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Pink dragons in orbit: Why unlikely threats present real challenges for space politics

Daniel Porras

The international and space communities have made numerous efforts to classify and categorise space security threats as they seek a suitable approach to deal with these challenges. In 2018, both the Secure World Foundation (SWF) and the Center for Strategic and International Studies (CSIS) published assessments of counterspace capabilities, grouping technologies by form and function (kinetic/non-kinetic, electronic and cyber). This is useful for experts to think about types of technology threats. In the recent UN Group of Governmental Experts on further practical measures for the prevention of an arms race in outer space (PAROS), these technologies were put on a spectrum based on destructive capabilities, with jamming on one end and "bunker busters" on the other. This was also a useful exercise, particularly because it demonstrated the lack of consensus on what is considered to be an attack on a space object. Additional UN bodies have also grouped threats into three scenarios: space-to-space, ground-to-space and space-to-ground. These scenarios describe the location of a threat and its respective targets.

All these classifications and models should help experts and diplomats to think about and discuss possible options for diplomatic solutions to space security. Yet there remains a division of opinions on what threats are most urgent and how to address them. A review of statements in the UN on PAROS reveals that, at present, there are two distinct perceptions about what space security threats are and what they mean. On the one hand, some States are highly concerned about threats to space systems, including things like anti-satellite missiles, hostile on-orbit vehicles and jamming technology. These capabilities are designed to deny the benefits of space objects to an opponent. On the other hand, a considerable number of States are highly concerned about threats from space systems, including the "placement of weapons in outer space" that have targets on the ground. And while this latter category seems as far-fetched to some technical experts as the placement of pink dragons in orbit, these concerns are impacting international dialogues in a very real way.

Yet another categorisation

When reading the SWF counterspace assessment, one can see that all the technologies described are threats to existing space systems. They include missiles like the one used in the recent Indian ASAT demonstration, as well as co-orbital vehicles that could be used to repair, refuel or even destroy a satellite. These are all ground-to-space or space-to-space threats. These threats already exist and are being increasingly perfected by a number of countries, principally by China, India, Russia and the US. As these threats are already generally recognised by the international community, a number of proposals have been put forward that could mitigate them and reduce tension between space rivals. Solutions like codes of conduct for orbital activities, ASAT test guidelines and even prohibitions on the destruction of objects in orbit could all be paths towards greater stability in space.

However, none of these approaches addresses the third scenario, namely space-to-ground. These are threats from space systems and could take the form of space-based missiles, or even the fantastical "Rods from God" (which, thankfully, are no longer discussed seriously). And while missiles in space might make about as much sense as deploying pink dragons in

orbit from a technical or even economic perspective, the perceived threat is keeping many States from agreeing to measures that don't cover this scenario.

The legacy of Reagan's pink dragons

In the 1980's, Ronald Reagan put forward the idea of placing space-based missile interceptors (SBI) in orbit as part of US missile defence, a project referred to as Star Wars. The idea is that putting interceptors in space will allow the US to shoot down incoming ICBM's at an earlier stage in its flight path. However, it soon became evident that Star Wars made little technical or economic sense with existing technologies and, following the collapse of the Soviet Union, the project returned to the shelf with other fantasies like Brilliant Pebbles or Rods from God. A fairly recent study from the Union of Concerned Scientists explains why SBI doesn't make sense, complete with graphics and estimated costs.

Yet the US has not given up on the idea completely. In the most recent missile defence review, the US decided to dust off the Star Wars book to give it another look. And while many experts will point out that the notion has not received any funding and is unlikely to go anywhere, some in the international community (namely those not allied with the US) interpret this review as a sign of intentions. These countries look at the US' extraordinary achievements in space (like the lunar landing, like the space shuttle, like so many other great things they've achieved) and wonder: if they can get to the Moon, why can't they put missiles in space? Indeed, the commitment and resolve displayed by the US in reaching the Moon (for whatever reason) stands as proof that when they put their minds to it, the US can achieve anything. For geopolitical rivals, the possibility of SBI is very real.

But why would SBI make people on the ground nervous? Such a tool would be defensive in nature. Here, the issue of verification comes full circle. Those who consider SBI as a possibility do not, at present, believe they would be able to verify whether the US is deploying SBI or whether they are deploying missiles that can target objects (or people) on the ground. The US and it's western allies often criticise the Chinese/Russian proposal for the "prevention of the placement of weapons in outer space" but, in this light, the concept makes more sense, even if SBI is still far-fetched.

How to utilise pink space dragons

Under the present circumstances, discussions on space security within the UN are going nowhere fast (the Long Term Sustainability Guidelines mostly deals with safety issues, not security). Western countries in the UN generally favour the adoption of non-legally binding transparency and confidence building measures that will help them protect their space systems. Yet others (led by China and Russia) are determined to address the issue of "weapons" in space through a treaty, regardless of what experts consider to be likely or feasible. Looking at the votes on space security resolutions in the UN General Assembly every year, it is not unreasonable to conclude that most of the world could care less about what approach is taken so long as something is undertaken with serious commitment.

So what to do?

One option might be to separate the discussions on threats to space systems and threats from space systems at the multilateral level. By addressing threats to space systems separately, the international community might be able to adopt one of the many reasonable proposals that exist today. Discussions could be focused on addressing issues where there is

convergence, such as the intentional destruction of objects in orbit. By separating the discussion from the knotty question of SBI or space-to-ground threats, there could be a higher likelihood for success in multilateral negotiations.

However, it is unlikely that any country that sees the possibility of a US-deployed space-based missile system would go along with a proposal on the prohibition of the intentional destruction of objects in orbit. Why? Simply because they would be giving up their means of destroying threats from space. Why would China or Russia give up on building ASAT's if they think the US will have missiles in orbit one day?

Here, the US could use its imaginary pink dragons to achieve a tangible goal. If SBI is so far-fetched, why not trade the fantasy for real concessions on ASAT's and other threats to space systems? By promising not to deploy any types of missiles or missile defence in space, the US might be able to convince China and Russia not to develop certain types of counterspace capabilities, especially the destructive kind. Such a trade-off could contribute significantly to stability in outer space and help ensure the long-term sustainability of the near-Earth orbital environment. In this way, the US could make a very real use of its fleet of pink space dragons in orbit.

Finally, It is possible that some space rivals do not actually believe SBI to be a real threat and simply say so in order to make the US and other western countries look badly in the UN. It is entirely possible that proposals to prevent the placement of weapons in space with a treaty is simply a stalling tactic meant to help China and Russia catch up to the US in terms of counterspace capabilities. Nevertheless, it would still be worthwhile to explore this option, even if just to enable discussions on threats to space systems.

Daniel Porras is a Security Senior Fellow with the United Nations Institute for Disarmament Research (UNIDIR).

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Astrobiology and India's natural laboratories: Training grounds for space exploration

Siddharth Pandey

What is astrobiology?

Astrobiology is a rapidly growing interdisciplinary field that investigates the origin, evolution and sustenance of life in the Universe. What is Life? How did it start? Can it be found elsewhere in the Universe? These are some of the profound questions that are covered in this field. Life is a product of over a trillion crucial geo-bio-chemical reactions that have taken place over the first billion years of the planet's existence. We are still learning about the processes; this knowledge is crucial in our ambitions of finding life elsewhere. Due to weathering over the lifetime of Earth, the earliest geological fossilized records are unfortunately only available in few locations on our planet.

There are several theories as to how and where life originated and what constitute the key elements for its formation. All of these require a complete understanding of the complex environment in which it is found. Astrobiologists comprise of a diverse range of professionals: biologists, geoscientists, chemists, physicists, engineers as well as philosophers. Since Astrobiology's nascent years of development in the United States in the early 1960s, astrobiologists around the world tackle these questions from various ends, conducting theoretical simulations (e.g. prebiotic chemistry, earth-ocean-atmosphere models, mineral alterations), replicating early-Earth conditions in laboratories, studying microbial life in extreme environments and analysing organic compounds in meteoritic samples found on Earth. Many of these studies have contributed towards the design and development of scientific experiments and bio-signature tracing instruments for robotic astrobiology space missions to Mars, Icy Moons, Comets and Asteroids.

Astrobiology research in India

In India, pockets of Earth and Planetary science groups at various research institutions and universities have been tackling several astrobiological questions since the past three decades. There have been recent efforts to consolidate the groups into a National level body. The body consists of several working groups, working towards preparing an Astrobiology Exploration Road Map for India. This strategic plan is aimed to be aligned with Indian Space Research Organization's (ISRO) mission architecture for the exploration of the Solar System.

Astrobiology-relevant exploration zones in India

There are several regions of interest, as identified and explored by several astrobiologist groups in India, we shall discuss two regions. Firstly, of prominence is the Ladakh region in Jammu and Kashmir. This

very high altitude (~3500-5600 m above sea level), cold, dry, high UV, desert environment hosts within close proximities, a unique collection of sites such as glacial passes, saline lakes, high altitude hot springs and permafrost sites that harbour unique extreme organisms (known as extremophiles).

Given its similarities to ancient Mars (that is known to have a warmer, wetter climate with liquid water on its surface), Ladakh is a time capsule for astrobiologists interested in understanding the possible origin and evolution of primitive life in terrestrial hot springs, studying salt loving bacteria in saline/brackish lakes and habitability of permafrost (permanently covered ice under soil), as is found on Mars. (Permafrost is rare on Earth, only found in very cold, dry environments such as Antarctica, Siberia and Chile). A 2016 field expedition by an international group of researchers to the Panamik and Tso Kar region of Ladakh led to the identification of several regions of interest in the region for Astrobiology.

The second astrobiologically relevant site in India is Lonar Crater near Aurangabad, Maharashtra. A crater is a post-impact site after a fragment of rock has entered the Earth's atmosphere from space and struck it to form a cavity on the surface. Lonar is one of only three hypervelocity impact crater sites formed in basaltic rock on Earth, and the only easily accessible site by foot/transport. Close to 500,000 years ago, a 100-meter wide meteor impacted the region, creating a 2-km wide crater. Lonar has a lake that is perennially fed by two streams. What makes Lonar interesting from an Astrobiological point of view is the presence of a stream-delta fan on the north western edge of the crater. NASA's next Mars 2020 rover landing site is in a similar crater on Mars known as Jezero Crater. This crater too, like Lonar, has a delta system adjacent to its western wall. The primary objective of this mission is to land very close to the delta and search for traces of biological signatures in the deposited sediments.

The hypothesis is that the chances of finding these signatures at this site is very high. Billions of years ago on Mars, liquid water might have transported organic material from tens of kilometres and deposited them into the crater. Lonar is our natural laboratory that offers strong potential to test scientific experiments, develop instruments and train future rovers and astronauts in surface exploration of Mars.

The way forward

As the astrobiology community grows and matures, the sites in Ladakh and Lonar are now being further explored. Sample analysis and site surveys are now planned to be regularly carried out to help develop a Terrestrial Analogue Database for the benefit of the astrobiology and space exploration community. The National level Astrobiology group should aim to work closely with ISRO. The findings reported in the Astrobiology working groups should be considered while

planning the future Mars missions. These sites, with their unique environment also offer an opportunity to educators to train students in field work and inspire them with the fundamental questions about life in the Universe.

Siddharth Pandey, Head, Amity Centre of Excellence in Astrobiology (ACOEA), Amity University, Mumbai

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FROM THE MEDIA

India to hold first simulated space warfare exercise next month

After successfully testing an anti-satellite (A-Sat) missile in March and initiating the raising of a new tri-service Defence Space Agency soon after, India is now planning to conduct its first-ever simulated space warfare exercise next month.

Source: Times of India, June 8, 2019

ISRO eyes space theme park in Shar

Besides addressing the long-standing demand from people to allow them to witness the launching of satellites from its space port in Shar, Sriharikota by constructing a gallery, the Indian Space Research Organisation is adding a space theme park at the same place.

Source: Deccan Chronicle, May 15, 2019

India planning to launch own space station by 2030, says ISRO chief

In one of the most ambitious projects ever undertaken by India, the country is planning to launch its own space station, Indian space agency ISRO chief K Sivan said today. India is targeting 2030 as the date to launch a 20 tonne space station, which will most likely be used to conduct microgravity experiments.

Source: NDTV, June 13, 2019

ISRO puts imaging satellite RISAT 2B into orbit

Its images will be used in the fields of agriculture, forestry, disaster management. India today launched RISAT 2B, the all-weather imaging satellite that boosts the capability to image earth resources as well as enhance surveillance and security.

Source: Hindu BusinessLine, May 22, 2019

Chandrayaan-2 will have 13 payloads: ISRO

India's second Moon mission that is planned for a July launch will have 13 paylaoads and and one passive experiment from American space agency NASA, the Indian Space Research Organisation (ISRO) said on Wednesday. "Thirteen Indian payloads (8 on orbiter, 3 on lander and 2 on rover) and one passive experiment from NASA," ISRO said in a mission update, but did not specify them or their objective.

Source: Deccan Herald, May 15, 2019

Isro's new commercial arm NewSpace India officially inaugurated

NewSpace India Limited (NSIL), the commercial arm of Indian Space Research Organisation (Isro), was officially inaugurated in Bengaluru on Thursday. NSIL's main objective is to scale up industry participation in Indian space programmes.

Source: Business Standard, May 24, 2019

ISRO to launch Chandrayaan-2 between July 9-16

The Indian Space Research Organisation has found a suitable window to launch India's second spacecraft to the moon, 'Chandrayaan-2' between July 9 and July 16 with an expected soft landing on the moon on September 6.

ISRO sources have confirmed that GSLV Mark-III will launch Chandrayaan-2 from Sriharikota during the favoured window time.

Source: NewsonAir, June 05, 2019

Panel clears proposal to set up agency for developing space warfare systems

Prime Minister Narendra Modi-headed Cabinet Committee on Security (CCS) has cleared a proposal to set up a new agency for developing sophisticated weapon systems and technology for space warfare. The new agency will be called Defence Space Research Agency (DSRO) and will be responsible for creating space warfare weapons systems under the Defence Space Agency (DSA).

Source: TimesNow, June 11, 2019

IIT Guwahati signs MoU with ISRO to set up space technology centre in Northeast

IT Guwahati has signed an MoU with The Indian Space Research Organisation (ISRO) to set up an IITG-ISRO Space Technology Cell (STC) at the institute where Assam Governor Jagdish Mukhi inaugurated a new academic complex and research and development building on Wednesday.

Source: IndiaToday, May 30, 2019

China reveals scientific experiments for its next space station

China has selected nine scientific experiments — including a project that will probe how DNA mutates in space — to fly on its first major space station, scheduled to be completed in 2022.

The China Manned Space Agency selected the projects, which involve scientists from 17 nations, from 42 hopefuls, in a process organized with the United Nations Office for Outer Space Affairs (UNOOSA).

Source: Nature, June 17, 2019

NATO aims to make space a new frontier in defence

NATO aims to recognize space as a domain of warfare this year, four senior diplomats said, partly to show U.S. President Donald Trump that the alliance is relevant and adapting to new threats after he signed off on the creation of a U.S. Space Force.

Source: Japan Times, June 22, 2019

CM Naveen Patnaik unveils flood hazard atlas for Odisha

Odisha Chief Minister Naveen Patnaik on Saturday unveiled a flood hazard atlas for Odisha to keep the state government better prepared to tackle natural disasters. The Chief Minister said the atlas will help identify the flood-prone areas of the state so that necessary plans can be made to deal with the situation.

Source: New Indian Express, June 22, 2019

SpaceX launches first batch of 60 internet satellites in landmark mission

SpaceX just vaulted a rocket full of 60 satellites into the sky, marking a huge leap forward on its mission to put up a mega constellation that could beam cheap broadband all over the planet. This is the first dedicated mission for SpaceX's internet constellation, called Starlink.

Source: CNN, May 28, 2019

Tech firm makes third attempt to launch first Singaporean into space

After two failed attempts including an 11th hour cancellation last year, technology firm IN.Genius is hoping to be third time lucky as it attempts to send the first Singaporean into the edge of space this month.

Source: Today Online, April 05, 2019

NATO to acknowledge space as warfighting domain

The North Atlantic Treaty Organisation (NATO) is expected to approve its first space strategy this coming week, and NATO leaders will apparently acknowledge that space is a warfighting domain at the NATO summit to be held in London in December 2019, according to reports by Reuters and the Financial Times.

Source: Space Watch Global, June 25, 2019

After ASAT test, India inches closer to developing hypersonic cruise missile

In a significant development, India's state-funded Defence Research Development Organisation (DRDO) has conducted its first test of the Hypersonic Technology Demonstrator Vehicle (HSTDV) that will pave the way for the development of a hypersonic cruise missile which will have a speed of over Mach 6.5.

Source: Sputnik News, June 12, 2019

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OPINIONS AND ANALYSES

Laxman K Behera, "Mission Shakti: What Next?" *Institute of Defence Studies and Analyses*, April 06, 2019

Rajeswari Rajagopalan, "The Importance of Nepal's First Satellite Launch" *The Diplomat, April 26, 2019*

Arun Venkatraman, "What's Ailing India's Rocketeers? The subdued Indian Private Space Industry in ISRO's Shadow" *First Post*, May 08, 2019

Lara Seligman, "The New Space Race" *Foreign Policy*, May 14, 2019

Ajey Lele, "Why India needs to build its own space station" *Financial Express*, May 27, 2019

Rajeswari Pillai Rajagopalan, "Managing nuclear risks: The emerging technologies challenge" *The Observer Research Foundation*, May 27, 2019

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Rajeswari Rajagopalan "What Does the Rise of Asia's Space Forces Mean?" *The Diplomat, June 04, 2019*

Rajeswari Rajagopalan, "India to hold first simulated space warfare exercise next month" *Times of India, June 08, 2019*

"Who decides what SpaceX shoots into space?" *The Post and Courier*, June 10, 2019

"India must focus on cyber and space war capabilities in its defence modernisation" *The Times of India*, June 10, 2019

Andrew Korybko, "India's Stepping Up The Pace Of The South Asian Space Race" *Eurasia Future*, June 14, 2019

Rajeswari Rajagopalan, "Significance of the changing space security landscape for India" *Financial Times, June 18, 2019*

C Uday Bhaskar, "Space Warfare: The Aspiration-Constraint Challenge For India – Analysis" *Eurasiareview*, June 20, 2019

David A. Deptula "The Militarization of Space & the Path Forward for the U.S.,"*The Ripon Society*, June, 2019

Nitin Pai, "What it would take for India to become a proper space power" *Livemint*, June 23, 2019.

Matthew Donovon "America needs a Space Force-Here's why" *Fox News*, June 22, 2019

Rajeswari Rajagopalan, "Managing New Actors in the Space Domain" *Diplomat, June 29, 2019*

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NEW PUBLICATIONS

REPORTS/STATEMENS/MULTIMEDIA

Pakistan and Russia signed a joint statement on "No First Placement of Weapons in Outer Space" in Bishkek, the capital of Kyrgyzstan, on the side-lines Council of Foreign Ministers' meeting of Shanghai Cooperation Organisation (SCO) on May 22, 2019

UN Office for Outer Space Affairs (UNOOSA) and the European Space Agency (ESA) signed a joint statement on their wish to cooperate on the challenge of space debris, May 24, 2019

NASA and ESA sign statement of intent on joint science research about the moon May, 2019

Europe-India Space Cooperation: Policy, Legal and Business Perspectives from India - Report released on May 29

JOURNAL ARTICLES

Benjamin Adams, "Cooperation in space: An international comparison for the benefit of emerging space agencies" *Astropolitics*, Vol.17, Issue 1, June 14, 2019

Joseph N. Pelton, "A path forward to better space security: Finding new solutions to space debris, space situational awareness and space traffic management" *Astropolitics*, May 17, 2019

Mohammad SadeghMahjoom et al., "Barriers to the Commercialization of Civilian Space Technology in Iran" *Space Policy*, June 10 2019

Caleb Pomeroy, "The Quantitative Analysis of Space Policy: A Review of Current Methods and Future Directions" *Space Policy*, May 2019

CHAPTERS/BOOKS/MONOGRAPHS/OCCASIONAL PAPERS

Douglas Brinkley, *American Moonshot: John F. Kennedy and the Great Space Race* (Harper, April 02, 2019)

Roger D. Launius, *Apollo's Legacy: Perspectives on the Moon Landings* (Smithsonian Books: May 2019)

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