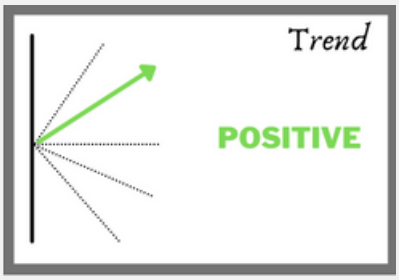
CAPS Nuclear Tracker

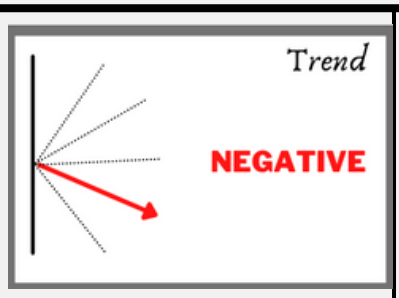
Issue XI: January - March 2024

2024 began well for the nuclear energy sector. In China, the first Generation IV demonstration nuclear reactor became operational in January. In India, the long-awaited core loading of its prototype fast breeder reactor was undertaken in March. Meanwhile, the first Nuclear Energy Summit concluded in Brussels with a statement by the nuclear industry to steadfastly and rapidly move nuclear energy to contribute to climate mitigation efforts. For all these reasons and more, the only positive trend that you see in this tracker is for nuclear energy. All the others mostly remain where they were. New developments in missile testing and vertical proliferation as well as no positive progress on Iran, North Korea and arms control made for a gloomy picture for this first quarter.

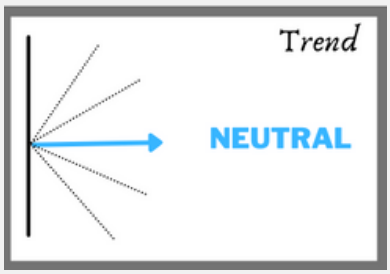
TREND OVERVIEW



- **Nuclear Energy**
  Dr Dhruba Tara Singh
  Ms Rishika Singh
  Ms Ritika Maurya



- **Missile Developments**
  Mr Javed Alam
- **Vertical Nuclear Proliferation**
  Dr Manpreet Sethi
- **North Korea**
  Dr Silky Kaur
- **Iran**
  Dr Silky Kaur
- **Nuclear Arms Control**
  Dr Manpreet Sethi

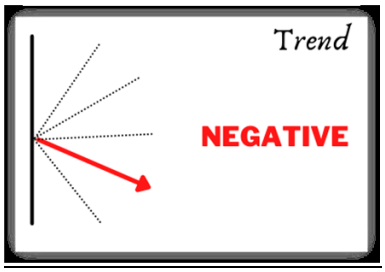


- **Sea-Based Nuclear Developments**
  Mr Javed Alam
- **Nuclear Security**
  Ms Prachi Lokhande

Missile Developments

Javed Alam

Previous Trend: Negative



The year 2024 has witnessed an early flight test of an intermediate-range ballistic missile (IRBM) on the Korean Peninsula. On January 14, North Korea conducted the initial flight test of its first solid-propellant intermediate-range ballistic missile (IRBM). It was reported that the missile used the first two stages of the Hwasong (HS)-18, a three-stage, solid-propellant intercontinental ballistic missile (ICBM). The new missile carried a manoeuvring re-entry vehicle (MaRV) previously flown on smaller missiles in 2022, rather than a traditional reentry vehicle (RV). On February 15, North Korea launched new surface-to-sea missile Padasuri-6. According to reports, this missile will be deployed with the coastal defence battalions of the East Sea and West Sea fleets of North Korea's navy. On March 18, North Korea fired multiple SRBMs just days after the end of the South Korean-US military drills. On March 20, it was reported that North Korea had reportedly conducted a successful ground-jet test of a solid-fuel engine for a new type of intermediate hypersonic missile.

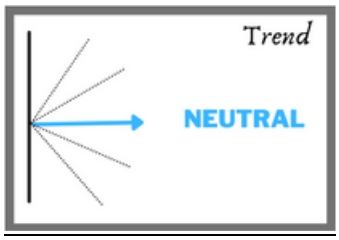
While West Asia continues to see an increasing number of conflicts, Iran's Islamic Revolution Guard Corps (IRGC) launched ballistic missiles from a ship on February 13. In South Asia, on March 11, India conducted the first successful flight of an Agni-V missile with re-entry vehicle (MIRV) technology. Meanwhile, Russia, days after issuing a nuclear warning, conducted a missile test on March 2 of its Yars intercontinental ballistic missile. Yars ICBM system is also known as RS-24. It was also reported that Russia in the month of February hit Kyiv with the hypersonic Zircon missile, its first use in the nearly two-year-old war.

The US, on the other hand, despite facing some setbacks in the hypersonic realm, finally, on March 17, managed to test a hypersonic cruise missile in the Pacific for the first time. The test of the hypersonic weapon, officially called the All-Up-Round AGM-183A Air-launched Rapid Response Weapon (ARRW), was conducted at the Reagan Test Site on Kwajalein Atoll in the Marshall Islands, almost 1,600 miles (2,600 kilometres) to the east of Guam.

Sea-Based Nuclear Developments

Javed Alam

Previous Trend: Negative



On January 19, it was reported that North Korea carried out a test of its "underwater nuclear weapons system." Shin Jong-woo, a military expert at the Seoul-based Korea Defense and Security Forum, said that the test was not of a nuclear device but instead of an underwater self-explosive drone.

The Nuclear Notebook, by the Bulletin of the Atomic Scientists, published its report on China's nuclear weapons on January 15. According to the Notebook, China has likely begun replacing the JL-2s SLBM with JL-3s SLBM on a rotational basis as each submarine returns to port for routine maintenance and overhaul. While a JL-2 SLBM has a reach of 7,200 km, the JL-3 has a 10,000 km range.

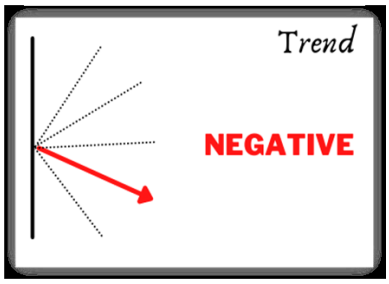
In another report, on February 20 the UK's nuclear deterrent faced an apparent failure when the test firing of a Trident missile from a Royal Navy submarine failed for the second time in a row. The latest test of the UK's nuclear deterrent was from HMS Vanguard, one of four Vanguard-class SSBNs with one of the vessels continually at sea. The submarines are based at Faslane Royal Navy base on the Firth of Clyde and carry US-built Trident II D5 missiles.

On March 20, the ceremony to induct the SNLE-3G (Sous-marin nucléaire lanceur d'engins – 3rd generation), France's future class of SSBNs took place. Though, the new submarine looks similar in size and form to the current Le Triomphant-class, it is an entirely new more stealthy design and is almost 10 meters (30 ft) longer (about 150 meters in length, 15,000+ tons displacement submerged, but official figures are still classified). The crew complement (110 sailors), the number of SLBM silos (16x), and torpedo tubes (4x) will remain unchanged compared to the Le Triomphant-class.

Vertical Nuclear Proliferation

Manpreet Sethi

Previous Trend: Negative



The US Air Force will not abandon its program to build the next ICBM, despite the massive cost overrun, Lt. Gen. Richard Moore, deputy chief of staff for plans and programs, said on Jan 24, 2024. The Air Force recently notified Congress that the LGM-35A Sentinel ICBM program is now expected to cost 37 percent more than previous projections, totaling almost $132 billion. The overruns breach the Nunn-McCurdy Act threshold, which means Defense Secretary Lloyd Austin will have to certify the program to stop it from being cancelled. The Government Accountability Office warned in June 2023 that ICBM-builder Northrop Grumman was struggling with staffing shortfalls, supply chain problems, and clearance processing delays. The overruns aren't caused by the "missile itself," but by the program being a massive "civil works" project, including building the silos and missile field modernization.

US Congress authorized $260 million for a new nuclear-armed sea-launched cruise missile (SLCM) for fiscal year 2024, despite the Biden administration's clear desire not to pursue the weapon's development. The administration did not request any funding for the nuclear SLCM in 2023 or 2024 because it assessed that the weapon has only "marginal utility" and would "impede investment in other priorities." But, for the second consecutive year, Congress overrode the Pentagon's decision due to a majority of lawmakers viewing the SLCM as critical in the current nuclear environment. The fiscal year 2024 National Defense Authorization Act (NDAA) authorizes $190 million for the missile and $70 million for its associated warhead.

Britain's Trident nuclear-deterrent system misfired during a test in February 2024, sending a missile crashing into the ocean off the Florida coast near the submarine that launched it. The Ministry of Defence confirmed that an "anomaly" had occurred during the test but said Britain's "nuclear deterrent remains safe, secure and effective". Britain's nuclear deterrent is provided by a fleet of four nuclear-powered submarines equipped with the U.S.-built Trident ballistic missile system, manufactured by Lockheed Martin. Britain and the U.S. say there have been more than 190 successful tests of the Trident missile system. Britain's nuclear deterrent costs around 3 billion pounds ($3.8 billion) annually to operate - equivalent to roughly 6% of the overall defence budget. Parliament voted in 2016 to approve building a new class of submarines, due to enter service in the 2030s, at a cost last estimated at 31 billion pounds.

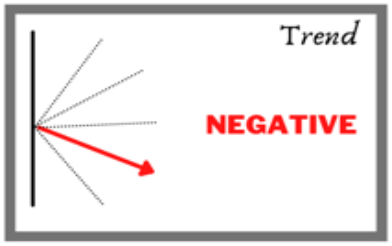
On Feb 23, 2024, President Vladimir Putin of **Russia** said that 95% of Russia's strategic nuclear forces had been modernised and that the Air Force had just taken delivery of four new supersonic nuclear-capable bombers. Putin made the comments a day after he flew on a modernised Tu-160M nuclear-capable strategic bomber. His message was that Russia's nuclear triad - its strategic land, sea and air nuclear capabilities - were up to date, being constantly modernised, and in good order. He also said that the naval component of the 'nuclear triad' is at almost 100 percent and that Russia had started serial production of its new Zircon hypersonic missiles and that new strike systems, which he did not specify, were being tested.

On March 18, 2024, **France** announced that it would resume the production of tritium, a key component in the manufacture of thermonuclear weapons. This production will utilize two civilian reactors operated by the energy giant, EDF.

Iran

Silky Kaur

Previous Trend: Very Negative



Iran initiated the construction of four new nuclear power plants in the southern coastal province of Hormozgan, with a combined capacity of 5,000 MWe, as reported by the state-backed IRNA news agency on February 1, 2024. Mohammad Eslami, head of the Atomic Energy Organization of Iran, disclosed that the construction is expected to span nine years. In another interview on February 12, 2024, former head of Iran's nuclear agency, Ali-Akbar Salehi, hinted at Iran's advancement towards nuclear weapon capability. Salehi's remarks, avoiding direct confirmation, suggested Iran has crossed significant thresholds in nuclear science and technology, sparking concerns over its nuclear ambitions. The head of the IAEA, Rafael Mariano Grossi, warned on February 13, 2024, that Iran's nuclear programme lacks transparency, citing the comments by Ali Akbar Salehi, suggesting Iran possesses the necessary components for a nuclear weapon. On February 19, 2024, Grossi said that Iran persists in enriching uranium well beyond commercial nuclear requirements, despite U.N. pressure. Iran's enrichment pace, although slightly slowed since last year, remained high, with around 7 kg of uranium enriched to 60% purity per month.

Grossi embarked on a diplomatic mission to Tehran on March 4, 2023, to engage in talks aimed at restoring the 2015 nuclear deal. He met with Mohammad Eslami, the head of Iran's Atomic Energy Organization, along with Iranian Foreign Minister Hossein Amirabdollahian and President Ebrahim Raisi. Discussions focused on nuclear safeguard issues, emphasizing the importance of cooperation while maintaining the agency's independence. Grossi's visit preceded the IAEA's Board of Governors meeting, where the United States and its European allies contemplated further resolutions regarding Iran's nuclear activities. Despite challenges, both parties affirmed commitment to their safeguards

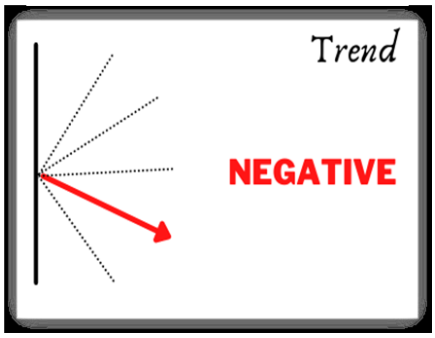
agreement. Traces of uranium enriched to near-weapons grade levels found in Iran were addressed, with Iranian officials reiterating their adherence to declared enrichment levels. Grossi expressed optimism that the discussions could aid in restoring the Joint Comprehensive Plan of Action (JCPOA), the official name of the nuclear accord. Tehran reiterated its stance on maintaining a strictly peaceful nuclear program.

Meanwhile on March 20, 2024, the U.S. Treasury Department announced new sanctions targeting procurement networks facilitating Iran's ballistic missile, nuclear, and defense programs. These networks, spanning Iran, Turkey, Oman, and Germany, have been acquiring materials vital for missile production. The move underscores ongoing efforts to curb Iran's nuclear ambitions amid accusations of stonewalling oversight attempts by the IAEA. The U.S. emphasized its commitment to disrupting networks supporting Iran's proliferation of weapons, citing concerns over regional destabilization and enabling of Russian aggression against Ukraine.

North Korea

Silky Kaur

Previous Trend: Negative



On January 1, 2024, North Korean leader Kim Jong Un asserted that his military should “thoroughly annihilate” the United States and South Korea if provoked, amid escalating tensions. He emphasized the urgency to bolster national security and highlighted plans to enhance military capabilities, including the production of more nuclear materials and development of attack drones.

On January 19, 2024, North Korea conducted a test of its nuclear-capable underwater attack drone, the Haeil-5-23, in response to joint naval exercises involving South Korea, the United States, and Japan. The test, reported by state media, aimed to deter what Pyongyang perceives as hostile military maneuvers by the US and its allies. While the drone's capabilities are disputed, it is seen as a political signal amidst escalating tensions. The Haeil-5-23 is purportedly capable of carrying out sneak attacks and generating a "radioactive tsunami" through underwater explosions. However, experts note its vulnerability to anti-submarine warfare due to its slow speed of around eight knots per hour. Recent moves by North Korean leader Kim Jong Un, including the closure of inter-Korean reconciliation bodies, indicate a worsening situation on the Korean Peninsula.

In another development, on January 24, 2024, North Korea announced its first flight test of a new cruise missile, named Pulhwasal-3-31, amidst escalating tensions with the United States and neighboring countries. The test, reported by state media, occurred a day after South Korea's military detected multiple missile launches into waters off North Korea's western coast. The North Korean Central News Agency described the missile as "strategic," hinting at potential nuclear armament. South Korea's Joint Chiefs of Staff noted that the

missiles flew a shorter distance compared to previous launches, suggesting efforts to enhance existing systems.

Meanwhile, on February 7, 2024, South Korean President Yoon Suk Yeol reiterated that South Korea would not pursue its own nuclear deterrent in response to threats from North Korea. In a televised interview, Yoon emphasized the country's commitment to the NPT and highlighted the economic consequences of acquiring nuclear weapons. He affirmed efforts to enhance nuclear deterrence strategies in collaboration with the United States amid escalating tensions on the Korean Peninsula.

On March 27, 2024, the United States announced sanctions on six individuals and two entities in Russia, China, and the United Arab Emirates, accusing them of funneling funds to North Korea's weapons programs. The U.S. Treasury Department coordinated this action with South Korea. The move comes as the U.S. and South Korea launch a task force to prevent North Korea from acquiring illicit oil amid uncertainties regarding international sanctions on Pyongyang.

Nuclear Energy

Rishika Singh, Ritika Maurya, & Ngangom Dhruba Tara Singh

Previous Trend: Positive

There is currently a worldwide revival of nuclear energy. Countries such as India, China, and the United States are making substantial investments to enhance their nuclear energy. European countries are increasingly turning to nuclear power to enhance energy security and attain their objectives of carbon neutrality, while Kenya is on the verge of embarking on its first steps to nuclear energy for the first time.

In Asia, the **Indian** government is currently seeking to extend invitations to private enterprises for an investment of approximately $26 billion in the nuclear energy industry. According to a report by Reuters on February 20, the government is now engaged in negotiations with a minimum of five private enterprises, namely Reliance Industries, Tata Power, Adani Power, and Vedanta, with the aim of securing investments amounting to approximately ₹44,000 crore each. By 2031-2032, **India** plans to increase its nuclear power capacity by 18 additional reactors, resulting in a total electricity generation capacity of 13,800 MWe. This will bring the proportion of atomic power in India's energy mix to 22,480 MWe. The announcement was made by the Nuclear Power Corporation of India Limited after the dedication of two domestically constructed 700 MW nuclear power reactors in Kakrapar in Gujarat by Prime Minister Modi. The approval for units 3 and 4 at **China** General Nuclear's existing Taipingling nuclear power plant in Guangdong province, as well as units 1 and 2 at China National Nuclear Corporation's new Jinqimen nuclear power plant in Zhejiang province, was granted during the meeting of the Standing Committee of the State Council, presided over by Chinese Premier Li Qiang.

In March 2024, the Washington state Legislature in the **United States** announced a notable investment in nuclear energy generation, marking the first such investment in almost ten years. Prior to ending, the Legislature unanimously approved a state supplemental capital budget for the fiscal year 2023-25, which allocates $25 million specifically for Energy Northwest to sustain its ongoing endeavours in developing new nuclear power plants. During a ceremony held in Washington DC, **Korea** Hydro & Nuclear Power entered into a letter of intent with Centrus Energy, a company based in the **United States**. The purpose of this agreement is to strengthen the supply chain of nuclear fuel. The Letter of Intent delineates precise business goals for developing a tangible structure for ensuring uranium resource security and fostering nuclear energy collaboration between KHNP and Centrus.

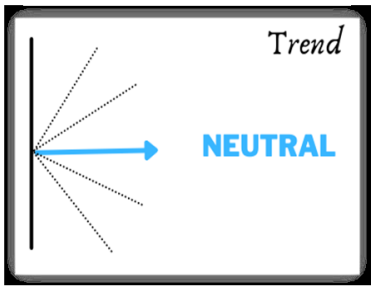
In Europe, during a visit to Paris, **Bulgaria**'s Energy Minister, Rumen Radev, has entered a declaration of intent with **French** Economy Minister Bruno Le Maire, with the aim of establishing collaboration between the two countries in the realm of nuclear energy. According to the French Economy Ministry, France and Bulgaria, as members of the European Nuclear Alliance, underscore the crucial significance of nuclear energy in attaining the European Union's goal of carbon neutrality by 2050, as well as in enhancing energy security and sovereignty. On January 07, 2024, the energy minister of France stated that **France** necessitates a greater number of new nuclear reactors than the presently scheduled six, and potentially even more than 14 new units. According to Energy Transition Minister Agnes Pannier-Runacher, the construction of further nuclear reactors and the augmentation of France's renewable energy portfolio are imperative in order to diminish the nation's reliance on fossil fuels from 60% to 40% by the year 2035. The EDF Energy intends to prolong the operating lifespan of its nuclear facilities located in the **United Kingdom,** while also allocating an additional 1.3 billion pounds ($1.7 billion) towards enhancing its operational nuclear fleet. These measures are intended to sustain existing levels of output and ensure energy security. The inaugural Nuclear Energy Summit took place in Brussels on March 21-22, 2024, jointly coordinated by the IAEA and **Belgium**. Global leaders convened to reassert their dedication to nuclear energy as a means of mitigating carbon emissions and achieving developmental objectives.

In Africa, **Kenya** is to commence the construction of its first nuclear power station in 2027, as it seeks to broaden its energy production in response to increasing demand and achieving zero-carbon emissions. As per Edward Mayaka, the Director for Partnerships and Public Awareness at the Nuclear Regulatory Authority, the country is poised to fully embrace nuclear applications as it prepares for the establishment of its inaugural nuclear power plant by the year 2035.

Nuclear Security

Prachi Lokhande

Previous Trend: Neutral



Over the past two years, the nuclear security condition of the Zaporizhzhia Nuclear Power Plant remains a focal point of scrutiny and concern. Evaluations have highlighted vulnerabilities in its security apparatus, ranging from breaches in perimeter defenses to inadequate protocols for handling potential threats. IAEA reports indicate instances of unauthorized access and lapses in personnel training, raising alarms about the overall readiness to respond to security incidents effectively. In his statement to the UNSC, IAEA DG called the nuclear safety and security situation at the ZNPP extremely fragile as the plant's six reactors have been shut down since mid-2022. In the latest IAEA DG statement on the situation in Ukraine, the power plant lost connection to its last remaining main power line amidst reports of widespread military action in Ukraine. This has highlighted the dangers present to the nuclear security of the power plant during the conflict.

China-US track II dialogue on nuclear security concluded its first in-person meeting in February 2024. Since its establishment in 2018, the China-U.S. Track II Dialogue on Nuclear Security has consistently served as a vital platform for facilitating the exchange of insights, fostering relationships, and cultivating a unified vision for enhancing nuclear security cooperation between the two nations.

In a recent development, Sri Lanka signed a security pact with the US to prevent illicit maritime trafficking in nuclear and radioactive material. Th MoU was signed between the Sri Lankan Navy and the US National Nuclear Security Administration on the 28th of February, 2024. On February 19, 2024, the European Council adopted a decision to allocate €7.2 million over a 36-month period to support the IAEA in the realm of nuclear security. This funding is earmarked for three specific objectives. It aims to enhance the capacity of IAEA Member States in fortifying their nuclear security frameworks, provide substantial nuclear

security assistance to Ukraine, and promote gender equality by bolstering the participation of women in careers related to nuclear security.

Kazakhstan and Australia are set to co-host the prestigious International Conference on Nuclear Safety (ICONS-2024) in Vienna from May 20 to 24, under the auspices of the IAEA. This highly anticipated event promises to be a cornerstone gathering in Vienna, attracting a distinguished assembly of heads of foreign services, relevant ministries, and over 2,000 nuclear security experts representing 178 IAEA member states. ICONS-2024 serves as a crucial platform for fostering dialogue, sharing insights, and advancing collaborative efforts towards ensuring global nuclear safety and security.

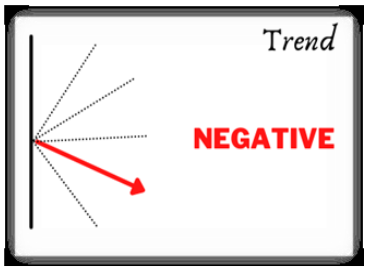
The IAEA completed its inaugural advisory service mission to Costa Rica in March, evaluating the country's nuclear security regime regarding material out of regulatory control (MORC). While acknowledging existing measures, the team encouraged Costa Rica to enhance national coordination for MORC-related security measures.

Indian security agencies intercepted a Pakistan-bound ship from China at Mumbai's Nhava Sheva port, suspected to be carrying a 'dual-use consignment' for Islamabad's nuclear and ballistic missile programme. The consignment included a CNC machine by an Italian company, inspected by customs officials and DRDO. This highlight concerns of Pakistan using China as a conduit for restricted items. The DRDO certified that the CNC machine could be used in manufacturing critical parts for Pakistan's missile development programme. The consignment, weighing 22,180 kilograms, was shipped by Taiyuan Mining Import and Export Co Ltd and was meant for Cosmos Engineering in Pakistan. The consignment was seized under the prevention of possible proliferation by Pakistan and China.

Nuclear Arms Control

Manpreet Sethi

Previous Trend: Negative



The Chinese foreign ministry's arms control department said earlier in Feb 2024 that states with the largest nuclear arsenals should negotiate a treaty on no-first-use of nuclear weapons against each other or make a political statement in this regard. Director general of the department, Sun Xiaobo, called on nuclear states to fulfil their "special and priority responsibilities" at the Conference on Disarmament. Sun said the body should define a roadmap or timetable for an international legal instrument that would protect non-nuclear-weapon states from the threat of nuclear weapons.

In response to the **US** expression of willingness to engage in bilateral arms control discussions with Russia and China without preconditions on March 18, 2024, Russia said that it would only discuss nuclear arms control with the United States as part of a broader debate and cautioned Washington that its use of commercial satellite companies to spy made such objects legitimate targets. "We are being offered to conduct dialogue exclusively on the terms of the United States and only on those issues which interest Washington," **Russian** Foreign Ministry spokeswoman Maria Zakharova said when asked about Thomas-Greenfield's remarks. "We are ready to discuss security and stability issues only in a single package, with an emphasis on those aspects that directly affect the security interests of our country." President Putin has refused strategic talks with Washington without a broader discussion of Russia's security, shorthand for Moscow's concerns about NATO enlargement and Western support for Ukraine. With **China**, meanwhile, though the United States does not expect formal nuclear arms-control negotiations anytime soon, but it does want to see a start of discussions on practical risk-reduction measures, especially with key Chinese decision makers or influencers on the country's nuclear posture.

It was reported on 19 March 2024 that the **US and Japan** are sponsoring a UN security council resolution calling on all nations not to deploy or develop nuclear weapons in space. US ambassador Linda Thomas-Greenfield told a UN security council meeting that "any placement of nuclear weapons into orbit around the Earth would be unprecedented, dangerous, and unacceptable." The announcement followed a confirmation from the White House in Feb 2024 that Russia has obtained a "troubling" anti-satellite weapon capability, although such a weapon is not operational yet. Russian President Vladimir Putin however has denied that Moscow had any intention of deploying nuclear weapons in space, claiming that the country has only developed space capabilities similar to those of the US.

Disclaimer: The views and opinions expressed in this document are those of the authors and do not necessarily reflect the position of the Centre for Air Power Studies [CAPS].

Centre for Air Power Studies (CAPS) was established in 2001 as an autonomous defence research and analysis body for research and focused analyses on issues related to national security, defence, and aerospace issues in the evolving strategic and international security environment. Its objective is to facilitate a greater understanding of these issues amongst the Armed Forces, the strategic community, and the public besides contributing to policy generation and decision-making.

CAPS research faculty comprises senior retired and serving Armed Forces officers from the three services besides academic scholars from national universities and retired members from the diplomatic community. CAPS also conducts nuclear strategy capsules for the Armed Forces and officers of security and technological organisations.