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Australian Space Regulation and commercial space transportation: the potential benefits of developing clearer regulatory policy

Shena Howell, *Senior Systems Engineer – Space, Shoal Group Pty Ltd, Adelaide, Australia,*
shena.howell@shoalgroup.com

Abstract

Australia's existing Space (Launches and Returns) regulations do not specifically address orbital and suborbital space transportation. While not specifically addressed, the *Space (Launches and Returns) Act 2018* and its associated Rules and standards* have established a sufficient framework to evaluate and authorise suborbital and orbital launches and returns, as well as launch facilities, which broadly cover the needs for space transportation.

However, the Australian space regulations do have some key gaps which will likely result in challenges for applicants intending to conduct regular space transportation operations to, from, or within Australia. One potential issue is not in the space regulations specifically, but in the definition of the boundaries and interaction with other regulations and regulatory bodies, like the Civil Aviation Safety Authority (CASA) which is responsible for airspace management. Another key issue is the silence of the Australian space regulations on human spaceflight, and the unique challenges it has for ensuring safety.

While the existing Australian space legislation can potentially support these types of space activities, the ambiguity in the governance will likely result in significant work for the applicants and the regulator to develop a path forward. By pre-emptively updating the Australian space regulation to specifically address suborbital and orbital space transportation, a considered approach can be developed to address potential challenges.

* *Space (Launches and Returns) (General) Rules 2019, Space (Launches and Returns) (High Power Rocket) Rules 2019, and Space (Launches and Returns) (Insurance) Rules 2019*, *Flight Safety Code*, and the *Maximum Probable Loss (MPL) Methodology*

Keywords: Australia, space transport, regulations

1 Introduction

With the development of reliable, reusable launch vehicles and the emergence of space tourism flights (suborbital, crewed flights), there are increasing indications that space transportation will become a regular commercial operation in the not-too-distant future.

In 2024, the Unites States (US) Department of Defense (DoD) invested significantly in the technology development of both point-to-point space transport concepts looking to deliver payloads anywhere in the world in under an hour, as well as in orbital space object cargo drop technologies [1]. In February and May 2025, Varda Space successfully completed two deliveries of orbital capsules designed for medical microgravity manufacturing to the Southern Launch Koonibba Test Range in South Australia, marking the first time a commercial operator has conducted a re-entry of an orbital space object to a commercial range [2]. And the global microgravity research market is expected to grow from \$3.3 billion in 2024 to \$5.32 billion in 2029 at a compound annual growth rate (CAGR) of 10% [3].

Yet, with demand and technologies clearly surging towards a future where deliveries and potentially the transport of people will regularly traverse through space, there are gaps in the regulatory environment in Australia and internationally that will need to be addressed to efficiently support space transport.

2 Current regulatory environment

In Australia, the *Space (Launches and Returns) Act 2018* ('the Act') clearly specifies that anything launched to, or returning from above 100 km above mean sea level is regulated by the Act, and therefore, must receive an authorisation or permit. Launches under 100 km but above a certain impulse threshold also must be permitted under the regulation. The 100 km limit is typically referred to as the Karman Line and is widely considered the point at which an object crosses into space.

Currently, in Australia, each launch or return, or series of launch or returns, must be reviewed and authorised to ensure the activity complies with the Act and its subsequent regulations.

Of course, an object cannot travel to or from space without going through airspace. In Australia, as is the case in most of the world, commercial air traffic is monitored and controlled up to 60,000 ft, or roughly 18.3 km [4]. Air traffic over and around Australia is controlled by the Civil Aviation Safety Authority (CASA), though international civil aviation services are subject to legal systems established by the Chicago Convention of 1944, working under the International Civil Aviation Organization (ICAO) [5]. ICAO helps 193 countries to

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cooperate together and share their skies to their mutual benefit through published Standards and Recommended Practice (SARPs), which typically are adopted in national legislation [5, 6].

For space activities, a different international coordination body exists under the United Nations Office for Outer Space Affairs (UNOOSA), which works to promote international cooperation in the peaceful use and exploration of space [7]. In addition, Australia is party to several international agreements regarding the responsible use of outer space, such as *Convention on International Liability for Damage Caused by Space Objects,* and the *Convention on Registration of Objects Launched into Outer Space*. However, UNOOSA does not have an equivalent level of standards and recommended practices for launches and returns that ICAO has for international air space management, so it does not have direct application in coordinating a path forward for future space transport. Without widely accepted standards and frameworks, each space activity, especially those involving more than one nation, must be reviewed and approved independently.

3 How the current regulations can be leveraged for space transport

As has been evidenced by the successful Varda Space returns, there is a viable path through the existing regulatory framework for space transport.

The Australian *Space (Launches and Returns) Act 2018*, along with the *Space (Launches and Returns (General) Rules 2019* and the *Space (Launches and Returns) (High Power Rocket) Rules 2019*, collectively referred to as ‘the space regulations’, clearly identify that launches from Australia require an authorisation: launches that exceed 100 km in altitude requires an Australian Launch Permit, launches under 100 km altitude that exceed established impulse thresholds require a High Power Rocket Permit, and returning a space object from beyond 100 km altitude to a place in Australia requires a Return Authorisation. Therefore, point-to-point space transport from Australia is reviewed and authorised through an Australian Launch Permit or High Power Rocket Permit, and a cargo delivery from orbit to Australia is reviewed and authorised through a Return Authorisation.

In both point-to-point and orbital delivery cases, if the starting point or destination of the activity involves another nation, the person or company seeking to conduct the activity will also need approval from that nation’s regulator. For the Varda Space capsules, Varda was required to get a permit for launch and return from the Unites States Federal Aviation (FAA) Office of Commercial Space Transportation (AST) under the Code of Federal Regulations (CFR) Title 14 Part 450 Launch and Reentry License Requirements prior to launch of the Australian-bound series of capsules [8]. The activity also required an Australian Return Authorisation, granted by the Minister for the Department of Industry, Science and Resources [9]; the Australian Space Agency is a specialist division within the Department of Industry, Science and Resources.

Noting that mechanisms exist currently for space transport, if suborbital or orbital space transport becomes a more regular occurrence, an updated approach will be required to overcome the challenges of the current regulatory environment, discussed in section 4 below.

4 Challenges with the current legislative approach

As mentioned, space activities in Australia are authorised per launch and return, or series of launches and returns. In the case of Varda Space, a series of three returns was authorised by the Minister [9]. In a future where goods are shipped regularly across the world via suborbital spaceflight, the necessary review and approval times of individual reviews and authorisations will likely become a barrier to the cadence of commercial operations.

In addition, currently, each application must include activity management plans, as well as safety plans, which outline how the activity will ensure the risk to public is low as reasonably practicable. This typically includes coordination by the applicant with airspace regulators and controllers, (i.e., CASA and Airservices Australia) to ensure a Notice to Airmen (NOTAM) will be issued for Temporary Restricted Areas (TRA) and / or Temporary Danger Areas (TDA) established based on flight safety analysis data, which ensures the risk to people in the air is reduced to as low as reasonably practicable. For the same reasons, coordination through the Australian Hydrographic Office (AHO) is typically required to establish Notice to Mariners (NOTMARS) for trajectories over the ocean, with monitoring required to ensure any high-risk areas like schedule debris drop zones are clear of people. Road closures or other land restrictions may also be required. Without developing a standardised approach, these coordination activities will likely quickly become an administrative challenge for the related regulators, and those seeking to perform commercial space transport.

This is further supported by the fact that across the globe, air traffic controllers are struggling to manage the increasing volume and complexities of commercial air traffic [10], and this is before the additional challenges of coordinating regular space-based travel through the airspace. Similarly, the volume and challenges around space traffic management have become an increasingly difficult to manage [11]. Orbital cargo drops will add additional complexity to space traffic management since they will require complex orbital manoeuvres from a stable low Earth orbit to a specific re-entry trajectory, moving through the orbits of other space objects. Similarly, suborbital transport flights must be assessed by space traffic managers to ensure there are no conflicts

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(potential conjunctions) with other launches and re-entries, with extremely low orbiting satellites, and that they will maintain at least a 200 km stand-off from human-occupied space assets, like space stations [12].

Beyond the operational safety aspects, there are several other regulatory challenges that will need to be met to enable regular commercial space transportation. For example, if the ultimate goal is to enable deliveries from anywhere on the globe to anywhere on the globe with a delivery accuracy of 6 meters [1], the typical approaches used for immigration control, customs control, biosecurity, and export controls will need to be adjusted to account for delivery or arrival outside of traditional ports of entry (i.e., airports or marine ports). Other aspects like environmental protections (including noise, air quality, etc.) and security (including security of critical infrastructure) will also need consideration.

5 Compounding complexity with human transport

While suborbital and orbital cargo space transport is covered under the existing legislation, the Australian regulations are silent on human spaceflight, so there is no clear authorisation path for crewed space activities.

In the United States, since the FAA does not certify launch or reentry vehicles as safe for carrying humans, federal law requires flight crew and space flight participants be briefed on the risks and hazards involved in human space flight launch and reentry operations, prepared in easily understandable language, before each person signs an informed consent of the risks [13].

Even though the Australian regulations are silent on human spaceflight, the *Space (Launches and Return) Act 2018* focuses on the risk of harm of space activities to the public (i.e., third party people and property), not a 'related party' to the activity. In addition, the Act definition of a related party includes a "contractor, subcontractor or supplier involved in the launch or return or the preparation of all or part of the space object for the launch or return." Therefore, there may be a potential pathway under the existing legislation to adopt an informed consent approach similar to the US approach.

Further, in the US approach, the FAA verifies that launch or reentry vehicles meant to carry humans operate as intended, and the FAA regulates flight crew qualifications and training. In theory, the same type of review is applicable under Australian regulations since the regulations require the application to include design information, as well as evidence of the competence of the persons conducting the activity. While these broad requirements can enable the review of the systems for human space activities, specific instructions or guidelines for this type of activity are not available in Australia. So, an applicant seeking to get approval for a crewed mission would need to work closely with the regulator to develop an individual approach that satisfies the Minister that the activity is safe. However, for regular human spaceflight, the regulations will need refined for efficiency.

This is not unique to Australia. Regulations across the globe need developed to support the burgeoning space tourism industry. The National Space Administration of China identified cultivation of space tourism as a future aspiration in its 2022 White Paper, but it is also acknowledged that dedicated regulations for its commercial space sector are not yet developed [14]. Similarly, the FAA created an Aerospace Rulemaking Committee (SpARC) in April 2023 to "collaborate with industry on the development and cost of possible future regulations for commercial human space flight occupant safety", with the SpARC delivering its final report on 4 April 2025, and the FAA planning to release the report to the public in the near future [13].

6 Possible options for improvement

6.1 Certification of spacecraft and operators

To reduce the per-activity approval burden for space transportation, it could be more effective to move to a model aligned with the civil aviation approach, where vehicles and operators are certified for a specific scope [15]. New systems, systems with significant changes, or significant operational changes would still be subject to individual review and authorisation to ensure appropriate oversight and incorporation of risk treatments. Yet, certification can be applied for mature, robust, and proven technologies, enabling continuous operations under the approved scope (with defined maintenance and overhaul schedules). Similarly, commercial space transport operators can be certified to perform the specified transport tasks.

6.2 Coordinated approach to traffic management

The US FAA and NASA have begun development for upper 'Class E' operations above 60,000 ft, and the development of a Class E traffic management (ETM) concept. This approach seeks to coordinate international norms and promote shared situation awareness among operators [16]. A coordinated, international approach will ensure the development of consistent regulatory frameworks, operating rules, performance-based standards and procedures, and roles and responsibilities that ensure the accountability of operators seeking to do point-to-point suborbital transport.

Technology developments like space-based Air Traffic Management systems, like those being developed by Skykraft may also assist by ensuring the continuous positional tracking and reporting of suborbital space transport objects, especially in areas where traditional air tracking has gaps, like over the oceans [17].

Similarly, space transportation may look to introduce "flow corridors" similar to those being introduced for air traffic management; essentially a tube-shaped airspace developed to better accommodate high levels of traffic

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[18]. This could be particularly useful for space-based transport where reliance on atmospheric conditions like jet streams is less important. A flow corridor approach could simplify the impact to airspace users, standardize hazard and warning areas for maritime traffic, etc.

6.3 Establish spaceports as ports of entry

The current Australian space regulations include scope for reviewing and authorising facilities that will conduct a launch authorised by an Australian Launch Permit. These facilities are authorised through a Launch Facility Licence. Currently, high power rockets and returns are not required to use licenced facilities.

The space regulations should be updated to incorporate relevant regulatory requirements when a facility will be used as a destination for space transport to include the relevant requirements for ports of entry to Australia. This will ensure that the appropriate controls are implemented at the sites to maintain customs and border security controls.

For point-to-point deliveries, a new approach may be required where deliveries can be pre-cleared prior to shipment, or arrivals can be brought to a centralised processing facility for declaration and screening.

6.4 Closing the gap for regulation of human space flight in Australia

Adding specific criteria for human spaceflight in the space regulations will improve the efficiency of any future human spaceflight operations to or from Australia. In the absence of updating the regulations, providing a clear indication of acceptable approaches for human spaceflight design will benefit any future applications. Examples may include the FAA's Human Spaceflight checklist [19] or NASA's Human Spaceflight Standards [20].

7 Conclusion

Through a proactive approach a regulatory framework can be established that will improve efficiency and meet the cadence required for suborbital and orbital space transport. In addition, closing gaps in the Australian space regulatory framework around human spaceflight will open opportunities to have Australia as a destination of choice for international travel through space.

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