

Space Mining: The Australian Perspective

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With the reality of space mining seemingly closer than ever, Australia joins the global conversation, backed by its industry leading mining expertise and experience.

Following on from the interest generated from the December 2019 release of our US colleagues - Scot Anderson, Kory J. Christensen, and Julia La Manna, publication titled: ***ADG Insights: The development of natural resources in outer space***, this article seeks to look at the issues relevant to space mining from the Australian perspective.

Introduction: Asteroids, the Moon and Mars

In recent times, there has been increased global discussion on the extraction of metals and minerals from near-Earth asteroids, the moon and even Mars.

Currently, developments are taking place across the world in an effort to potentially claim the enormous value of precious metals thought to exist in asteroids. The composition of asteroids is categorised as carbon, silicon or metal; with particular interest in metallic asteroids due to their significant mining value.

Data from telescopic observations alongside analyses of meteorites (fragments of asteroids that have fallen to Earth) suggest that a small percentage of asteroids contain high concentrations of valuable metals such as platinum and gold. However, as previous scientific investigations into asteroids, like NASA's Minor Planet Survey, have largely focussed on discovering potential threats (i.e. extinction level events such as collisions with Earth); the exact composition of asteroids is not yet known.

Of particular interest to those seeking to monetise this field, is the understanding that there are an estimated two million near-Earth asteroids with the potential to be mined. One such asteroid recently making headlines is the 16-Psyché asteroid which orbits the Sun between Mars and Jupiter at a distance ranging from 378 million to 497 million kilometres (or 2.5 to 3.3 Astronomical Units ("AU")), with 1 AU being the distance between Earth and the Sun). 16-Psyché captured and stimulated the debate when it was widely reported by many sources as being rich in gold and other precious metals with a mining value of \$700 quintillion. While stirring debate on this topic should only be viewed as a positive, it must be noted that NASA's own Planetary Science Communications team have reported that, according to their research, 16 Psyché is comprised mostly of metallic iron and nickel similar to Earth's core. Further, NASA's current approach to 16-Psyché is an exploratory

mission with a near asteroid orbit date of early 2026. No mineral extraction of any kind has been discussed by NASA.

Mining on the Moon and Mars has also been discussed as a means to access resources that can be manufactured into construction materials or, in the case of water, transformed into rocket fuel. However, it is unlikely that these extracted resources would be sent back to Earth.

Evidently monetising this field to make mining the Moon, Mars and asteroids like 16 Psyche feasible, all run into the same problem: mining and manufacturing in such inhospitable environments requires massive technological development and advancement. Fortunately for Australia, researchers have stated that due to its history of operating largescale mining operations in remote locations, bearing a geological semblance to space mining landscapes, and being at the forefront of implementing automation and robotics- key technology required in space mining, Australia possesses very specific expertise applicable to the challenges facing mining in space. By way of example, NASA was reportedly working with Woodside Energy, an ASX top 20 listed company, headquartered in Perth, Western Australia, on automation for the International Space Station.

This provides Australia with an opportunity to not only engage in the conversation but also utilise its significant experience and expertise to be a leader in this burgeoning field.

Australia's Regulatory Framework

There is presently concern over the legal ramifications of the growing space mining industry, given the lack of legal and regulatory framework required to govern the international nature of space mining.

The current regulatory framework in Australia and across the world includes customary international law, international treaties and conventions, international case law and domestic statute and case law.

In Australia, prior to 31 August 2019, the legislative framework was governed by *the Space Activities Act 1998* (Cth) ("**the Act**") and *the Space Activities Regulations 2001* (Cth). The Act ratified the main international treaties regarding space law and regulated the conduct of space activities in Australia and by Australians overseas for which the Commonwealth of Australia would be held responsible by international law. In 2015, the Australian Government commenced a review of the Act to ensure Australia's space regulation was appropriate for technology advancements and did not unnecessarily inhibit innovation in Australia's space activities. The Act was amended to reflect improvements appropriate to Australia's national context and supported participation in the Australian space industry, while balancing the Australian Space Agency's role as a globally responsible regulator.

The newly amended act, *The Space (Launches and Returns) Act 2018* (Cth) ("**Amended Act**") commenced on 31 August 2019 and provides greater clarity and flexibility for the Australian space mining industry. Under the Amended Act, companies require approval from the Australian Space Agency to undertake certain space activities in Australia, these include:

- launching a space object from Australia;
- returning a space object to Australia;

- launching a space object overseas (and you're an Australian national with an ownership interest);
- returning a space object overseas (and you're an Australian national with an ownership interest); and
- operating a launch facility in Australia.

Australia's new regulatory framework under the Amended Act is articulated in '**Rules**' (outlined below) instead of regulations, to provide increased flexibility:

- *the Space (Launches and Returns) (General) Rules 2019*, which set out the application requirements and conditions for the licences, permits, and authorisations ("**General Rules**");
- *the Space (Launches and Returns) (High Power Rockets) Rules 2019*, which governs the specific regime for high power rockets and is effective from 30 June 2020 ("**High Power Rockets Rules**"); and
- *the Space (Launches and Returns) (Insurance) Rules 2019* ("**Insurance Rules**").

These Rules are in relation to the administration of launch facility licences, high power rocket permits and prescribed insurance, including amounts covered, for different types of launches.

The Amended Act removes barriers to participation in preliminary space mining activities by encouraging innovation and entrepreneurship. Critically, the new legislative framework does not contain any provision for the appropriation of outer space resources or mining rights and processes.

The Amended Act is one of the foundational steps to propelling Australian space resource prospecting and exploration activities. The Amended Act streamlines the approvals processes and lessens required insurance amounts for launches and returns, capping the maximum amount of insurance required at AUD\$100 million. At the same time, it ensures the safety of space activities and reduces the risk of damage to persons and property as a result of activities, and implements other obligations under the various international treaties. For example, s 62(1) of the Amended Act provides that the Minister may publish notices setting out appropriate information about licences, permits or authorisations which is a domestic extension to Australia's obligations under the United Nations Convention on Registration of Objects Launched into Outer Space. This convention requires countries to provide the United Nations with details about the orbit of each space object. It is intended that the level of information, insurance required and conditions will be commensurate with the activity's risks of potential damage caused to the surrounding environment or people.

Recognising the rapid technological development in the space sector, the Amended Act broadens the regulatory framework to specifically include launches from aircraft in flight and provides for launches of high power rockets. The Amended Act increased the penalties for contraventions of the Amended Act with significant monetary penalties imposed for individuals launching or returning a space object or high power rocket without a licence.

The reduction in cost and lowering of administrative barriers to participation flowing from the new legislative framework is aimed at fostering a more open space mining market in Australia. For space mining in Australia, it also creates new commercial opportunities for mining companies looking to continue, or expand, their investments and developments. This would allow existing and new players in the mining industry to use their technical expertise to innovate and fully harness sustainable

mining, artificial intelligence and pure automation with a view to adapt these to the outer space environment. As extractors come from all over the world, the Australian mining industry has expertise in making them autonomous and then integrating them into remote asset management- an advantage to the development of the Australian space mining industry. It is expected that the vast costs, complexities and need for support for development will ultimately require government-to-government partnerships between Australia and other large countries such as the United States, Japan or China. With key Australian mining players already competing in the space mining race, there is keen interest on the long term effect of these legislative changes and future government action on the promotion of participation, innovation and investment.

International Regulatory Framework

For in-depth information on the international regulatory framework governing space mining, please see the publication prepared by our colleagues in the United States, Scot Anderson, Kory J. Christensen, and Julia La Manna, titled: ***ADG Insights: The development of natural resources in outer space.*** This excellent publication also provides an overview of the US legislative regimes governing the space mining industry as well as commentary on some of the key commercial consideration relevant to an entity embarking on any form of commercial mining venture in space.

As explained in our colleagues' publication, internationally, the five main multilateral treaties and conventions governing space law to which Australia is also a party to, are:

1. the 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and other Celestial Bodies ("**Outer Space Treaty**");
2. the 1968 Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space ("**Rescue Agreement 1968**");
3. the 1972 Convention on International Liability for Damage Caused by 'Space Objects' ("**Liability Convention 1972**");
4. the 1975 Convention on Registration of Objects Launched into Outer Space (the "**Registration Convention**"); and
5. the 1979 Agreement Governing the Activities of States on the Moon and other Celestial Bodies ("**Moon Treaty**").

The seminal international treaty is the Outer Space Treaty, signed by 106 countries including Australia, the United States, Luxembourg, the United Kingdom and Russia, amongst others. One of its main principles which potentially obstruct private or national appropriation of outer space is the declaration that the moon and other celestial bodies are the province of all mankind (Outer Space Treaty Article I) and is not subject to national appropriation by claim of sovereignty, "use or occupation or by any other means" (Outer Space Treaty Article II). Further, the Moon Treaty presents an even more significant barrier to space mining by prohibiting resource extraction from the moon, as the moon and other celestial bodies as well as their resources are the common heritage of all mankind (Moon Treaty Article 11(1)). However, the ambiguity from these treaties in their current form means that there is great doubt about whether space mining is prohibited. Framed broadly, the international treaties provide scope for amendment in this respect and for the creation of dispute resolution mechanisms of future disputes over space mining activities especially

where disputes occur between nations or a group of nations and/or large international private entities.

Arguments have been advanced that there are numerous examples on-land where resources are profitably exploited in the absence of fee-simple ownership and that these treaties simply provide a right to access the moon and other celestial bodies. Hence, the United States and Luxembourg have enacted legislation which creates private property rights of resources extracted from space. Such legislation being: the *U.S. Commercial Space Launch Competitiveness Act* and the *Luxembourg Law on the Exploration and Use of Space Resources*.

Upon review of both United States and Luxembourg national laws, it becomes evident that the international obligations under the abovementioned treaties are explicitly affirmed. Despite assertions that these national laws are not an attempt to re-interpret international law, pundits have argued that these laws do just that, at least as far as the Outer Space Treaty are concerned, to which the United States and Luxembourg are parties. Both nations assert that their laws are a necessary first step to provide legal certainty to the new industry with a view to securing investments. As such, they would not stand in the way of subsequent future international agreements. As the International Institute of Space Law on Space Mining's 2015 Position Paper states, a national law such as the United States' Commercial Space Launch Competitiveness Act can be a possible interpretation of treaty law; however, it is not necessarily the only correct interpretation.

Relationship between national and international law

Since the United States, Luxembourg and Australia are all parties to the Outer Space Treaty, they must act in conformity with its provisions. The current Australian legislative framework continues to give effect to the international treaties above. This means that until Australian law is enacted to appropriate resources extracted from outer space bodies, the current legislative position reflects that of the international law position, whereby appropriation of outer space resources extracted has not been expressly prohibited- although appropriation of celestial bodies are prohibited.

The Amended Act is therefore a preliminary step to national engagement and encouragement to participate in the space industry. For clarity and engagement with Australian mining companies, the Australian government must, as a first step, found a legal basis which vests resources extracted from outer space with the Australian state- which may probably only be sourced from an international level. Only then, would there be certainty about Australia granting property rights in these resources to private entities. The future Australian and international space mining framework must at a minimum address the matters raised in ***ADG Insights: The development of natural resources in outer space***, including conferral of title, rent and royalty regimes and enforceability against overseas nations or entities, to provide certainty to the mining industry essential to the finance, investment and development of space mining equipment and infrastructure.

It is unclear whether Australia will adopt the same position as the United States or Luxembourg of full private appropriation, development and extraction in consideration of the Australian on-land mining legislative regime. As the Amended Act in its current form only governs the process of launching and returning of space objects, future steps would be to develop a space mining licensing regime to regulate resource extraction and related activities once these objects leave our planet. We speculate that future Australian space mining activities could also take the form of mining state (or

in this case, national) agreements. State agreements are used in Australia between governments and a private company to build or operate a specific development and have been predominantly used in Australia for pioneering mining and oil and gas activities. For example, in Western Australia, Australia's largest mining state, there are 65 state agreements currently in operation, governing energy and resources projects, some of which have been in operations since the 1920's. In any event, due to the scale of potential space mining projects as well as funding needs, national significance, safety and environmental implications, we anticipate that the Commonwealth Government will have a large role to play in facilitating and executing any Australian space mining endeavours.

Future Development

As a nation with a well-developed and sophisticated mining sector, Australia is presently developing a model for future Australian mining operation on asteroids.

The Australian Asteroid Mining Project, formed in August 2017, has ambitions of a prototype mission by mid-2020. This research project consists of sixty academics from across Australia's leading universities with expertise ranging from space engineering, astrophysics and law.

The Australian Remote Operations for Space and Earth was announced in February this year to be based in Perth, Western Australia. The industry-led, not-for-profit consortium will seek to position Perth as a global sector for remote operations in space, and capitalises on the Western Australian resources sector's position as global leaders in autonomous and remote operations to develop technologies and services for space that will benefit future mining exploration.

NASA's administrator Jim Bridenstine has urged Australian mining companies to grasp the opportunity and challenge of applying industry expertise in remote resource extraction to the moon. With the Australian Space Agency entering its third year of operation, many have called for the launch of an organisation bringing together Australian industry, government and science/academia to build extractive technologies for space.

Bridenstine has stated that NASA's vision of the future includes Australia. It is anticipated that Australia can be part of the next moon mission and eventually missions to Mars, with involvement to ultimately be a government-to-government partnership. Therefore, for the mining industry to fully-engage in space mining as a private enterprise, global governments would need to introduce legislation allowing industry participation in the ground-breaking opportunities space mining presents.

Conclusion

As is evident by the extent of the Australian framework, as outlined above, together with the time invested by government and policy makers to create and refine same, Australia is seeking to position itself to partner with other governments and industry in order to successfully develop a space mining project (or projects). With a flexible framework in place and its industry leading mining expertise and experience, there is no reason why Australia cannot be a significant player in the not too distant space mining future.

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