁴⁹

During the 2016 dispute with Pakistan, for example, then-Indian defence minister Manohar Parrikar indicated that India should not "bind" itself to that policy.⁵⁰ In 2019 the current defence minister Rajnath Singh reiterated that the no first use policy might change in the future, a statement that was particularly relevant because it was made during a period of heightened tension in Kashmir.⁵¹ This has been the case ever since the Hindu Nationalist Bharatiya Janta Party (BJP) came back to power under the leadership of Prime Minister Narendra Modi after the 2019 general elections. The BJP and its support base have been consistently ideologically motivated to support nuclear weapons even before China tested its first bomb, and their role in carrying out the 1998 nuclear weapons tests was considerable.⁵²

The BJP's political outlook has also led to heightened tensions between India and Pakistan. In early 2019, the two countries were embroiled in a major standoff that involved aerial attacks and that prominently featured threats to launch missiles at each other.⁵³ Ceasefire violations in Kashmir along the Line of Control (LOC) between the two countries have increased tremendously. In 2019, a total of 3,200 incidents of firing across the LOC have been reported, which is a large increase over the 1,629 incidents reported in 2018, and an even larger increase over the 583 reported in 2014.⁵⁴

India did not participate in the negotiations of the Treaty on the Prohibition of Nuclear Weapons, adopted in July 2017. At the time, it stated that it was "not convinced" that the negotiations would deliver an effective nuclear disarmament treaty, including one with effective verification mechanisms, and that it would prefer to see discussions occur within the UN Conference on Disarmament.⁵⁵ To that end, India has advocated a negotiating process toward a Convention on the Prohibition of Use of Nuclear Weapons including through statements and resolutions tabled at the UN General Assembly's First Committee on International Security and Disarmament.⁵⁶



Gas-mask © Yuri B, Pixabay

Public discourse

The expansion and modernisation of nuclear weapons has been accompanied by claims about India becoming a powerful nuclear state. While Pakistan is a traditional target of the media, there has been an increased focus on being able to attack China, although this is usually phrased as 'defend against' China.⁵⁷ With Pakistan, surgical strikes and border skirmishes are being highly publicised, with the government's actions being described as a strong response. In both 2016 and 2019, Indian media went into a frenzy especially on television channels.⁵⁸ "We want revenge, not condemnation. ... It is time for blood, the enemy's blood," screamed Arnab Goswami, a notoriously aggressive news anchor.⁵⁹ Social media too featured similar rhetoric and pro-war hashtags trended on Twitter. One twitter handle started a poll on people's opinion of using nuclear weapons to "finishing Pakistan" as well.⁶⁰ A big budget Bollywood film "Parmanu" valorising the 1998 nuclear test by India was a huge financial success. The rhetoric of war and nuclear weapons was used widely in the 2019 general elections with Prime Minister Modi himself implying that he will not be scared to use nuclear weapons.⁶¹

There is also a long-standing desire on the part of the elite to have India be recognised as a great power. Many official announcements about the achievement of any new capability will be accompanied by a statement about how India has reached some exclusive set of countries with that particular capability. For example, when India

destroyed a satellite with an anti-satellite weapon in March 2019, the Prime Minister tweeted "India is only the 4th country to acquire such a specialised and modern capability" and "India stands tall as a space power!".⁶²

On 27 May 1998, about two weeks after conducting nuclear tests, India's Prime Minister Atal Behari Vajpayee declared in the Parliament, "India is now a nuclear weapon state" and went on to state that India's "strengthened capability adds to our sense of responsibility".⁶³ As illustrations of this sense of responsibility, Vajpayee declared the country's intentions not "to use these weapons for aggression or for mounting threats against any country" and not "to engage in an arms race". Today, over two decades after that statement, it is clear that India has been engaged in an arms buildup that is very reminiscent to the Cold War although smaller in scale.

The same period has also seen a number of threats issued. An example is the rhetorical question by the current Indian Prime Minister, who belongs to the same political party as Vajpayee and who asked whether India's nuclear arsenal had been kept for Diwali, the traditional Indian festival where firecrackers are burst. Today, India can legitimately lay claim to belonging to another select, if infamous, club: of countries that are at risk of nuclear war. It is not a club worth belonging to, for the lives of millions and millions of people are at stake.

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