



Space Alert

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CONTENTS

COMMENTARIES

A new French Space Command

By Dr Xavier Pasco

On a hot 25 July this year, the French Ministry of the Armed forces, Mrs. Florence Parly, announced a new national “Space Defense Strategy” and the creation of a new French Space Command starting from 1st September 2019. Beyond the announcement itself, this speech has touched upon a series of issues supporting the move that clearly made this official speech unprecedented in the French military space history.

Japan-India in Space?

By Kazuto Suzuki

Japan and India face similar challenges in space. On the civilian side of space, China has successfully landed rover on the “other side” of the moon, for the first time in the history of humankind. Although China was the growing force in civilian activities, most of what China did was to catch up the technological achievements, which are already accomplished by either United States or Russia.

Space Force vs Space Command: A Primer

By Victoria Samson

With U.S. President Donald Trump’s call in June 2018 to create a United States Space Force and the

re-establishment in August 2019 of U.S. Space Command, non-space observers often either confuse the two or use the two names interchangeably. They are in actuality two separate entities that have different missions and goals.

FROM THE MEDIA

- Chandrayaan 2: NASA fails to locate Vikram lander due to 'long shadows' over landing site
- China launches three new satellites
- India, Japan to collaborate on outer space and cyber security projects
- ISRO plans to source 5 PSLV rockets from domestic firms
- Hubble telescope spies water raining on distant world
- SpaceX’s first rocket built for humans test-fired in Texas
- Russian spacecraft carrying robot docks with space station: TASS

OPINIONS AND ANALYSES

NEW PUBLICATIONS

EDITORIAL BOARD

Editor: Dr. Rajeswari Pillai Rajagopalan

Associate Editor: Pulkit Mohan

Commentaries

A new French Space Command

Dr Xavier Pasco

On a hot 25 July this year, the French Ministry of the Armed forces, Mrs. Florence Parly, announced a new national “Space Defense Strategy” and the creation of a new French Space Command starting from 1st September 2019. Beyond the announcement itself, this speech has touched upon a series of issues supporting the move that clearly made this official speech unprecedented in the French military space history. Most of the media has realized this and what looked like a small revolution in the eyes of many, not only abroad but also in France, has been widely reported. Of course, from a public opinion perspective and for the large audience, the matter has appeared particularly sensitive also because it was taking place in the context of the year-long U.S. debate about a “Space Force”. For the non-specialist, with this political announcement, France would then supposedly embrace the Trump administration’s stance, and would even act more quickly by creating its own “Space Force” after the summer. As we will see, if only from an institutional perspective, nothing may be more different from what has actually been decided. More generally, to an experienced observer, the announcement and associated developments could hardly be considered a surprise.

The roots of the decision

Before coming to some of the specific points highlighted in the speech in July, it is advisable to go back a little to better understand the evolution of the French thinking about military space. Indeed, this new “[Space Defense Strategy](#)” has come a long way. More than ten years ago, space was officially hailed (for the

first time) as a key element of the national military posture. The “Defense and Security White Book” published in 2008 was the first official document emanating from any French government which underlined the importance of military space and put it at the center of a newly created “strategic function” entitled “Knowledge and anticipation”. The creation of this new function itself resulted from an analysis of the new challenges and key emerging threats for international and homeland security since 2001. Until then, space had traditionally addressed high-level strategic needs defined during the cold-war years, mostly for ensuring intelligence and monitoring and notably in support of the nuclear deterrence policy adopted decades ago during the Gaullist era. Satellites have always been considered mostly as intelligence tools reserved for high-level users, and representing a crucial asset in strategic decision-making processes dealing with strategic issues. While still true, other considerations have been taken into account in bringing about these new changes. Moreover, given the evolution of the geostrategic landscape in the 2000s, strategic intelligence has not remained the sole objective assigned to military space system. In 2008, the [new White book](#) made it a priority to adapt the national military apparatus to the new threats and it quickly appeared that space capabilities would represent invaluable assets by being tailored and reorganized to deal precisely with those new threats.

The first creation of a Joint Space Command in 2010

This move has materialized at the time through the creation of a “Joint Space Command”, a rather modestly staffed structure but highly positioned in the institution and soon to become a key step in helping space find its way in the new military thinking. The role of the JSC (CIE in French for *Commandement Interarmées de l’Espace*) was to harmonize widely spread

competences inside the Ministry (Mostly between the Military Directorate for Intelligence (DRM) that operates military Observation and ELINT satellites; the telecommunication Directorate (DIRISI) that operates the military telecommunication satellites and the Air Force Defense Operation Command (CDAOA) that takes care of space surveillance and monitoring) in order to make them more responsive to real military use on the ground, mostly for supporting external operations.

Quickly, this new organization would be put at test with the first external operation undertaken in Mali (Code-worded “Serval operation”) decided by the then French President François Hollande to help disrupt Islamist-Jihadist worrying moves detected in southern Mali and to push them back up North. Recognized as a military success characterized by swift use of rapid forces in high tempo mobile operations, Serval was also acknowledged as the first real-size operation having made such an extensive use of space systems. For example, the capability to rapidly map largely unknown territories, to detect and identify elusive enemies, or to better assess targeting opportunities and damages have largely convinced the French military establishment of the key role played by space assets in modern war operations.

Very clearly, on-going external military operations conducted without any interruption by France since Serval have only confirmed this fact. And for a few years already, the growing dependency of France on its space systems has been considered as an undisputed fact by most specialists and observers. From then on, satellites would not only be used to ensure political autonomy at strategic levels, but it would also be used for conducting real military operations. For France, this was rather new. The feeling of this growing “military dependency” partly led to the project of

consolidating what had been started in 2010 with the project of a reinforced “Space Command” that would enjoy a more operational “weight” in the system over time.

The new Space Command seen as a reinforcement of the military role of space

This partly explains the decision made by President Emmanuel Macron in 2018 to ask for a new “Space Defense Strategy”, giving the start to a largely revamped posture in space leading to the creation of this new organization. First, this New Space Command will transition from a mere 30 officer-“Joint Space Command” to a more than 200-uniformed military-organization, before gaining more personnel over time, possibly up to several hundreds. The need for an operation driven “Command” also explains why it will be located under the auspices of the French Air Force (that shall be renamed “Air and Space Force”). This is certainly where the conception of this new French Space Command radically differs from the U.S. Space Force concept, which is supposed to stand by itself as a brand new military service as and when it gets operational. The French move giving more weight to the Air Force in the space domain might well represent something many in the U.S. Air Force would not even dare to dream.

Another important element is linked to the relocation of most of the technical services of this Space Command in Toulouse, a city lying in the south-west of France where the main technical centers of the French space agency CNES is already located. This decision reflects the objective of giving the military a full operational control on the military satellites, with uniformed personnel actually operating them. This is also new in the French organization. Until then, CNES specialists were technically operating the French military satellites on behalf of the defense

establishment. This will change and this has motivated this relocation.

Beyond the organizational change itself, this is not anecdotic. It tells a lot about the new perceptions of the space environment by the ministry. The “Defense Space Strategy” underlines the necessity to prepare for deploying an “active defense” and thus for potential military actions in space. This means that, along with the perceived growing dependency mentioned earlier, new threats are also considered as a given fact, with the space landscape expected to become even fuzzier due to a growing number of objects, which means, for the military, a more hostile and possibly a more dangerous environment they have to prepare for. Hence, the rather “right-on-target” style of the ministry speech and the mention of technological developments in the field of SSA and some directed-energy systems, namely lasers, possibly installed on satellites for “self-defense” (as characterized in the [speech](#)).

This coincidence of the increased French military dependency on space and the perception of a more hostile environment must be seen as one of the key reasons behind this reorganization. Let us just hope that the current difficult international discussions for more collective security in space will finally succeed and help possibly conceive such military developments as simply guard rails without any other consequence.

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(Back to Contents)

Japan-India in Space?

Kazuto Suzuki

Japan and India face similar challenges in space. On the civilian side of space, China has successfully landed rover on the “other side” of the moon, for the first time in the history of humankind. Although China was the growing force in civilian activities, most of what China did was to catch up with the technological achievements, already accomplished by either United States and/ or Russia. The landing on the “other side” of the moon was the first time that China has accomplished something no one has done before.

Also on the strategic side, the role of space is increasingly important for conducting modern warfare. Space provides vital services for military actions, especially C4ISR. Without space capabilities, you cannot see, hear or move in the battlefield. This is why China conducted ASAT test in 2007 for demonstrating its capability to take down space capability of its adversaries in case of military conflict. Such counterspace capability is the key element for national strategy, and for this reason, India has conducted similar ASAT test in March 2019 despite international condemnations.

Space Race Reactivated?

Such emergence of China as a space power has ignited a strong response from the United States. The Trump Administration has launched a new program called Artemis to land American astronauts (this time it will include female astronauts) by 2024 before Chinese taikonauts will land there. It sounds a lot like space race during 1960s, but the heat is not as high as it used to be. However, it is certain that the investment in the moon landing technology will be increased and given the short time frame to achieve its goal, NASA would have to rely on commercial actors to support its plan for Artemis program.

This implies that there will be much tougher competition in the private space sector. The US

companies have already launched a number of commercially developed satellites and provided services. So are the Chinese and European companies. Although there are several companies challenging in this domain, Japanese and Indian players are not yet at the center stage. The revitalized space race would fuel much active commercialization of space, and Japan and India will have to respond to it.

In this context, Indo-Japan cooperation would play an important role. In December 2017, JAXA and ISRO had signed the Implementing Agreement on lunar exploration. This agreement is designed to build lander and rover for the Moon mission. This program will have international significance because its aim is to explore the polar region of the Moon, where there is a high probability that water may be found. It will have not only the scientific value but also commercial and strategic significance for further exploration on the Moon and to Mars, because water can be used both for human exploration and for rocket fuel to launch from the Moon. If this programme finds water on the Moon for the first time in the human history, it will have a much bigger impact than simply the landing of astronauts by the United States or China, since there were already 12 astronauts landed on the Moon. Furthermore, Japan is interested in soft-landing capabilities and conducting exploration by robotic vehicle or rover because Japanese private company, Ispace, is developing a very lightweight rover (4kg) which is capable of searching water under the lunar surface. The joint program between Japan and India will certainly have strong impact on the commercial capabilities for the industries in both countries.

Japan-India Needs Strategic Dialogue

Although Japan does not appreciate the debris-creating kinetic ASAT (Anti-satellite) test conducted by DRDO (Defense Research and Development Organization) in March this year,

it recognizes the importance of developing resilience and mission assurance capabilities in space. In addition, there are threats of space debris hitting those satellites with high velocity, which would cause malfunctioning of these vital satellites. Thus, it is imperative to develop shared and interoperable capabilities in case of losing these space-based services. Cooperation between Japan and India would form an ideal partnership in terms of high level of technological capabilities and satellite positioning in orbits. The Japanese geostationary satellites are located on the latitude of East 110 degrees whereas Indian satellites are in East 70-80 degrees. Japan and India both operate regional navigation satellites, QZSS and IRNSS. These locations and compatible capabilities will contribute to secure continuation of missions if satellite capabilities are damaged in case of intentional or non-intentional attacks.

Although there are such potential areas for cooperation, the strategic dialogue between Japan and India has not been realized yet. Japan and India decided to start “2+2 (Ministers of Foreign Affairs and Defense from both countries)” meeting at the Japan-India Summit in October 2018, but this has not happened for various reasons. Even in the strategic dialogue between Foreign Ministers, space has not been a priority issue. Part of the reasons of this low-key tone is the effect of ASAT test in March 2019, but also the lack of coordination between Japan-India-US space strategies. Although Japan and India are the part of “Quad” quasi alliance including Australia, the trilateral or quadrilateral coordination in space is yet to come. Nevertheless, given the strategic challenges that “Quad” states face vis-à-vis emergence of China as strategic player in space, a coordinated strategy is much-needed. This is why Japan-India cooperation for increase

resilience and mission assurance in space is badly needed.

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(Back to Contents)

Space Force vs Space Command: A Primer

Victoria Samson

With U.S. President Donald Trump’s call in June 2018 to create a United States Space Force, and the re-establishment in August 2019 of U.S. Space Command, non-space observers often either confuse the two or use the two names interchangeably. They are in actuality two separate entities that have different missions and goals.

What is the Space Force?

The Space Force is intended to be a reorganization of functions currently undertaken by the Air Force Space Command. The question is how will that look? What the Trump administration has called for – a sixth service in the U.S. armed forces that resides in a separate department within the Department of Defense– is not what Congress will authorize. Furthermore, the House of Representatives and the Senate both have differences in how they view a Space Force, which still require a compromise to be found. A service’s responsibility is to organize, train, and equip troops so that they would be prepared for a conflict. So a Space Force would essentially do that. Per Secretary of Defense [Mark Esper](#), “The creation of Space Force will allow us to develop a cadre of warriors who are appropriately organized, trained and equipped to deter aggression and, if necessary, to fight and win in space.” The Pentagon has been drawing up [plans](#) for what the Space Force might look like and currently believes that an [“initial Space Force staff”](#) would be able to be stood up 90 days after the new branch is formally established by Congress. Plans would

be for it to be comprised of 200 people at the beginning, but the Department of Defense projects that within the first five years of the Space Force’s existence, 15,000 service members would be transferred over to it – from the Air Force alone.

So what will formally establish a Space Force? Congress needs to include the authorizing language in the National Defense Authorization Act for Fiscal Year 2020 along with the separate appropriations funding. And in order for that to happen, the House and Senate must reconcile their different ideas of what the Space Force could look like. They most likely will be able to do this, as their draft ideas share some similarities. To begin, neither envisions this to be a separate department – they both plan on the Space Force being within the Department of the Air Force, similar to how the Marine Corps is a separate service within the Department of the Navy. CSIS’ Kaitlyn Johnson writes that “both envision the organization as a corps-like structure within the Department of the Air Force and a co-equal service to the U.S. Air Force,” although confusingly, the Senate’s version calls the new department the Space Force, while the House’s version calls it the [Space Corps](#). It is not certain whether in the final legislative language Congress will amend Title 10 of the U.S. Code in order to add a new armed service. This is necessary for it to do its own acquisitions, something that the Air Force wants to retain control of; otherwise, the Space Force will be competing for money against other non-space priorities like military space is at present. This legislation should move ahead this fall, although it may be held up by broader domestic political battles over issues like using Pentagon funding for Trump’s border wall.

What is Space Command?

Space Command had been shut down in 2002 as part of the U.S. response to the 9/11 attacks and shifting its focus on what was seen then as more pressing threats. Congress passed legislation re-establishing Space Command in [FY 2019](#), which was then stood up in August 2019. Now the 11th unified Combat Command, Space Command is intended to focus on

warfighting and identifying threats to U.S. space assets. Interestingly, [one change](#) from the earlier iteration of Space Command is that it is a geographic command now, with an area of responsibility starting at an altitude of 100 kilometres and going up from there. The last iteration of Space Command was a functional combat command; according to [Raymond](#), this new version was made a geographic combat command so “to solidify space as a warfighting domain and to allow us to have a clear, tighter partnership with the other geographic combatant commands and other combatant commands that we have to operate with.”

In the ceremony that launched Space Command, Trump [stated](#), “So just as we have recognized land, air, sea and cyber as vital warfighting domains, we will now treat space as an independent region overseen by a new unified, geographic combatant command.”

Speaking in Washington, DC, in September 2019, Space Command head AF Gen. John Raymond stated that the United States has pivoted in the past year and a half from acting that space was a benign domain to one where space is clearly a warfighting domain. With that statement, he echoes other US government speakers, who have become quite vocal about space being a warfighting domain – always with the caveat that no one wants war in space and thus their goal is to deter attacks on U.S. space assets. Raymond in fact noted that Space Command’s mission can be termed the 4 D’s: **d**eterrence, **d**efend U.S. space capabilities, **d**eliver warfighting capabilities globally, and **d**evelop a space warfighting cadre.

Space Command is in its early stages and the Space Force still doesn’t legally exist yet, so it does remain to be seen how the two organizations will interact. In theory, the Space Force will train and equip war fighters, who will then be turned over to Space

Command to manage military space operations and support terrestrial military operations in other theatres. It will be interesting to watch the evolution of both organizations and see if they meet their goals.

Victoria Samson is the Washington Office Director for Secure World Foundation and has twenty years of experience in military space and security issues.

[\(Back to Contents\)](#)

FROM THE MEDIA

Elon Musk Unveils SpaceX's New Starship Plans for Private Trips to the Moon, Mars and Beyond

Standing beneath a towering Starship Mk1, a prototype for SpaceX's massive reusable launch system, Musk laid out his plan for interplanetary travel at the company's South Texas test site here on Saturday (Sept. 28) — the 11th anniversary of the first successful orbital launch of SpaceX's first rocket, the Falcon 1.

Source: Space.com, September 29, 2019

China launches three new satellites

China sent a resource satellite and two small satellites into planned orbits from the Taiyuan Satellite Launch Center in north China's Shanxi Province on Thursday. The resource satellite, ZY-1 02D, is developed by the China Academy of Space Technology (CAST) and is an important part of China's space-based infrastructure.

Source: Xinhua, September 12, 2019

Air Force tries to set record straight on what the Space Force is really about

Air Force leaders are working to dispel what they believe are misconceptions about the future Space Force as they continue to press lawmakers to enact the new branch of the armed services.

Source: Space News, September 18, 2019

Chandrayaan 2: NASA fails to locate Vikram lander due to 'long shadows' over landing site

National Aeronautics and Space Administration's Lunar Reconnaissance Orbiter (LRO) has failed to spot Chandrayaan 2 Vikram lander, days after the lander lost

contact with Indian Space Research Organisation just before touching the Moon's surface. The Lunar Reconnaissance Orbiter camera instrument has sent pictures of the intended Moon touchdown site for the Vikram lander but shadows in the area could not capture the lander's exact position.

Source: Business Today, September 19, 2019

ISRO moves on, gears up to test semi-cryogenic engine in Ukraine

ISRO has put its disappointment over the not-so-successful moonlanding behind it and has begun to look forward — to the next missions. On the cards is a clutch of launches, starting from PSLV 47 later this month. But the next big milestone is the testing of the semi-cryogenic engine — in Ukraine.

Source: Hindu Business Line, September 19, 2019

Chandrayaan-2: How ISRO churns out low-cost missions

As the team of Indian Space Research Organisation (ISRO) scientists make efforts to communicate with the Chandrayaan-2 lander, Vikram, which lies on the lunar surface not very far from its actual landing site, there had been a lot of talk about the low costs of ISRO missions. The Chandrayaan-2 mission cost around Rs978 crore, which includes Rs603 crore for the orbiter, lander, rover, navigation and ground support network and Rs375 crore for the heavy GSLV rocket with indigenous cryogenic engine. This year, during the 2019-20 budget session, Finance Minister Nirmala Sitharaman allocated Rs12,473.26 crore to the department of space. This allocation includes the budget for Gaganyaan, India's maiden human space flight project.

Source: The Week, September 14, 2019

KU Engineering launches new satellite design and development lab

A new laboratory opening this fall at the University Of Kansas School Of Engineering will provide a state-of-the-art environment for aerospace engineering students to design and build launch-worthy satellites.

Source: [University of Kansas](#), September 13, 2019

Hubble telescope spies water raining on distant world

Astronomers have spotted hints of water raining in the atmosphere of a planet beyond the Solar System. The discovery is a rare glimpse of water molecules around a distant world that is not much bigger than Earth. Named K2-18 b, the planet is 34 parsecs (110 light-years) from Earth in the constellation Leo.

Source: [Nature](#), September 11, 2019

Astronomers Find Water on an Exoplanet Twice the Size of Earth

Water vapor in the skies of the world K2-18 b may make it “the best candidate for habitability” presently known beyond our solar system. Two scientific teams have announced their independent discovery of water—the foundation of biology as we know it—in the atmosphere of a transiting planet dubbed K2-18 b.

Source: [Scientific American](#), September 11, 2019

India’s Chandrayaan 2 Loses Contact with Vikram Lunar Lander

After a six-week journey, the Indian Space Research Organization (ISRO) lost contact with Chandrayaan 2's Vikram lander shortly before it was supposed to have touched down

on the lunar surface. The Moon landing was set to occur on September 6th at 20:22 UT / 4:22 p.m. EDT. Vikram (Sanskrit for "valor") separated from the Chandrayaan 2 orbiter on September 2th at 7:45 UT for a four-day descent that would take it 62 miles (100 kilometers) down to the lunar surface.

Source: [Sky and Telescope](#), September 06, 2019

SpaceX’s first rocket built for humans test-fired in Texas

The Falcon 9 booster assigned to launch two NASA astronauts on an orbital test flight of SpaceX’s Crew Dragon capsule has been test-fired in Texas, but the schedule for the long-awaited mission remains unclear.

Source: [Space Flight Now](#), September 05, 2019

Chandrayaan 2 completes final de-orbital operations, all set for moon landing

“With this manoeuvre, the required orbit for the Vikram lander to commence its descent towards the surface of the moon is achieved. The lander is scheduled to a powered descent between 0100 - 0200 hours IST on September 07, 2019,” said a statement from the Indian Space Research Organisation (ISRO).

Source: [Hindustan Times](#), September 06, 2019

JAXA preparing to develop equipment for future 'Gateway' moon-orbiting space station

The Japan Aerospace Exploration Agency (JAXA) is gearing up to develop technology for use in the United States' future moon-orbiting "Gateway" space station, with the Japanese science ministry seeking development funds from next fiscal year's budget.

Source: [The Mainichi](#), September 03, 2019

Militarization of space is inevitable, Roscosmos head says

"It is moving in this direction slowly but surely. No one in Roscosmos has any illusions about this," Rogozin wrote on his official Twitter account, commenting on recent remarks by US President Donald Trump that space is the area of future confrontation.

Source: [Russian News Agency](#), August 30, 2019

Russian spacecraft carrying robot docks with space station: TASS

A Russian Soyuz spacecraft carrying a humanoid robot docked with the International Space Station (ISS) on Tuesday, TASS news agency reported, citing a live broadcast.

Source: [Reuters](#), August 27, 2019

ISRO plans to source 5 PSLV rockets from domestic firms

Targeting to realise 12 Polar Satellite Launch Vehicles (PSLV) per year from the domestic private sector, Indian space agency ISRO's commercial arm NewSpace India Ltd has issued an Expression of Interest (EoI) for first manufacturing five of these rockets.

Source: [Times Now](#), August 18, 2019

NASA confirms ocean moon mission

Scientists working on an audacious mission to the ocean world of Europa can proceed with the final design and construction of the spacecraft, NASA says. The Europa Clipper mission will target the ice-encrusted moon of Jupiter, which is considered a prime target in the search for life beyond Earth.

Source: [BBC](#), August 20, 2019

China's lunar rover travels 271 meters on moon's far side

China's lunar rover Yutu-2 has driven 271 meters on the far side of the moon to conduct scientific exploration on the virgin territory. Both the lander and the rover of the Chang'e-4 probe switched to its dormant mode for the lunar night on Wednesday (Beijing time), according to the Lunar Exploration and Space Program Center of the China National Space Administration.

Source: [Xinhua](#), August 08, 2019

India, Japan to collaborate on outer space and cyber security projects

India and Japan have decided to collaborate in the areas of cybersecurity and outer space as part of their growing security partnership in the Indo-Pacific region, a development that comes in the backdrop of increasing violation of social media platforms by extremists and India's successful Anti-Satellite Weapons (ASAT) test.

Source: [Economic Times](#), July 2, 2019

Chandrayaan-2: Is this India's path to a space station or a race with China?

The Chandrayaan-2 mission, if successful, will make India the fourth country to soft-land a probe on the moon and the first to reach the satellite's South Polar Region. On July 22, when the mission blasted off, was two days after the 50th anniversary of man's first step on the moon.

Source: [The Telegraph](#), July 15, 2019

ISRO's commercial arm launched 239 satellites in last 3 years, earned ₹6,289 crore: Govt

A total of 239 satellites were launched by ISRO's commercial arm Antrix Corporation in the last three years, garnering revenue of ₹6,289 crore, the government informed Parliament on Wednesday.

Source: [The Hindu](#), July 24, 2019

ISRO to build 2nd dedicated satellite for Navy to interlink warships, aircraft

The Navy will get its second dedicated communication-cum-surveillance satellite by 2022 to keep tabs on the critical Indian Ocean Region and network all its warships, submarines and aircraft with operational centres ashore.

Source: [Times of India](#), July 21, 2019

[\(Back to Contents\)](#)

OPINIONS AND ANALYSES

Shankar Raj, "[ISRO's passionate planetary pursuit](#)" *Free Press Journal*, August 15, 2019

Miriam Kramer "[The Hubble Constant Conflict](#)" *Axios*, August 13, 2019

Oliver Haill, "[Space is the place... for capitalism](#)" *Proactive*, September 17, 2019

Theresa Hitchens, "[Declassify Space Threats, US Capabilities For Stronger Deterrence:](#)

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M. Somasekhar, “[Chandrayaan 2: A story of many hits and a miss](#)” *Hindu Business Line*, September 11, 2019

Kalpit Makikar, “[Sky is not the limit in Asia: How China and India are shaping space diplomacy](#)” *The Observer Research Foundation*, September 12, 2019

Kanchan Gupta, “[#Chandrayaan2: India joins the big space race](#)” *The Observer Research Foundation*, July 22, 2019

Rakesh Sood, “[Expanding India’s share in global space economy](#)” *The Observer Research Foundation*, July 04, 2019

Sudip Bhattacharyya et al., “[Will the Chandrayaan-2 moon landing be India’s biggest scientific achievement?](#)” *The Print*, September 06, 2019

Rajeswari Rajagopalan “[Chandrayaan 2 Moon Landing: The sign of a mature space mission](#)” *Hindustan Times*, September 06, 2019

Rajeswari Rajagopalan “[China extends terrestrial rivalries into orbit with new space race](#)” *Nikkei Asian Review*, August 23, 2019

Rajeswari Rajagopalan, “[India's strategy in space is changing. Here's why](#)” *Eurasia Future*, August 14, 2019

Rajeswari Rajagopalan, “[The ISRO isn’t enough. India needs its own Elon Musk or Jeff Bezos](#)” *Quartz India*, July 19, 2019

“[No country is sending weapons into orbit now, but ‘militarization of space is only matter of time’](#)” *RT*, July 05, 2019

Ajey Lele “[Space Activities Bill: India’s great galactic leap](#)” *Financial Express*, July 02, 2019

Gerard Brachet “[Aggression in outer space – time for action](#)” *Room*, July 2019

Rajeswari Rajagopalan, “[Chandrayaan 2: How Does ISRO'S 978 Crore Moon Mission Fit into India’s Global Space Ambitions?](#)” *First Post*, July 23, 2019

[\(Back to Contents\)](#)

NEW PUBLICATIONS

REPORTS/STATEMENTS/MULTIMEDIA

[Joint Statement](#) on Cooperation in Lunar Exploration between Japan Aerospace Exploration Agency (JAXA) and NASA, September 24, 2019.

[Joint statement](#) of intent between the Australian Space Agency and the National Aeronautics and Space Administration (NASA) on Expanding Cooperation in Space Exploration, September 21, 2019.

NASA Multilateral Coordination Board [Joint Statement](#), August 28, 2019.

[Joint statement](#) of intent on space exploration and research between UK Space Agency and NASA, July 16, 2019.

Global Space Industry Outlook Report 2019-2025: Satellite Manufacturing, Launch Services, Downstream, Ground Stations and Satellite Networks, Value Chain, [PR Newswire](#), September 06, 2019.

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Biswanath Gupta and Ekta Rathore, “United Nations General Assembly Resolutions in the Formation of the Outer Space Treaty of 1967” *Astropolitics*, Vol.17, Issue 2, July 02, 2019

Naman Khatwani, “Common Heritage of Mankind for Outer Space” *Astropolitics*, Vol.17, Issue 2, July 25, 2019

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Narayan Prasad Nagendra, “Indo-Brazil Remote Sensing Agreement: Policy Perspectives and Implications for India” *Space Policy*, August 2019

Zaeem Shabbir et al., “Space Technology Applications for Maritime Intelligence, Surveillance, and Reconnaissance” *Astropolitics*, Vol.17, Issue 2, July 05, 2019

Aleksander M. Lubojemski, “Satellites and the Security Dilemma” *Astropolitics*, Vol.17, Issue 2, July 12, 2019

Eytan Tepper, “Structuring the Discourse on the Exploitation of Space Resources: Between Economic and Legal Commons” *Space Policy*, August 2019

Mohammad Sadegh Mahjoom et al., “Barriers to the Commercialization of Civilian Space Technology in Iran” *Space Policy*, August 2019

CHAPTERS/BOOKS/MONOGRAPHS/OCCASIONAL PAPERS

Rakesh Sood, *An Indian space law: Long overdue* (Observer Research Foundation, August 29, 2019)

Sergio Marchisio, *The final frontier: Prospects for arms control in outer space* (European Leadership Network: July 2019)

[\(Back to Contents\)](#)