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Why National Space Policy Matters

Brian Weeden

National space policy is an increasingly popular topic, yet one that can still be mysterious even within the space world. The term "policy" in the space world often gets defined as "everything that's not engineering or law," but public policy is actually a well-defined field in and of itself. This short article provides an overview of the importance of public policy and space, the value formal and declared space policy can have, and why the increasing number of countries establishing national space policy is an overall positive trend for the world.

To understand why space policy is important, we must first understand why public policy itself matters. In the context of government, public policy can be broadly defined as why, how, and to what effect governments pursue particular courses of action or inaction in dealing with important issues. Public policy decisions often involve weighing the potential positive and negative impacts of multiple competing options.

The decision-making process is further complicated by the participation of many different interest groups and political actors who have competing perspectives in the decision-making process. And it can often be difficult to enumerate explicit costs and benefits of various policy options, which limits the ability to make a purely rational decision.

Public policy on space can be established through many different methods, several of which may be interacting at the same time. One way of establishing policy is through the international, bilateral, and multilateral treaties and agreements by which a country is bound. National policy can be established explicitly through formal decision-making processes such as intra-governmental committees or legislation, and may or may not be disclosed publicly. Policy can also be established implicitly through a choice to not pursue a particular path, and can be manifested through cultural or ideological contexts that impact decision-making and choices. In countries with a separation between executive and legislative powers, policy may not be consistent, and may even be contradictory.

Developing a formal national space policy can have several benefits. First, it can serve to define the rationale and objectives for why a country is conducting space activities, which could boost internal political support for funding and resources, and also provide a signal to other countries. Second, national space policy can also define the principles by which a country will conduct its space activities, which can reaffirm or demonstrate a country's adherence to international agreements and treaties.

Third, national space policy can be used to delineate roles, responsibilities, and coordination mechanisms between federal agencies and departments to implement a country's national obligations under international law, such as radiofrequency spectrum licensing. Fourth, national space policy can link space activities and programs to broader national policy goals, such as foreign policy, economic and trade policy, or science, technology and innovation (STI) policy.

The United States has the longest track record for creating declared public policy on space. The first U.S. national space policy was issued by the Eisenhower Administration in 1959,

and established many of the principles and positions that continue to influence U.S. space policy today. Most of the following presidential administrations have issued either their own national space policy, or policy directives on specific issues or sectors, such as anti-satellite weapons or commercial space. In most cases, the presidential policy decisions were made as the output of a months-long, formal interagency process between the various agencies and departments that have an interest in space.

Thus, the details of "presidential" space policy often reflect the interests and priorities of the bureaucracy more than the personal interests or policies of the president. Each presidential administration has also made their own adjustments to the process, with some opting to establish a separate decision-making body or process specific to space, and others choosing to use existing national security processes for space policy.

Over the last several years, many other countries have developed, or have begun developing, their own national space policy. This trend is useful, but also deserves some caution. One advantage of the spread of declared national space policy is that it helps bolster expertise and decision-making processes within countries on space issues. The increased capacity might help to lubricate multilateral discussions and debates on space by enabling more countries to participate and contribute in a substantive manner.

Another advantage is that the spread of national space policies could help boost national space programs and industries, which could in turn improve global space capabilities that could help solve broader global challenges. A third advantage is that declared national space policy, particularly on national security issues, could serve as a transparency and confidence-building measure that helps reduce tensions and the possibility of conflict on Earth extending into space.

The caution is against countries trying to mimic the way the United States does space policy in a manner that conflicts with their unique national character. While there are certainly some overlaps between the interests of many spacefaring countries, each country in the world has their own unique set of governance principles and mechanisms, cultural traditions and norms, and interests. Thus, establishing a process to develop national space policy that simply copies the way it is done in the United States, without accounting for the differences between countries, is likely to fail or produce a less-than-ideal result.

Similarly, countries should strive to develop policies that truly reflect their own national interests and needs, and have strong buy-in from all relevant national entities, than policies that repeat language or concepts used by other countries. The true value in developing a national space policy may raise more from the process by which it is created, and the experiences of those who participate in the process, than what exists on the paper at the end.

Dr. Brian Weeden is the Director of Program Planning for Secure World Foundation, and former U.S. military officer. He can be reached at bweeden@swfound.org

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Revitalising Europe-India Strategic Partnership: The Role of Space

Marco Aliberti

In November 2004, the European Union (EU) and India officially launched their Strategic Partnership. Despite initial enthusiasm, abundant affinities, and a genuine desire to interlink the sound economic relations with geopolitical considerations, over the past ten years the partnership has proved unable to match words with deeds, failing not only to develop a real strategic (i.e. security and defence-related) dimension, but also to receive sufficient political attention from both sides.

Largely absorbed by their own internal problems and immediate neighbourhoods, both the EU and India have dismissed the importance and potential of their political relations. While extensive policy dialogue and consultations at ministerial and expert level have been held on a variety of political issues, these have generally been "long on abstract political objectives, but short on specifics and deliverables". Trade and investments have remained the primary focus.

But, here too, the relation seems to have become hostage to the stalled negotiations on a Free Trade Agreement, despite the EU being India´s top trading partner. As a result, much cooperation potential has remained untapped.

At the latest EU-India Summit of 30 March 2016, the President of the European Commission, of the European Council and India's Prime Minister strongly committed to give new momentum to their bilateral ties endorsing a vision document to jointly guide and strengthen the India-EU Strategic Partnership in the period 2016-2020. But commitment alone will not suffice to achieve the full potential of this partnership.

Actionable policy measures and new cooperative efforts in key areas of mutual interests are imperative if the two parties are to re-energise their relations. Among the various playing fields that could be ripe for a new level of mutually beneficial cooperation, space figures as a very promising and effective one. To be sure, Europe already has a longstanding record of space cooperation with India through national space agencies like the French Centre National D'Études Spatiales (CNES), which is one of ISRO's most important partners, as well as international organisations like the European Space Agency (ESA) and the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT).

Additionally, the EU has already put an institutional framework in place regarding cooperation on space matters with India. Space technology was, in fact, listed among the sectors of dialogue and cooperation within the Joint Action Plan of 2005. This cooperation, however, did not eventually take-off because of the disappointing experience with the Galileo programme for global satellite navigation, from which India eventually withdrew due to the EU's internal struggles.

Today, following the 13th Summit of 2016 and the parallel adoption of the EU-India Agenda of Action 2020 as a common roadmap to jointly guide relations on a broad range of issues including space, there is new impetus to boost cooperation in the field and to integrate all European space competencies and experience within the political framework of EU-India relations.

While space is only one of the issue-areas where the EU and India have pledged to re-energise cooperation, it can nonetheless serve as a catalyst for achieving a plethora of shared policy objectives. Indeed, for each of the "sector policy cooperation" identified by the Agenda 2020 namely Climate Change, Urban Development, Research & Innovation, Information and Communication Technology, Energy, Environment, Transport, and the 2030 Sustainable Development Goals, it is evident that space assets and related applications can play significant role in achieving these objectives. Thanks to its unique transversal qualities, space provides a wide range of opportunities for closer EU-India cooperation.

For instance, in the field of urban development the EU and India could explore the potential contributions offered by space assets in the creation of "smart cities dashboard solutions" for enhancing the quality of urban planning and situational awareness through the integration of Earth Observation, Navigation and Telecommunications services. Interweaving space cooperation with that of urbanisation would not only provide innovative solutions to meet the policy objectives set for both fields, but also contribute to better partnering in the implementation of flagship initiatives being promoted by the Indian Government such as the 100 Smart City Mission and the ARMUT (Atal Mission for Rejuvenation and Urban Transformation) programme.

In addition, such cooperation would arguably have positive spill-over effects on other policy areas, opening-up valuable opportunities for cooperating on research and innovation and for creating business solutions as well as new start-up companies within such frameworks as the "Start-up Europe India Network" or the Horizon 2020-funded GNSS Asia programme.

More broadly, when considering the role of space in boosting India-Europe relations, an analogous line of reasoning could certainly apply to most of the issue-areas the EU and India have committed to working on together, including the recently launched EU-India Water Partnership, the Resource Efficiency Initiative or even global security issues like terrorism, piracy, climate change and natural disasters.

Indeed, while most of the cooperation between Europe and India would understandably focus on civilian ventures, it is important to acknowledge that space might also act as an enabler for the establishment of more tangible cooperation schemes in the field of security.

In their joint statement of 30 March 2016, the EU and India expressed their resolve to deepen security cooperation and work towards tangible outcomes with respect to counter-terrorism, counter-piracy, maritime security, non-proliferation and disarmament; all areas of increased interest to both actors and their respective space programmes.

The sharing of space-based information for security purposes could hence be an ideal instrument to contribute addressing these shared security objectives and further the scope of India-EU strategic partnership, especially in today's digital and data-centric world, where the flow and depth of available intelligence has become more crucial than ever.

By the same token, security of space could be well primed to become an area of fruitful policy dialogue and cooperation. Europe and India have expressed a number of shared views and concerns about the safety and stability of the space environment. Therefore adding an agenda item on space security in the

new EU-India Foreign Policy and Security Consultations would serve mutual benefits. Such policy dialogue would be particularly important considering the increasing relevance space assets have for both actors as well as the ongoing inclusion of security-related objectives within the realm of India's space policy.

Further, as the experience of the defunct Code of Conduct for Outer Space Activities clearly shows, proactive diplomatic engagement with like-minded partners is necessary for attaining consensus on norms regulating responsible space behaviour. Teaming up with India through bilateral level consultations and in multilateral fora like the United Nations Committee on Peaceful Uses of Outer Space could prove key to advancing new normative solutions on the international stage.

In conclusion, there appears to be much scope and opportunities to unfold in space cooperation between Europe and India, which in turn would bolster the overarching objective of deepening further the relationship and realising the full potential of India-EU Strategic Partnership.

Marco Aliberti is Resident Fellow at the European Space Policy Institute (ESPI), Vienna, Austria. He can be reached at marco.aliberti@espi.or.at

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The Significance of an Indian Direct Ascent Kinetic Capability

Kartik Bommakanti

Should India build a direct ascent anti-satellite (ASAT) capability to ward off space coercion? The answer to this question requires reasoned analysis. China obviously retains an edge over India because it has a proven capability. This is not merely an esoteric debate about deterrence and compellence, but the value a weapons system like a direct ascent ASAT bequeaths to India.

It is invaluable in the context of the Sino-Indian conflict dyad. Their disputatious boundary relationship is what renders imperative an Indian kinetic ASAT capability. China today can launch a ground war and use the space medium accompanied by kinetic capability without suffering the prospects of significant countervailing costs and risks.

Deterrence and compellence are two sides to the coercive balance. Deterrence is dissuasive, whereas compellence is persuasive. Deterrence represents the negative side of coercion and compellence the positive side of coercion. For deterrence and compellence to have any credibility in the India-China space dyad, New Delhi will require a potent retaliatory capability.

Foremost, a potent Indian ASAT capability will denude opportunities for China to threaten India's space infrastructure and gives New Delhi the opportunity to limit the means and the ends that Beijing pursues in conflict against India. Otherwise, space deterrence that is inextricably linked to terrestrial deterrence between India and China will remain fragile.

Thus, the risks are substantial in the absence of Indian ASAT capability. False optimism could lead India to underprepare, thereby easing a Chinese attack against Indian space-based assets and the ground nodes. Logical and justifiable optimism could also lead China to attack, if India unduly or unilaterally subjects itself to self-imposed constraints.

What do we make of the argument that India might fall prey to self-deterrence in that New Delhi for some reason is inhibited from employing its counter-space capabilities in response to a Chinese attack against Indian space assets? The concept of self-deterrence is ultimately not analytically useful, simply because it is the actual retaliatory capability of one side that deters an opponent.

If self-deterrence stymies India from using weapons in retaliation targeting China's ground-based space segments and space-based assets, why should not the same be operative for China? Is China not bound by the same uncertainties, risks, costs and consequences of a space war or even a limited space war as India? While no space war has occurred, its closest analogue is nuclear war. After all, it is the uncertainty of losing control that makes nuclear war unthinkable and has prevented its outbreak all these decades, because belligerents lack the capacity to control its escalatory dynamics, tempo and the destructive consequences following an exchange.

A space war between India and China could escalate from non-kinetic attacks to kinetic attacks, which very likely will be tied to land engagement. Indeed the destruction of two or three Indian satellites by China and a matching response by India might halt any further attacks in the space domain. Yet we cannot presume that escalation can be controlled through the exercise of restraint by both sides.

Therefore, even a limited space war could get out of hand. As the nuclear strategist, Thomas

Schelling put it: "The idea is simply that a limited war can get out of hand by degrees", without allowing it to descend into an all-out war. The same applies with a potential space war. New Delhi will have to emphasize a shared risk following the outbreak of hostilities and a proven and tested ASAT weapons system allows it.

Indeed, China has to consider and anticipate the costs and risks of losing control of a space war and the space medium playing a significant part in surface operations against India. Therefore, the balance of resolve also plays an important role in deterring and contesting China's moves. For New Delhi, the purpose must be to emphasize risk as much as cost. Notwithstanding the remote possibility of space war tied to a Sino-Indian land war, a strategy predicated exclusively on exploiting the risks inherent in uncertainty is necessary, but insufficient.

As long as China continues its development of space capabilities, India cannot but pay attention to the improvement of its own space military capabilities. Deterrence requires a defence effort or a build-up, otherwise it will lose credibility and lead opponents of an Indian ASAT capability to justify that the entire effort unnecessary.

Therefore, a direct ascent ASAT is a very potent and an active measure and therefore can be developed and tested. Its value derives not only from its military utility, but equally from its psychological effect. It gives India the capacity to escalate asymmetrically, which actually may very well reinforce space and terrestrial deterrence. There are virtually no defences against a direct ascent ASAT targeting a spacecraft, which makes it a terrifying military instrument in use and a credible means to deter China.

Publicly, it would demonstrate that India can match China's capabilities and can be a potent means to reinforce deterrence both on land and in space, thereby influencing China's assessment of risk and cost. India's strategic managers and decision-makers can be bold on this front by conducting different types of ASAT tests. In addition to the ground launched ASAT weapon tests, India could also opt to design and test air and sea launched ASAT weapons. India can prepare sequenced execution of the tests as and when there is an opportunity. These tests can be conducted against India's obsolescent satellites much like China in 2007 and the U.S. in 2008.

This will require considerable political will if an actual Indian ASAT capability is to be realised. There is no scope or reason for New Delhi to dither and vacillate when China's space military power is on an inexorable march.

Kartik Bommakanti is an Associate Fellow at Observer Research Foundation. He can be reached at kartik@orfonline.org

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FROM THE MEDIA

PSLV-C37 Successfully Launches 104 Satellites in a Single Flight

In its thirty ninth flight, the PSLV-C37 successfully launched the 714 kg Cartosat-2 Series Satellite along with 103 co-passenger satellites. The total weight of all the 104 satellites carried on-board PSLV-C37 was 1378 kg.

Source: *Press Information Bureau*, February 15, 2017

Smart Save: ISRO Successfully Saves Its Mars Mission Spacecraft From Eclipse

ISRO engineers began planning for the orbit-tweaking operation soon after its orbit dynamics specialists predicted a long eclipse. The goal was to change the inclination of the orbit to avoid the shadow zone, ISRO Chairman A S Kiran Kumar said.

Source: *Sputnik News*, February 8, 2017

CNES Supplying Cameras to Indian X Prize Team, Talks Reusability with ISRO

The French space agency, CNES, will supply two spacecraft cameras to a team from India competing for the Google Lunar X Prize, and has formed a working group with ISRO to study reusable launch technology.

Source: *SpaceNews*, January 10, 2017

Team Indus to Send Seven Experiments to The Moon Including Three From India

"Teams Callisto, Ears and Kalpana from India, Space4Life from Italy, Lunadome from Britain, Killa Lab from Peru and Regolith Revolution from the US have qualified to fly their experiments to the lunar surface in our spacecraft," said a TeamIndus statement.

Source: *Huffington Post*, March 16, 2017

India can Develop Space Station, says ISRO Chief

"We have all the capabilities to set up a space station. The day the country takes the decision, we will 'ok' the project. Just draw a policy and provide us necessary funds and time," A S Kiran Kumar said.

Source: *Times of India*, February 20, 2017

India to Use Russian Isotope Products for Chandrayaan-2

JSC Isotope, a Rosatom enterprise, said that it supplied Radionuclide curium-244 (Cm-244) sources to the Physical Research Laboratory in Ahmedabad. The sources will be installed on the Alpha Proton X-Ray Spectrometer, which will analyse the lunar surface during Chandrayaan-2.

Source: *Russia and India Report*, February 14, 2017

ISRO Commissioned Hypersonic Wind Tunnel at VSSC

This is the world's third largest hypersonic wind tunnel, next only to the ones in the US and Russia. These facilities will help in the launch of aerospace vehicles at hypersonic speed and to reduce the cost of access to space with future reusable launch vehicles.

Source: *Times of India*, March 21, 2017

Bangladesh to Join India's South Asia Satellite Initiative

Bangladesh has signed an agreement with India to formally join New Delhi's 'South Asia Satellite' initiative, through which the Indian Space Research Organization (ISRO) will launch a communication satellite for serving the South Asia region.

Source: *News18*, March 24, 2017

Japan's Space Agency Hopes to Swiftly Relaunch its Minirocket

Japan's space agency announced a plan to relaunch its SS-520 minirocket, which failed during launch in January to meet demand from the public and private sectors to increase the use of civilian products in the space industry.

Source: *Nikkei Asian Review*, March 9, 2017

Progress Underway for First Commercial Airlock on Space Station

"We want to utilize the space station to expose the commercial sector to new and novel uses of space, ultimately creating a new economy in low-Earth orbit for scientific research, technology development and human and cargo transportation."

Source: *NASA*, February 6, 2017

U.S. STRATCOM, Belgium Sign Space Situational Awareness Agreement

U.S. Strategic Command agreed to share space situational awareness data with Belgium under an agreement. "Our space systems underpin a wide range of services, providing vital national, military, civil, scientific, and economic benefits to the global community," U.S. Air Force Gen. John E. Hyten.

Source: *SpaceNews*, February 8, 2017

FCC Gets Five New Applications for Non-geostationary Satellite Constellations

Five companies - SpaceX, OneWeb, Telesat, O3b Networks and Theia Holdings - all told the FCC they have plans to field constellations of V-band satellites in non-geosynchronous orbits to provide communications services in the United States and elsewhere.

Source: *SpaceNews*, March 2, 2017

Former Boeing Executive to Lead Virgin's Smallsat Launch Venture

Virgin Orbit is part of the portfolio of companies within the Virgin Group known as Galactic Ventures, which also includes Virgin Galactic and its manufacturing arm, The Spaceship Company.

Source: *SpaceNews*, March 2, 2017

New NASA Radar Technique Finds Lost Lunar Spacecraft

"We have been able to detect NASA's Lunar Reconnaissance Orbiter and the ISRO's Chandrayaan-1 spacecraft in lunar orbit with ground-based radar," said Marina Brozovic, a radar scientist at JPL and principal investigator for the test project.

Source: *NASA*, March 9, 2017

Hughes Targets Suburban U.S. Customers With Faster Satellite Internet Service

Ramping up competition for faster internet-via-satellite links, EchoStar Corp.'s Hughes Network Systems unveiled a new service projected to double the company's residential broadband subscribers and substantially boost business users within a few years.

Source: *The Wall Street Journal*, March 7, 2017

Phase Four's Smallsat Plasma Thruster Finds a Ride to Space

The propulsion system will be tested in late 2017 on a Landmapper satellite built by Astro Digital, an Earth imaging and analysis company located at the NASA Ames Research Park, Moffett Field, California.

Source: *SpaceNews*, March 7, 2017

Blue Origin Signs OneWeb as Second Customer for New Glenn Reusable Rocket

OneWeb has signed on as Blue Origin's second customer for its New Glenn orbital launch vehicle. OneWeb has 21 Soyuz launches booked with Arianespace, plus options for five additional Soyuz and three of the future Ariane 6 rocket. With Virgin Galactic, OneWeb has 39 missions with LauncherOne, the company's air-launched vehicle.

Source: *SpaceNews*, March 8, 2017

SpaceX to Transport 2 Paying Customers Around Moon

SpaceX founder Elon Musk said he's planning a private space mission, using a SpaceX rocket to transport two paying passengers around the moon.

Source: *Florida Today*, February 27, 2017

Blue Origin Teases Cargo Spaceship for a Moon Base

The founder of Amazon envisions setting up an Amazon-like shipment service with a cargo spacecraft capable of depositing up to 10,000 pounds of supplies for a "future human settlement." Blue Origin is working to develop the Blue Moon spacecraft in time for a maiden flight in 2020.

Source: *Popular Mechanics*, March 6, 2017

Stephen Hawking Plans to Travel to Space

"I thought no one would take me but Richard Branson has offered me a seat on Virgin Galactic, and I said yes immediately," Hawking was quoted as saying.

Source: *Times of India*, March 21, 2017

Satellite-tracking Firm LeoLabs Opens for Business With $4 Million Banked

LeoLabs began operating a phased-array radar in Midland, Texas, in February. With data from the new Midland facility and a radar near Fairbanks, Alaska, LeoLabs can track 94 percent of all objects 10 centimeters or larger in low Earth orbit.

Source: *SpaceNews*, February 27, 2017

NASA 'Smallsats' Open Up New Planetary Frontier

"There's an array of ideas that we're kicking around right now. So I think what we'll see in the next 10 or 15 years is that the smaller satellites will have their own way to be implemented in planetary science that will be very complementary and we'll get some exciting science from them," Dr. Green said.

Source: *BBC*, March 22, 2017

China to Launch First High-Throughput communications satellite in April

China plans to launch Shijian-13, its first high-throughput communications satellite, in April. The 4.6-tonne satellite, with a message capacity of more than 20 GB, will be carried into orbit by a Long March-3B carrier rocket.

Source: *Xinhuanet*, February 17, 2017

Chang'e-5 Sample Return Probe to Reach Launch Site in Aug, Launch in Nov

The complex mission will involve a number of stages and components, involving lunar soft-landing, collecting samples, ascent from the Moon, a docking in lunar orbit, heading home and reentry into the Earth's atmosphere.

Source: *GB Times*, March 1, 2017

Scientist Eyes Commercial Launch Centre

"These government-run launch centers are well developed, but they are too busy to handle the increasing demands from the commercial space sector, and it is not uncommon that even a government-assigned mission has to wait for arrangements at those sites," said Hu Shengyun, a senior rocket designer at the China Aerospace Science and Industry Corp's Fourth Academy.

Source: *China Daily*, March 16, 2017

China to Develop Space Rockets to Launch from Planes - State Paper

China will develop rockets that can be launched into space from aircraft, a senior official told the state-run China Daily newspaper, as Beijing aims to send hundreds of satellites into orbit for military, commercial and scientific aims.

Source: *Reuters*, March 7, 2017

China Launches 1st Commercial Space Mission With New Rocket

China today successfully sent three satellites into space in its first commercial mission using an updated version of the low-cost Kuaizhou-1A rocket. The rocket, carrying the satellite JL-1 and two CubeSats XY-S1 and Caton-1, blasted off from northwestern China's Jiuquan Satellite Launch Center

Source: *Economic Times*, January 9, 2017

A New SpaceX? China Developing System to Recover, Reuse Space Rockets

China is developing a system to recover parts of rockets used in space launches to bring down costs and make its space programme more commercially competitive, according to researchers involved in the project.

Source: *South China Morning Post*, March 17, 2017

AsiaSat Says Booming Regional Economies Outweigh Oversupply Fears

Regional satellite operator AsiaSat of Hong Kong expects the high growth rates of several Asian economies will outlast the current oversupply of satellite capacity and will reinforce the operator's business case in an increasingly crowded market.

Source: *SpaceNews*, March 15, 2017

Dubai Space Centre in MoU with South Korea

The Mohammad Bin Rashid Space Centre (MBRSC) has signed a Memorandum of Understanding with the Korea Aerospace Research Institute (KARI) in South Korea with the goal of cooperating on various space related activities and transferring expertise.

Source: *Gulf News*, March 6, 2017

Senator Loren Legarda Proposes Philippine Space Act

Senator Loren Legarda has proposed the Senate Bill No. 1259 or the Philippine Space Act (PhilSA).

Source: *International Business Times*, January 10, 2017

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An Interactive Look at the U.S.-China Military Scorecard, RAND Corporation

An Interview with Gen David L. Goldfein, Twenty-First Chief of Staff of the US Air Force, Strategic Studies Quarterly

Need policy initiatives to better integrate ISRO with industry, Report of the 3rd ORF Kalpana Chawla Annual Space Policy Dialogue, February 16-18, 2017

Videos of panel presentations, special addresses and discussions of the 3rd ORF Kalpana Chawla Annual Space Policy Dialogue, February 16-18, 2017

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Chandana Rohitha Rajapaksa and Jagath K. Wijerathna, "Adaptation to Space Debris Mitigation Guidelines and Space Law," *Astropolitics*, vol. 15, Issue 1, March 2017, pp. 65-76

Ian B. Perry, "Law of Space Resources and Operations on Celestial Bodies: Implications for Legislation in the United States," *Astropolitics*, vol. 15, Issue 1, March 2017, pp. 01-26

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