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Space as a strategic geography

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Space is a congested, contested, and competitive physical domain of growing strategic importance. As such, it is useful, and topical, to consider space in the context of strategic geography, which has long been a central tenet of national interests and national security. Traditionally though, the concept of strategic geography has been constrained primarily by terrestrial considerations, a limitation that discussion of the space domain must redress in order to better underpin the evolving character and conceptualisation of space power. It is in this context that space must be realised as a unique operating domain that critically facilitates global interconnectedness and interdependence in terms of economic, geopolitical, and social considerations[1]. This is all the more important noting the growing accessibility to space by state, non-state, and commercial actors makes it not only more valuable but also more vulnerable.

Strategic geography relates to the access to, exploitation of, or control over spatial areas of strategic importance to nations. In this sense, it directly influences national security and prosperity. Traditionally, it has been defined through a focus upon or delineation of terrestrial characteristics, such as land masses and maritime features. These features have typically defined boundaries in terms of nation states and areas of strategic interest, including resources, which establish a physical context for the pursuit of national advantage. All too often, this endeavour has resulted in competition, tension, and conflict.

While not immutable, the physical nature of the features has always been considered enduring in shaping geopolitical considerations. In this sense, Grey and Sloan identified that "geography is the mother of strategy (Gray & Sloan, 1999)." And while the traditional view remains extant and predominant in the realm of geostrategy, it is a perspective that equally applies to the space domain, especially in terms of underpinning the notion of space power. This is particularly pertinent as the utility of the space domain grows beyond the traditional perspective of it being solely an information ocean supporting terrestrial activities. The advent of new missions, such as planetary defence and space resource exploitation, are potential game changers.

Space power provides the conceptual basis for how the space domain may be exploited to serve national objectives. This is characterised by the application of credible space capabilities—civil, commercial and military—and political will to shape events and maintain assured access. In the military context, the evolving character of contemporary war continues to shape and define military space power, which serves to sustain a space advantage while denying the same to an adversary. As a distinct form of military power, space power is on par with sea, land, air and cyber power with each of these having characteristics that make them unique.

Critical to appreciating space power, and the capacity to exploit it, is the articulation of why space is important. This is especially relevant in terms of space-derived terrestrial effects, as well as the utility of various orbits and consideration of in-space bodies, the latter encompassing both artificial objects in Earth's orbit and natural space objects. Collectively,

[1] In this, it is critical to note that while there is a continuum from the air to space environment, the two domains are distinctly different as operating domains. Apart from physical differences in terms of atmosphere, temperature, and radiation consideration, the former relies on aerodynamic considerations and the latter on orbital mechanics.

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these aspects shape national perspectives and policy in exploiting space for national interests, which will have collaborative and unilateral considerations. And in this, Klein notes that from an historical perspective, states will always seek to protect their interests no matter where those interests lay, and that space is no different (Klein, 2020). It is in this context that strategic geography provides a useful rationale for understanding its current—and future—utilisation and protection.

In terms of exploiting space, the idea of strategic geography has both a traditional terrestrial element as well as a growing focus on non-terrestrial considerations. This reflects that the long-held narrow definition will come under increased pressure to adapt to the growing importance of information and space in a multi-domain and interdependent operating environment. From a terrestrial perspective, location matters, primarily in terms of access to space and space-derived services and effects. Launch sites and ground stations[2] provide an enduring example of the importance of terrestrial geography to space systems, an aspect that will continue to be important. In the Australian context, the value of location has been clearly demonstrated by the fact that the country sits approximately equidistant from the continental United States and Western Europe, which are both key space powers. This feature was underscored by the support provided by the likes of the Honeysuckle Creek facility during the Apollo missions as well as from a broader alliance perspective with the Joint Defence Facility at Pine Gap in the Northern Territory. This has afforded Australia significant strategic benefit.

The growing strategic importance of Australia's location has garnered an increased focus noting the rapidly evolving international security environment. For the US in particular, this has been highlighted by the rise of China as a significant regional power and emerging peer competitor, especially noting its focus on space activities and capabilities in its doctrine of information-enabled warfare (Defence Intelligence Agency, 2019). Notably, this has been reflected in the growing importance of the space control mission, for which space domain awareness (SDA) is an underlying requirement. This focus has seen the establishment of a C-band radar and space surveillance telescope in Western Australia, while there has also been past consideration regards a space fence. These form important components of a broader space surveillance network of optical and non-optical sensors used to track objects in Earth orbit. In this context, it is pertinent to note that the 2020 Defence Strategic Update stated that "Australia holds a unique geographical position to contribute significantly to collective space domain awareness with our allies and partners... In addition, Australia will need capabilities that directly contribute war fighting outcomes in the space domain using terrestrial and/or space based systems.(Department of Defence, 2020a)" This focus was clearly reflected in the 2020 Force Structure Plan, which identified new expenditure of $7 billion for satellite communications, terrestrial operations in contested space, and space domain awareness initiatives (Department of Defence, 2020b). Additionally, Australia is also in a good geostrategic location for space launches by being a politically stable country within the Western Alliance close to the equator. The recently released 2023 Defence Strategic Review has reinforced earlier guidance in regards to the growing importance of the space domain to Australia's security (Department of Defence, 2023).

From a distinctly space perspective, the notion of strategic geography has already been established, albeit not in such clear terms. While space is considered as a global commons, much like Antarctica, the reality is that the Earth-centric space operating environment has been debated in the context of sovereign rights, most notably the geostationary orbit, which has long been considered the most valuable real estate in space. This reflects that the geostationary satellite slots are of a finite number and tightly regulated. This reality came to a head in 1976 when several equatorial countries claimed exclusive sovereign rights to those portions of the geostationary orbit located above their territory. While this was roundly dismissed as counter to space law, norms and behaviours, and in particular the Outer Space Treaty (OST), it nonetheless underscores that space is not immune to considerations of strategic geography. Further, as more high-density satellite constellations, such as SpaceX's Starlink venture, are fielded in the low-Earth operating domain then this too will become more congested. This has obvious security considerations as nations and corporations compete for a finite and increasingly desirable physical space. This situation that may also be exacerbated by the ever-growing amount of space debris and the associated risk of debris-generating events, although this can be mitigated by positive control processes.

While the Earth-centric space environment is the primary focus in the foreseeable future, it is important not to dismiss that a broader perspective will become increasingly important. The cis-Lunar realm that sits between the Earth and the Moon, the Moon itself, and beyond also warrant consideration from a strategic geographic perspective with resource, scientific, and security considerations. This reflects that space itself and specific orbits are increasingly being viewed as a commodity. In terms of free space, the Lagrange Points provide highly stable positions relative to a planetary body, such as Earth. This stability, analogous to a geostationary orbit, provides an ideal location for surveillance of the space domain, especially from a scientific perspective but also potentially in terms of security. All major spacefaring nations have also articulated an intent to conduct missions to the Moon. In 2019, China landed the first probe on the far side of the Moon with plans to collect data on resources. The US, India, Russia, Europe, South Korea and Japan are all considering robotic and manned Moon missions, which ultimately may result in a permanently inhabited presence on

[2] Emerging technologies, such as intra-constellation optical links that provide satellite-satellite communications are providing greater resilience for the critical anchor stations that satellites are dependent upon.

the planet. These efforts are being driven by both scientific and commercial considerations. Notably, it is considered that the Moon may harbour rare-earth metals, such as yttrium, samarium and lanthanum, all used in modern electronics, and platinum-group metals as well as possible future sources of energy such as Helium-3. In this vein, one space mining venture has described the Moon as the 'eighth continent.' Beyond the Moon, there is also interest in space mining of asteroids with much speculation—and significant hyperbole—regarding the untapped wealth orbiting in space. And while this may currently be more science fiction than science fact, it does underscore the potential strategic geographic importance of the broader space environment when looking to the future[3].

In noting this, there remain fundamental issues in terms of both technology and law. From a technology standpoint, however, this becomes a question of viability rather than feasibility. Many companies have already started exploring the technology requirements for space resource exploitation, which may be considered challenging but not insurmountable. In terms of advancing commercial interests, the major sticking point is one of legal definition and contextual ambiguity. In particular, Article II of the OST forbids "national appropriation by claim of sovereignty, by means of use or occupation, or by any other means". This is generally construed to mean that no nation can make a territorial claim on the Moon or on any other celestial bodies, such as asteroids. However, given increased commercial space access it is now argued that there is no explicit ban of appropriation by private enterprise. In this sense, commercial interests have argued that while they would not claim ownership of space territory and entities per se, they can claim ownership of the resources they mine there. This view appears to have gained a measure of political credence with the US's passing of the 2015 Commercial Space Launch Competitiveness Act, by which companies owned by US citizens have the right to claim ownership of any resources that they mine off-Earth and the right to sell them.

The recently-endorsed Artemis Accords appear to advance this broad theme in looking to the future. The accords, to which Australia is a signatory, seek to build upon extant international agreements, such as the OST, to provide a renewed foundation for space exploration and commerce. Notably, the agreement covers initiatives that broadly encompass "... the Moon, Mars, comets and asteroids, including their surfaces and sub-surfaces." As the accords clearly state, this comprehensive context lays the foundation for the utilisation of space resources for the benefit of humankind and that the extraction of space resources doesn't inherently constitute national appropriation under Article II of the OST. The latter point is of particular importance as it creates the basis for commercial exploitation, which ties back to the growing strategic importance of space and the new opportunities it presents. Arguably, this focus is a harbinger of things to come.

So what can we conclude from this? Quite simply, it is time for space to be considered in terms of strategic geography, especially in relation to understanding space power. This reflects that strategic geography has always shaped national interest and national security, and this is no different for the space domain. In this context, it is now appropriate to frame the growing importance of space by expanding upon the limited terrestrial perspective of strategic geography. And if it wishes to have 'skin in the game,' then Australia must be closely involved in this debate noting the growing focus on space dependency and concomitant vulnerability, especially in terms of leveraging the advantages of the nation's location.

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[3] Emerging technologies, such as intra-constellation optical links that provide satellite-satellite communications are providing greater resilience for the critical anchor stations that satellites are dependent upon.