The Geostrategic, Techno-Nationalist Push Into Space*

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ABSTRACT

The technological benefits of space hardware are universally recognized. One is hard pressed to find an area of the world where satellite dishes for television reception, satellite use for data transmission, or the Global Positioning System (GPS) for multiple purposes are not utilized. But utilization of commercial or of other countries' space assets does not equate to being a space-faring nation. Space-faring nations have, to varying degrees, their own capabilities. The importance of status as a space-faring nation comes from two sources: not having to rely on others for access to the benefits of space assets, and prestige that can translate into geopolitical influence. Beyond users and space-faring nations, there are those countries actively asserting space leadership in some form, whether regional or global. What pushes countries to go beyond being a space-faring nation and assert leadership potential, including potentially engaging in an implicit or explicit space race, is techno-nationalism, which for the purposes of this paper refers to nationalism that becomes the impetus for technology development as an indicator of geostrategic power. It is often triggered by a threat or perception of a threat, including a threat to perceived leadership. Techno-nationalism carries with it an inherent quest for leadership, by some definition.

Key words: Space, leadership, NASA, China, exceptionalism.

El empuje geoestratégico del tecno-nacionalismo en el espacio

RESUMEN

Los beneficios de las aplicaciones espaciales son reconocidos universalmente. Es difícil encontrar algún área del mundo en que las antenas parabólicas satelitales para recepción televisiva, uso satelital para transmisión de datos, o

* Recibido: 29 de marzo de 2014 / Modificado: 29 de octubre de 2014 / Aceptado: 29 de octubre de 2014
Para citar este artículo
Johnson-Freese, J. (2014). The geostrategic, techno-nationalist push into space. *OASIS*, 20, 9-22.

el Sistema de Posicionamiento Global (GPS) para aplicaciones múltiples, no sean usados. Pero la utilización comercial o con equipos provenientes de terceros países no equivale a ser una potencia espacial. Las potencias espaciales tienen, en diferentes grados, sus propias capacidades. La importancia del estatus y el prestigio de serlo proviene de dos fuentes: no tener que depender de otros para acceder a los beneficios de bienes espaciales, y que el prestigio pueda traducirse en influencia geopolítica. A parte de los usuarios y las potencias espaciales, existen otros países que están afirmando activamente su liderazgo espacial en alguna forma, ya sea regional o global. Lo que impulsa a los Estados, más allá de ser potencias regionales y afirmar su potencial liderazgo, incluyendo la participación en una carrera espacial explícita o implícita, es el tecnonacionalismo, que para los propósitos de este ensayo se refiere al nacionalismo que se transforma en ímpetu para el desarrollo tecnológico como indicador de poder geoestratégico. Es comúnmente inducido por una amenaza o percepción de la misma, que incluye una amenaza al liderazgo percibido. Según se ha definido, el tecnonacionalismo conlleva una inherente búsqueda de liderazgo.

Palabras clave: espacio, liderazgo, NASA, China, excepcionalismo.

Space is heralded as the Final Frontier. It is embodied by mythical references, symbolizes heroism, the future and technological achievement, and carries with it connotations of leadership for those individuals, groups and countries bold enough, smart enough and persistent enough to overcome its challenges and hardships. The United States and the then Soviet Union engaged in a superpower race to the Moon in the 1960's, until the Soviets dropped out because it was clear the United States had prevailed. And prevail it had, triumphantly landing on and returning a crew from the Moon within a decade of President John Kennedy's 1962 announcement of the United States' intent to do so. Recognizing the technological and symbolic importance of space, Europe and Japan began to build space programs in the 1960's as well, though on a smaller, less-ambitious scale. Space was originally the domain of the economically and technically developed countries.

More recently, the number and types of "space players" has expanded. Individuals, billionaires such as Elon Musk, have created companies like SpaceX to provide Low Earth orbit launch services. But it is still national efforts that are able to make the kind of investments required for large-scale space development and exploration efforts. Countries from Argentina to Zambia have (or, in the case of Zambia, have had) space programs that stretch beyond utilization of others' space assets. Space development and exploration is risky and unquestionably expensive, often prohibitively so, which is why aspirations often exceed activity in developing countries.

The technological benefits of space hardware are universally recognized. One is hard pressed to find an area of the world where satellite dishes for television reception, satellite use for data transmission, or the Global Positioning System (GPS) for multiple purposes are not utilized. But utilization of commercial or other countries' space assets does not equate

to being a space-faring nation. Space-faring nations have, to varying degrees, their own capabilities. The importance of status as a space-faring nation comes from two sources: not having to rely on others for access to the benefits of space assets, and prestige that can translate into geopolitical influence. Beyond users and space-faring nations, there are those countries actively asserting space leadership in some form, whether regional or global. What pushes countries to go beyond being a space-faring nation and assert leadership potential, including potentially engaging in an implicit or explicit space race, is techno-nationalism, which for the purposes of this paper refers to nationalism that becomes the impetus for technology development (Sulfikar, 2007) as an indicator of geostrategic power. It is often triggered by a threat or perception of a threat, including a threat to perceived leadership. Techno-nationalism carries with it an inherent quest for leadership, by some definition.

SPACE CHOICES

Space assets are essential for countries seeking to have or maintain a modern military, and as a development tool in a globalized world. Much of that technology is available commercially today, far more so than in the past when these assets were largely controlled by a small number of government security organizations. So countries have the option of being a consumer of space information and capabilities, or an owner.

Every country has been faced with the issue of what degree of dependence on other countries for space capabilities is judicious –in other words, how much risk is acceptable– with the alternative being making the large investments required for autonomy. Europe decided to invest in launch technology after issues with the United States about launching the European Symphonie satellites in the 1970's, the U.S. fearing those satellites would lead to a competitive European communications satellite industry (Johnson-Freese, 2007, p. 33). Conversely, however, Canada decided to focus on the development of satellites, and leave launches to other countries to avoid both the research and capital investments that would have been required. Similarly, Europe decided to invest in its own satellite navigation system, Galileo, because it did not want to become overly reliant on the U.S. military-owned Global Positioning System which, with the internet, is considered one of two global utilities. And when the United States and Russia became locked in dispute over the Crimea, the imprudence of the U.S. allowing itself to become reliant on the Russians for transportation to the International Space Station became an issue (Munsil, 2014). The economics of space, however, can override desires for autonomy.

Clearly, however, there are times when economic prudence can be overridden by geostrategic, techno-nationalist concerns. The United States and the Soviet Union raced to the Moon not for any tangible return-on-investment or to obtain any specific technology (though the technology leaps made and benefits derived were substantial), but because of the leadership implications associated with technological achievements in general. Technological prowess was seen as a Cold War indicator of power, and both the United States

and the Soviet Union sought to convince the non-aligned countries that preferentiality to them was their best political option.

Space technology is also largely dual-use technology, meaning it is of value to both civilian and military communities, with associated positive and negative spillover. On the positive side, investment in one piece of hardware, a remote sensing satellite for example, can yield benefits for civilian urban planners and military surveillance. Japan has been especially creative in exploiting dual use technology to avoid legal issues presented by the Japanese constitutional restrictions reserving space for "peaceful purposes" only, with "peaceful" defined as "non-military" (Johnson-Freese & Gatling, 2004).

Difficulties with dual-use technology arise though, because the technology provides capabilities but does not define intended use. The technological differences between a rocket and a missile are matters of modification: the workhorses of the early U.S. rocket fleet, Atlas, Delta and Titan, were all born as warhead-carrying missiles. Small maneuverable satellites recently proposed as useful to monitor and potentially help abate space debris could technically also be used to ram a satellite and so be considered a space weapon. Consequently, space technology is highly ambiguous and can trigger security dilemmas. Sometimes, the geopolitical perception of a threat is enough to trigger responsive, and expensive, space activity in other countries, activity that might otherwise have been deemed unwarranted.

LEADERSHIP AND SPACE RACE TRIGGERS

In a 2011 article, Louis Friedman, the former Executive Director of The Planetary Society, lamented American neglect of positive space leadership implications as related to foreign policy. "Sometimes, the connection between space exploration and foreign relations has even been belittled in the space community… space exploration and development are often overlooked in foreign relations and geopolitical strategies" (Friedman, 2011). That neglect was once not the case. The 1958 Space Act creating NASA included directives for international cooperation, as a way of building and cementing relations with other countries. Beginning with early scientific missions and launch opportunities, NASA reached out to other countries, and the Space Transportation System (the Shuttle program) included international participants. More recently, the International Space Station, Cassini-Huygens, the James Webb Space Telescope, the Europa Jupiter System Mission, Mars 2016/2018 and Earth observing satellites all involve more than one country.

When, however, does nationalism overpower internationalism and pragmatism, and evolve into techno-nationalism that can even lead to engaging in a space race? The answer seems to be when a leadership challenge is involved. Clearly, there was a nationalistic drive behind the Apollo program, and substantial global leadership rewards were reaped from its success. More recently, examining the case of India and China is illustrative, and provides parameters for considering implications for other countries.

CHINA-INDIA

Chinese interest in space after independence in 1949 focused largely on building systems to facilitate economic development and link the information flow across China's vast geographic areas. Just as the Europeans had in the 1960's, the Chinese understood the relationship between space and technology, technology and industrialization, and industrialization and economic growth (Johnson-Freese, 2007, p. 170). Later, China watched and appreciated the varied benefits that the U.S. and other advanced countries garnered from space. The Apollo program yielded benefits ranging from student interest in science and engineering to prestige that translates into geostrategic influence. China saw and understood the military value of space capabilities the U.S. clearly demonstrated during the 1991 Gulf War, with the broad employment of the Global Positioning System (GPS) and space systems generally for command, control, communication, intelligence, surveillance and reconnaissance (C3ISR). China's 2011 White Paper on space states "Space activities play an increasingly important role in China's economic and social development" (Information Office of the State Council, 2011). Further, dual-use space technology has both civilian and military applications, important for military modernization, with an increasing emphasis on the latter. Consequently, China currently seeks a broad spectrum of space capabilities.

China's modern day space program required serious rebuilding at the end of the 1960's Cultural Revolution. Much of its scientific and engineering talent had been scattered, or worse, during the reign of the Red Guard, so those left with the task faced a steep learning curve. Nevertheless, Chinese leaders recognized the value of space assets and persevered, largely on their own until the late 1980's. By 1990 China was launching not only Chinese-built satellites, but those such as AsiaSat, built by the Hughes company in the United States. Indeed during the decade of the 90's, China was establishing itself as a commercial launch provider, establishing global relationships that proved financially and politically lucrative.

China's international launch profile changed though, with the release of the highly politicized 1998 Cox Commission report in the United States. That report included sensationalist allegations of China illegally obtaining U.S. nuclear secrets from Los Alamos National Laboratory scientist, Dr. Wen Ho Lee, and information that would greatly improve their missile capabilities from American aerospace companies (Select Comittee, United States House of Representatives, 1999). Scientists and analysts quickly critiqued the report findings, most notably in a Stanford University analysis stating it contained numerous errors and misrepresentations (May, Panofsky, Johnston, Di Capua & Franklin, 2000). Nevertheless, the report triggered new and draconian U.S. export control laws on dual use space technology, laws that would prove damaging to the U.S. satellite industry (Johnson-Freese, 2001; 2000), spur satellite industry development outside the United States, curtail Chinese commercial launch business, and virtually quashed U.S.-China space relations. The Cox Committee Report also provided the impetus for a U.S.-China military space race, one

characterized by U.S. rhetoric about "space dominance", though with little overall effect on Chinese space technology development.

China had announced plans in 1992 for a 3 step human spaceflight program, called Project 921, or Shenzhou (actually the name of the capsule which carries its astronauts, or taikonauts). The first step was achieved in 2003 with demonstration of basic human spaceflight capabilities. In 2008 China moved on to step two, demonstration of more advanced spaceflight capabilities, such as docking and maneuvering in space. They are well into this phase in 2014, including docking with a small orbiting technology testbed, called Tiangong, which is capable of serving as a temporary manned laboratory as well. Project 921 will culminate with China having a large, permanently manned space station in orbit, likely around 2023 (Beard, 2013). Yang Liwei, China's first astronaut and now deputy director of China's Manned Space Agency, has already stated that China will welcome foreign astronauts on its space station and provide training toward enabling others to develop their own space projects (Space Daily, 2013).

Militarily, in areas such as development of anti-satellite (ASAT) capabilities for example, China is advancing quickly. ASAT technology, however, is very similar if not symbiotic to that of missile defense technology. China overtly held one ASAT test in 2007. That test on one of its own moribund satellites, which irresponsibly created massive amounts of dangerous space debris, seriously hurt China's ability to portray itself as a responsible space-faring nation. But China has long viewed U.S. missile defense capabilities as having significant offensive potential, confirmed to them in 2008's Operation Burnt Frost where the U.S. used missile defense technology to destroy a failing U.S. satellite claimed dangerous to the public. Since 2007, China has tested its ASAT-capable technology under the guise of missile defense tests. Additionally, tracking stations necessary for human spaceflight missions, can also be useful for military purposes such as tracking missiles. Undoubtedly, China has multiple justifications for space technology development.

Though international journalists, and policy officials who should know better, frequently write and talk about a Chinese manned lunar mission, as yet there is no such official program. Individuals in China sometimes speak about manned lunar landings as a given (sometimes just to chafe and spin-up U.S. officials), but that is not the case. Ouyang Ziyuan, a geologist and chief lunar scientist for the robotic Chang'e lunar exploration program, for example, has long and very publicly endorsed a manned lunar mission and his comments are often mistaken by Western media as official government policy. He also hints at exploration of the moon for Helium-3, a potential fuel for a fusion reactor. Mining Helium-3 as an economic rationale for lunar exploration once made its way through Washington circles as well –though no fusion reactor exists where it could be used. While the potential for lunar mining is very real, it is also a very long way off. Use of this rationalization now may signal efforts by scientists to address political questions about "return on investment".

It has only been in recent years that a manned lunar mission has been seriously discussed in China, first within the space com-

munity and then among decision-makers. Chinese officials prudently first focused on testing requisite capabilities through the manned Shenzhou and robotic Chang'e programs. While there is certainly enthusiasm among some groups, there is also skepticism– just as there was in the United States regarding the Apollo program –among some scientists and politicians that such a program would require too much focused funding in one scientific area, at the expense of others. Still, Chinese leaders are aware that China has reaped significant regional –and global– geostrategic benefits, including the demonstration of technical prowess and attracting students to science and engineering programs, as well as dual-use military capabilities, from its space efforts. Though it is likely that a merging of the Chang'e and Shenzhou programs will eventually be officially approved and expanded as a manned lunar program, it has not occurred yet. In the meantime though, China has already reaped considerable political benefits from its space successes, including extensive international media coverage of Chinese human spaceflights.

The 1957 launch of Sputnik was a huge psychological boost for both the Soviet people and the Soviet government during the Cold War, and conversely a huge blow to both the people and the government of the United States (Johnson-Freese, 2004). Pride, and a consequent "rallying-around" in the Soviet Union after Sputnik (as experienced as well in the United States after the Apollo moon landing), also translated into credibility and hence governmental legitimacy. Credibility and legitimacy are important considerations in Beijing as well. Shenzhou V carried Yang Liwei, the first Chinese astronaut, or taikonaut, into orbit in 2004. One Chinese official stated of that launch, "This is not America where money comes from the taxpayers. This is money of the Communist Party –they would do with it what they decide. It is great they are investing in something that makes us proud" (Bezlova, 2003). Beijing's interest in manned spaceflight for reasons of domestic pride and international prestige parallels its interest in bringing the Olympics to Beijing in 2008. Indeed, Yang carried an Olympic flag with him into orbit, unfurling it ceremoniously upon his return.

Most post-launch Shenzhou V celebrations appeared largely choreographed, as opposed to the many celebrations that spontaneously erupted when Beijing was named the 2008 Olympic host city. The space mission was both an event meant to be filmed and shown to the world, and one directed by and supported from the top levels of government. Having planned celebrations at the Millennium Monument rather than in Tiananmen Square also deflected comparisons with or reference to other times in Tiananmen that were neither celebratory nor reflective of national pride and unity. Symbolism is important.

Launching a person into orbit is a technical feat not achieved by any of the other regional space contenders, including Japan and India, and it carries with it significant leadership cachet. Officials from around the world, and particularly the region, sent congratulatory telegrams to President Hu Jintao. Initial Japanese responses to the launch varied. Some space officials discounted the technical

significance of the event while nonetheless congratulating China. One Japanese official spoke directly in geostrategic terms.

> Japan is likely to be the one to take the severest blow from the Chinese success. A country capable of launching any time will have a large influence in terms of diplomacy at the United Nations and military affairs. Moves to buy products from a country succeeding in manned space flight may occur (Japan Economic Newswire, 2003).

Space Activities Commission member Hiroki Matsuo candidly stated that "discussions on manned space flight have long been simmering in Japan", and he further implied that the launch would likely trigger a reconsideration of Japanese goals for space development. One woman on the street was quoted in Japanese media coverage as saying, "It's unbelievable. Japan lost in this field" (Japan Economic Newswire, 2003).

In India, however, space officials downplayed the technical aspects of China's launch, confidently asserting that India could do the same if it chose to, which they said it did not. Economics and need (what can a manned mission achieve that an unmanned mission cannot?) were cited as reasons for that choice (Agence France Presse, 2003).

However, then Indian prime minister Atal Bihari Vajpayee congratulated China on its success and publicly encouraged Indian scientists to work toward a manned lunar mission. "Those who wonder what could be achieved by such space missions simply want the status quo to continue", he proclaimed prior to the launch (Agence France Presse, 2003). It is unclear to or about whom he was speaking –the rest of the world, his own scientific community, or perhaps both. Just two days after China's taikonaut launch, India launched into orbit its most sophisticated remote sensing satellite to date. The lack of consequent fanfare certainly validated Beijing's manned spaceflight approach for maximum prestige value.

Since the 1960's India has had an ambitious space program, one often considered perhaps extravagant for a poor country. (Johnson-Freese & Hoey, 2010). Childhood malnutrition remains a sweeping problem in India and as of 2012, 32% of India's population is considered to live below the international poverty line (Somini, 2009)[1]. Until recently, however, India's space program largely enjoyed domestic support. Dr. Vikram Sarabhai, considered the father of India's space program, clearly linked heavenly goals to terrestrial responsibilities.

> There are some who question the relevance of space activities in a developing nation. To us, there is no ambiguity of purpose. We do not have the fantasy of competing with the economically advanced nations in the exploration of the moon or the planets or manned space-flight. But we are concerned that if we are to play a meaningful role nationally, and in the community of nations, we must be second to none in the application of advanced technologies to the real

[1] See: UNICEF statistics, http://www.unicef.org/infobycountry/india_statistics.html#69, http://www.unicef.org/infobycountry/india_statistics.html

problems of man and society. (Indian Space Research Organization).

While that quote remains as a banner on the official website of the Indian Space Research Organization (ISRO), India's outlook and plans for space have changed dramatically over the past 5-7 years. They are now much more in line with the vision of former President Abdul Kalam (2002-2007), a key developer and explicator of India's nuclear and missile programs.

While India once rejected human spaceflight as an extravagance of the rich, it has now embarked on an accelerated plan for human spaceflight to the moon and beyond. India's plans are outlined in *Space Vision 2025*, released in 2009. Theoretically, it is nested into the goals of *India Vision 2020*, authored by Kalam. While still including such goals as satellite based communications and navigation systems for rural connectivity, and enhanced imaging capability for natural resource management, weather and climate change studies, it also now includes planetary exploration, development of a heavy lift launcher, reusable launch vehicles and human spaceflight. The specifics initially included a man on the moon by 2020, robotic missions to Mars, and to a nearby asteroid and to an observable distance from the sun. In discussions with Indian analysts, this philosophical change is often explained as simply "evolutionary".

India's space agenda is considered by many as even more ambitious than China's. India has already successfully launched the Chandrayaan -1 lunar orbiter on its Polar Satellite launch vehicle in 2008. Though Chandrayaan-2 was originally scheduled for launch in 2012, it has been postponed until 2016 or 2017. Perhaps most impressively, India's Mars Orbiter Mission (MOM), or Mangalyaan, was successfully launched in 2013, and will reach Mars in September 2014. Only the United States, Europe and Russia have previously achieved that goal – with China noticeably missing from that list. MOM put India into the record books as the first Asian country headed to the Red Planet, something not unnoticed in news coverage. When the low-cost ($73 million), fast-turn-around MOM mission was launched, the *Christian Science Monitor* heralded, "India's Mars mission leaves earth orbit – surpasses Chinese ambitions" (Asokan & Reuters, 2013). India created and launched the mission on a highly accelerated schedule (Rai, 2014) to meet a small launch window, less than two years, demonstrating the importance placed on making that window, for reasons of both science – and the record books.

Within the realm of human spaceflight, an unmanned launch of a prototype capsule capable of carrying humans into space on a variant of India's Geosynchronous Satellite Launch Vehicle is projected for 2014, although funding remains tenuous (Ananthaswamy, 2014). A manned mission will likely not occur for another 4 or 5 years. In January 2010, the Indian government said a manned mission would occur in 2016, with a moon landing by 2020 so clearly, and not unexpectedly, delays are already occurring. Early human spaceflights may get an assist from Russia, as did China's early ventures. It is anticipated that Moscow will help with astronaut training. Previously, there had even been talks about India accelerating its human spaceflight program by

buying a Russian Soyuz capsule to send two astronauts into orbit in 2013 (Interfax-AVN, 2010).

India's new, expanded approach to space has not come without criticism. "India has major issues regarding education, health and rural sanitation, and these struggle to get funds", said columnist Praful Bidwai. "Yet here we are, funding a giant national ego trip when people do not have latrines. It's monstrous" (Ramesh, 2009). Others discount the link between India's poverty and expanded expenditures on human spaceflight. "The poor will always be around… If only the lunar mission's bill of U.S. $77 million –or even a bigger amount, according to other estimates– could make even a minute difference to the undoubted privation of the poor…Moon shots, of course, are more ambitious and may be less lucrative (than the information technology sector), but they are a milestone to which countries aspire on the way to becoming major powers" (Hoey, 2009).

Human spaceflight programs historically have had a hard time competing against populist issues for government funding, because the public gets a vote, as evidenced by both Europe and Japan having the technological potential for a human spaceflight program but lacking the political will. The 2009 cancellation of the Constellation program in the United States similarly reflects public priorities. There seems only one way for democracies to avoid resistance to human spaceflight goals over other national priorities, and that is to link it to other strategic goals. In the case of the United States, it was techno-nationalism during the Cold War. So too is it for India, in a techno-nationalist race against China. India has an advantage over other democracies though, as it has basically been on a war-fighting economy since its inception, with the populace largely willing to make economic choices prioritizing those areas the government deems important to security, broadly defined.

Just as space and prestige are linked, so too are security and space inherently linked, due to the dual-use nature of the technology. Not only has India been feeling pressure from the prestige China has reaped from its space accomplishments, but from the military potential of the space technology China has been developing. As succinctly headlined by long-time American aerospace journalist Craig Covault in 2012, "India Races China for Asian Prestige, Military Security" (Covault, 2012).

India states that its space program is intended for "peaceful" purposes only. Different countries define "peaceful" differently though. India considered its nuclear program peaceful right up to and including its 1974 test, and there are significant parallels, for example, between India's nuclear program development and its current space program development. Former President Kalam's definition of peaceful provides India considerable latitude. "In the 3,000-year history of India, barring 600 years, the country has been ruled by others. If you need development, the country should witness peace, and peace is ensured by strength. Missiles were developed to strengthen the country" (The Hindu, 2008). Kalam's winding but consistent view of what constitutes a "peaceful" program is also evident regarding space and provides the rationale for developing a wide range of new and emerging space technologies with far-reaching military applications.

In the spring of 2000, a report entitled "Military Dimensions in the Future of the Indian Presence in Space" caused waves within official circles but drew little international attention, probably due to its lack of availability outside of India. Perhaps most controversial was its suggestion that India could deploy a directed-energy weapon, such as a particle beam weapon, in space by 2010 and also a system referred to as the KALI (kinetic attack loitering interceptor). Likely not coincidentally, Kali is also the Hindu goddess of death. At the time of publication, the paper's author, Dr. V. Siddharta, was an officer on special duty in the secretariat of the scientific advisor to the Defense Minister. The paper is testament to, at the very least, a long-standing interest within the Indian military of deploying not only a space-based laser, but also an ASAT system.

Over the past decade, there has been no shortage of inflammatory comments made by Indian military officials claiming India's intent to weaponize space. There has also been no shortage of contradictions to these statements from India's most senior government officials – oftentimes happening within days of one another. For example, on January 26, 2007, after China's satellite shoot-down, Prime Minister Manmohan Singh and then-Russian President Vladimir Putin convened a joint press conference where Singh declared: "Our position is similar in that we are not in favor of the weaponization of outer space". This was just one day after then-Indian Air Force (IAF) chief Shashi Tyagi had stated, "As the reach of our air force is expanding, it has become extremely important that we exploit space, and for it you need space assets".

The pragmatic aspect of India's quest to keep up with China in space, including ASAT development, also stems from past experience with nuclear weapons and the 1970 Non-Proliferation Treaty (NPT). The NPT basically divides the world into nuclear "have" (those countries which had nuclear weapons prior to 1970) and "have-not" countries, with the "have" countries bestowed nearly full latitude on their nuclear development, with the "have-nots" highly restricted. India did not sign the NPT, exploded a nuclear weapon in 1974 and was thereafter denied nuclear technology from the West. Feeling stung from that NPT experience and determined not to be a "have not" in any potential space weapons treaty, India has been actively pursuing missile defense cum ASAT technology. Just as China tests ASAT capable technology through missile defense tests, so too does India (Samson, 2010).

India began missile defense tests in 2006, with increasing levels of difficulty and achievement since then. As Indian scholar Amit Saksena noted in his 2014 analysis of India's military space efforts, "The line between militarization [of space] and weaponization is blurred" (2014). India is not the first country to take advantage of that blurred line.

Both India and China deny a space race between them. China is prudent to do so, as acknowledging India's effort would only give India the credibility it seeks as a challenger. India denies a race so as not to be measured against China's substantial lead. Nevertheless, it is clear that both feel compelled to develop technology comparable to those it feels challenged by, militarily and/or for regional leadership. In the case of China, the perceived

challenge is from the United States; in the case of India, it is China.

IMPLICATIONS FOR OTHER COUNTRIES

Of the original BRIC countries, all have active, even ambitious space programs save Brazil. Brazil has a space program but, like most other countries, its ambitions exceed subsequent supportive political will and so funding. While certainly it is the case that Brazil has many other ambitious government programs that currently take priority, including both the upcoming World Cup games and the Olympics, it is also a fact that its regional leadership is not challenged by any other country, generally or regarding space activity. While Argentina, Colombia, Chile, and Venezuela are engaged in space activities beyond being user states, their programs are small.

Brazil has had a space agency since 1994, has its own launch sites and has engaged in cooperative international programs, most notably an Earth Resources Satellite program with China, and being a bilateral partner with the United States on the International Space Station. In the 1990's Brazil outlined an ambitious plan toward space autonomy, including satellite and launcher development. But in 2003, a rocket exploded on a launch pad at Brazil's Alcantara launch site, days before it was scheduled to be launched, killing 21 of Brazil's top space scientists and engineers. Devastated officials vowed at the time to continue with the program, toward making Brazil Latin America's first space power. Project officials appealed to the federal government for support (Garrone, 2003), but the risks and economics of space caught up with Brazilian ambitions and the program slowed. Joint projects may offer Brazil the best prospect for moving more than incrementally, with Russia offering Brazil cooperative opportunities in 2013 (Sputnik News, 2013).

Elsewhere, other countries profess space ambitions, but those ambitions largely coincide with testing their missile technology. Iran and Pakistan are closely watching Indian and Chinese space activities. So far, however, there appears no impetus to commit serious funding for a broad-based space program on the scale of India or China. Iran's techno-nationalism is currently playing out through its nuclear program, and Pakistan has largely limited its techno-nationalist urges to going tit-for-tat with India on nuclear weapons and missiles. Both Iran and Pakistan have missile technology that could be used for spaceflight –and Iran has even boasted that it will put an astronaut on the moon by 2025 (Hsu, 2010)– but in both cases national priority has actually been on missile development. Similarly, North Korea professes to have a space program, though testing its missile technology is clearly its main concern.

Without prestige linked to regional leadership being at risk, or a security dilemma linked to space technology, it is unlikely any other countries will commit the requisite funding for a serious space race in the near future. Space activities are high cost, high risk endeavors, as nations and entrepreneurs both have found. Success carries with it great prestige, technological benefits and potentially even economic returns. But the road to success is filled with peril; peril few countries seem willing to take on without significant impetus.

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