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#### India’s private sector is key to their space programme.

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India’s finance minister Nirmala Sitharaman announced last week that India’s private sector will play a key role in augmenting India’s space programme, and that the government intends to share the facilities of the Indian Space Research Organisation (ISRO) with the private sector. This announcement was part of the Narendra Modi government’s call for new and bold reforms in an effort to promote its ‘self-reliant India’ mission. It is the fourth segment of the Rs 20 lakh crore Aatma Nirbhar Bharat Abhiyan special economic stimulus. Sitharaman’s announcement entails a role for the private sector, possibly with the goal of greater investments in technology development and acquisition, capacity-building and space exploration, including planetary exploration. The minister, while announcing these reforms, appeared to understand that the private sector can help augment India’s space capability. While praising the work done by ISRO, she also pointed out that the private sector is also doing a lot of work in developing space technology. She also acknowledged that the existing regulations prevent private entities from using or even testing their products. Therefore, to level the playing field, the government “will make a provision for the private sector to benefit from the assets which are available to ISRO and for India (in general) to benefit from.” The minister also said the new reforms would allow the private sector to play an active role in “satellites, launches and space-based services”. But as always, implementation is key. Properly executing these reforms will require enabling policies and appropriate regulatory frameworks. That the new reforms will allow private sector players to use ISRO facilities is a big deal. This indeed must be music to the ears of commercial players who have been seeking to get a fair share of the pie in terms of manufacturing of satellites and propellant technologies, among other areas. It should not be too difficult for India’s private space sector because there is a sizeable talent pool available outside ISRO. More importantly, the entry of the private sector, as in the telecom sector, can bring several advantages in terms of cost and access. Following the announcement, ISRO tweeted that it will follow the government’s guidelines to allow the private sector to undertake space activities in the country. Though this did not seem particularly welcoming of the government’s initiative, ISRO’s support is critical to making it a success. ISRO has in the last few years been opening up to the Indian private space sector in a gradual manner – mostly as a matter of compulsion because ISRO simply does not have the in-house capacity to address India’s growing requirements. Today, the Indian space programme is not just about civilian applications for remote-sensing, meteorology and communication, as in the early decades. India’s space sector and its requirements have grown enormously in the last decade to include television and broadband services, space science and exploration, space-based navigation and, of course, defence and security applications. Among others, Ambassador Rakesh Sood has articulated the need for legislation to facilitate ISRO’s partnership with industries and entrepreneurs. Narayan Prasad and Prateep Basu, two prominent faces in the Indian space start-up segment, have argued that despite ISRO’s successes, “India’s space competitiveness has suffered from the absence of a globally reputed, private space industry.” The private sector, especially the NewSpace industry and start-ups, have an advantage in terms of low-cost operations, which itself should be a big incentive for the government to make it an active stakeholder. A certain amount of democratisation of space technology with the participation of the private sector can ensure costs are kept low. And expanding the number of stakeholders will also ensure more transparency and better accountability and regulatory practices. This has been missing in India’s space sector. The same agency has undertaken promotion, commercialisation and regulatory functions – which is not healthy.

#### India’s Space program is key to primacy and winning the space race against China.

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The regional rivalry between India and China has long simmered, and the next frontier increasingly appears to be space. Although officials on both sides of the border have denied the existence of a space race between the two nations, this claim is increasingly dubious. Recent events present the first counter: in response to China’s 2007 anti-satellite test, the ISRO formed the Integrated Space Cell to manage its future military space assets, and pledged to develop ground-based anti-satellite weapons. Days after China announced it would send a human into orbit in 2003, then- Prime Minister of India Atal Vajpayee publicly urged his nation’s scientists to land a man on the moon. It is also in this intensified climate that India’s space budget has increased by double-digit percentages. Economic rationale provides another reason to believe a competition is afoot. China has offered its global satellite-navigation services to countries participating in its One Belt, One Road (OBOR) infrastructure plan; India, which has been skeptical about OBOR, is developing a satellite system which could compete with the Chinese offerings. And as a greater number of private companies seek entry into space-related operations, the two nations will be vying against each other to attract the same paying customers. Both sides increasingly are adopting rhetoric tied to a space race. Wu Yanhua, vice administrator of the China National Space Administration (CNSA), in the first half of 2016 stated his organization aimed “to rank among the world’s top three (alongside the U.S. and Russia) by around 2030”. Evident within this statement is a competition in which India falls short of China’s achievements. More explicitly, the Global Times – a nationalist and populist outlet for the Communist Party of China (CCP) – in February described a successful Indian satellite launch with the title, “India’s satellite launch ramps up space race.” The article then describes Sino-Indian competition in both military and commercial spheres. India, meanwhile, has been heralding space achievements in such a manner that the subcontinent’s press, believing the Indian mission to Mars was meant to show China it was a worthy rival, reacted with forthright nationalism in the event’s wake. The government’s decision to use the Mars orbiter as the new design for the 2,000 rupee note lends further support to patriotic conceptions of a space competition between the Asian neighbors. Whether or not either nation’s top leadership declares a space race, the tit-for-tat timing of space-related developments, economic competition, and the rhetoric present at other levels of government and society indicate a race is indeed occurring. From a fundamental ‘hard power’ perspective, the appeal of outer space is clear. Satellites are crucial to modern day capabilities in the realm referred to as ‘C4ISR’ – command, control, communications, computers, intelligence, surveillance, and reconnaissance. And while there are currently international prohibitions on the deployment of nuclear weapons, conventional weapons do not yet have these limits, although there is a precedent against deploying them to space. Indeed, the theories of deterrence that have long applied to terrestrial combat are now inextricably linked in a complex web with space, nuclear weapons, and conventional weapons. The value of crossover technologies is another important reality for China and India. Experts estimate that upwards of 90% of technologies developed during a space program have applications elsewhere. These cross-applications of the research and development fueling the space race is a means by which nations can improve domestic quality of life, produce technologies more suited to compete in a global environment, sharpen military capabilities, and improve domestic innovation.

#### India Primacy key to US efforts to counter China Rise – turns case

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The Trump administration declassified its strategy to ensure continued dominance over China, which focuses on accelerating India’s rise as a counterweight to Beijing and the ability to defend Taiwan against an attack. National Security Advisor Robert O’Brien on Tuesday announced the publication of the document, titled “United States Strategic Framework for the Indo-Pacific.” Approved by President Donald Trump in February 2018, it provided the “overarching strategic guidance” for U.S. actions the past three years and was released to show the U.S. commitment to “keeping the Indo-Pacific region free and open long into the future,” O’Brien said in a statement. “Beijing is increasingly pressuring Indo-Pacific nations to subordinate their freedom and sovereignty to a ‘common destiny’ envisioned by the Chinese Communist Party,” O’Brien said in an expanded statement. “The U.S. approach is different. We seek to ensure that our allies and partners – all who share the values and aspirations of a free and open Indo-Pacific -- can preserve and protect their sovereignty.” The document lays out a vision for the region in which North Korea no longer poses a threat, India is predominant in South Asia and the U.S. works with partners around the world to resist Chinese activities to undermine sovereignty through coercion. It assumed that China will take “increasingly assertive” steps to compel unification with Taiwan and warns that its dominance of cutting-edge technologies like artificial intelligence will “pose profound challenges to free societies.” While the timing of the release just a week before President-elect Joe Biden takes office raises questions about the motive, the Trump administration’s actions to counter China in Asia have largely enjoyed bipartisan support. Incoming Biden officials have talked about the need to work more with allies and partners against China, which also forms a key part of the strategy -- particularly in strengthening security ties with Australia, Japan and India. Rory Medcalf, a professor and head of the National Security College at the Australian National University, said that the document shows U.S. policy in Asia was driven by efforts to “bolster allies and counter China.” But he noted that the strategy was so ambitious that “failure was almost assured” on issues such as disarming North Korea, sustaining “primacy” in the region and finding international consensus against harmful Chinese economic practices. “The declassified framework will have enduring value as the beginning of a whole-of-government blueprint for handling strategic rivalry with China,” Medcalf wrote in a post for the Australian Strategic Policy Institute research group. “If the U.S. is serious about that long-term contest, it will not be able to choose between getting its house in order domestically and projecting power in the Indo-Pacific. It will need to do both at once.”

#### China leadership causes prolif --- empirics prove transition wars.

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**China’s appetite for prolif**eration **remained undiminished** **even after it acceded to the NPT**. In 1995, it allegedly sold Pakistan 5,000 ring magnets needed for high-speed gas centrifuges, while a U.S. intelligence report in 1997 held that “China was the single most important supplier of equipment and technology for weapons of mass destruction” in the world. China’s civil nuclear trade commitments with Pakistan have gained considerable momentum since Pakistan’s nuclear tests in May 1998. The China-Pakistan Power Plant Corporation’s Chashma-1 and Chashma-2 power reactors, which were under item-specific IAEA safeguards, were held not to be in violation of NSG guidelines as they were pre-existing commitments and thus “grandfathered” in at the time of China’s induction into the NSG in 2004. However, China then entered into agreements in 2009 for the construction of two new 340 MW power plants (Chashma-3 and Chashma-4). There have since been reports of undertakings for the construction of additional plants in Chashma and Karachi. Some in Pakistan have argued that these commitments date back to a 1986 agreement with China on cooperation in construction and operation of nuclear reactors for an initial period of 30 years, and thus not in violation of NSG guidelines. This spurious argument, if accepted, implies that China can continue to commit to any number of additional nuclear projects in Pakistan without any repercussions. It is another matter that the actual text of the so-called 1986 agreement remains unreleased and shrouded in mystery, thereby preventing the international community from validating Chinese and Pakistani representations. China has demonstrated remarkable consistency over four decades in acting in ways that undermine with impunity the global non-proliferation regime. Its nuclear deals with Pakistan – both military and civilian – were conceived and executed in secrecy. The recent news articles now confirm that China remains committed to a long-term nuclear relationship with Pakistan under its own terms. This is a pattern of behavior that is **unlikely to change without the application of sustained international pressure to bring China into compliance with the commitments it has undertaken**.\

## Astriod mining Da

**India is mining asteroids now.**

**NDTV 16**. [New Organization based in India] “Mining In Space Can Be India’s Next Milestone, Suggest Scientists.” *NDTV*, 28 July 2016, <https://www.ndtv.com/india-news/mining-in-space-can-be-indias-next-milestone-suggests-scientists-1437519>. [GHS-AA]

To become self-sufficient in minerals, India must start mining in the asteroid belt, scientists said in Kolkata today. "Earth's resources are finite and there is a shortage of minerals. The next best opportunity is to trap resources lying in the objects near the earth," eminent nuclear scientist Anil Kakodkar told reporters in Kolkata. He said besides we can take steps to tap some asteroids in the outer space for mining. Even the moon is rich in minerals, said Kakodkar, Chairman of Technology Information, Forecasting and Assessment Council (TIFAC). TIFAC Executive Director Prabhat Ranjan said the potential exploitation of moon and asteroids as a mineral resource can be a big game-changer. He said a US-based private company is already planning to send the first commercial space mission to exploit such resources. "In the next 10 to 15 years, we expect that outer space would be exploited for mineral wealth and India should not lag behind," Mr Ranjan said on the sidelines of a function of the Central Glass and Ceramic Research Institute here. He said according to a NASA estimate, the amount of mineral wealth in the asteroid belt would be equivalent to USD 100 billion. Dr Srikumar Banerjee, former Director of Bhabha Atomic Research Centre (BARC), said the future lies in mineral wealth mining in the space.

Asteroid mining is key to preventing climate change

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Secondly, there’s the climate change fix. Suarez sees asteroid mining as the only way we’re going to build solar power satellites. Which, as you probably know, is a form of uninterrupted solar power collection that is theoretically more effective, inch for inch, than any solar panels on Earth at high noon, but operating 24/7. (In space, basically, it’s always double high noon). The power collected is beamed back to large receptors on Earth with large, low-power microwaves, which researchers think will be harmless enough to let humans and animals pass through the beam. A space solar power array like the one China is said to be working on could reliably supply 2,000 gigawatts — or over 1,000 times more power than the largest solar farm currently in existence. “We're looking at a 20-year window to completely replace human civilization's power infrastructure,” Suarez told me, citing the report of the Intergovernmental Panel on Climate Change on the coming catastrophe. Solar satellite technology “has existed since the 1970s. What we were missing is millions of tons of construction materials in orbit. Asteroid mining can place it there.” The Earth-centric early 21st century can’t really wrap its brain around this, but the idea is not to bring all that building material and precious metals down into our gravity well. Far better to create a whole new commodities exchange in space. You mine the useful stuff of asteroids both near to Earth and far, thousands of them taking less energy to reach than the moon. That’s something else we’re still grasping, how relatively easy it is to ship stuff in zero-G environments.