

SOUTH AUSTRALIA'S ROLE IN THE SPACE RACE: THEN AND NOW

I INTRODUCTION

It would surprise most people to learn of Australia's almost forgotten role in the space race of the Cold War Era. Whilst many people are familiar with the name Woomera, few have any knowledge that it was from this remote South Australian township that an Australian satellite constructed at the University of Adelaide was launched into space on an American rocket, making Australia the fourth country in the world to launch a satellite from its own territory.¹ What we do know is that little followed from this first bold experiment. Australia certainly went on to become a major provider of ground services, famously celebrated in the beloved Australian movie *'The Dish'*, but few Australians regard Australia as a potential site for space launches even now at the dawn of the new era of commercial space.

Australia played a key role in the development of rocket technology after World War II. Whilst derived from the weapons developed and used by Germany during the war, that same technology constituted the basis of the rockets that would take the USSR and the USA into space from the 1950s onwards. Indeed, that technology remained fundamental to launches into space until the recent disruption to the space industry caused by commercial start-ups such as Blue Origin, SpaceX and RocketLab.² Australia, and importantly South Australia, have played a significant role in fundamental space research from the dawn of the space age. However, prior to the announcement of the creation of an Australian Space Agency at the International Astronautical Congress ('IAC') in Adelaide in September 2017, there was only a fragmented appreciation of the role that Australia had played in this endeavour and of the significant contribution that Australia can make to Space 2.0 if the right regulatory framework is created.³

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¹ Allan Forbes, 'A Historical Perspective on WRESAT, the First Satellite Launched from Australian Soil' (2018) 6(1) *Australian Journal of Telecommunications and the Digital Economy* 118, 118.

² For a discussion of the commercialisation of space law, see Joel Lisk, 'Space Law: A Treatise' (2018) 39(2) *Adelaide Law Review* 453, 473–6.

³ Melissa de Zwart, 'We have lift off! Why Australia needs the new Space Agency' (2018) 43(2) *Alternative Law Journal* 71.

This article will explore some of South Australia's role in the fostering and facilitation of an Australian space industry. It will focus on activities rather than individuals, but it should be noted that several key figures in the Australian space pantheon are from South Australia. These include University of Adelaide physicist John Carver, astronaut Andrew Thomas, space lawyer Michael Davis and space archaeologist Alice Gorman, each of whom in a unique way has contributed to the growth and recognition of the Australian space industry. The article will consider in particular the importance and legacy of Woomera, the advocacy for a Space Agency leading up to the IAC, and activities of the Adelaide Law School, through projects such as the *Woomera Manual on the International Law Applicable to Military Space Operations*, as examples of the role that has been and continues to be played by South Australians in the fostering of an Australian space industry. This article will uncover a little of the importance of the history and legacy of Woomera and point the way to a revised role for South Australia in the new domain of commercial space.

II THE WOOMERA ROCKET RANGE

The Woomera Rocket Range (now known as the Woomera Protected Area) is the largest land-based rocket range in the world, covering an area of approximately 122,000 square kilometres.⁴ At its maximum in the heyday of rocket testing, covering an area of 270,000 square kilometres, Woomera hosted the second highest number of rocket launches in the world, exceeded only by the NASA launch facilities at Cape Canaveral.⁵

Following the capture of the German V2 rocket technology at the end of World War II, the United Kingdom needed a rocket range to continue testing and developing this potent weapon. Two sites were considered as potentially suitable: Canada and outback South Australia. The South Australian site was chosen because its size (at the time, larger than England itself) and remoteness made it uniquely valuable for the development, testing and evaluation of a variety of weapons, aircraft and rockets, including some of the earliest work done involving autonomous or pilotless aircraft, now known as drones. Located approximately 500 km north of Adelaide, its remote and (to many) hostile desert environment made it a desirable location both on national security grounds and due to its quiet electromagnetic environment and many days of clear skies. The leader of the the United Kingdom Mission in 1946, General JF Evatts, is recorded as declaring the attributes of the site:

⁴ Australian Government, *Coexistence in the Woomera Prohibited Area 2018 Review* (2018) 12 ('Coexistence Review').

⁵ For a comprehensive account of the history of Woomera, see Peter Morton, *Fire Across The Desert: Woomera and the Anglo-Australian Joint Project 1946–1980* (Australian Government Public Service, 1989); Woomera High School, *A Sense of Urgency: A Social History of Woomera: Its Inception and Growth 1947–1965 and the History of Education in Woomera 1950–1978* (Woomera High School, 1978); Helen Buchanan and Katrina Edwards (eds), *Woomera the First Fifty Years 1947–1997* (Woomera Board, 1997). For a more general overview of Australia's history in space, see Kerrie Dougherty, *Australia in Space* (ATF Press, 2017).

Three thousand three hundred hours of sunshine a year, cloudless skies for nine months of the year, close to a rail link, good for airfield building and, of course, its remoteness.⁶

The Woomera Rocket Range consisted of the township of Woomera, which was closed to the general public until 1982, as well as an airport, observation posts and various defence infrastructure assets and testing areas, as well as later, the Nurrangar and other United States satellite ground stations. The township at Woomera was at one time a vibrant place, with a bowling alley, movie theatre, swimming pool, shops and schools, and a hospital with the highest birth rate in Australia in the 1960s.⁷ The township was built with horseshoe shaped streets to encourage neighbourliness and the streets were given Aboriginal names.⁸

The Australian government agreed to participate in the project on the condition that Australia would be an equal partner in the project: 'Australia would share the development and maintenance costs of the Rocket Range in return for technology transfer, the employment of Australians within the facility and contracts to Australian industry.'⁹ The Anglo-Australian Joint Project was formally constituted by agreement between Australia and the the United Kingdom in 1946, with area being declared a Prohibited Area in 1947 and testing commencing the same year.¹⁰ Underpinning the creation of the Joint Project was the intention and desire that Australia would develop its technological expertise and capability.

Supporting the testing work to be undertaken at the Woomera Rocket Range, the Long-Range Weapons Establishment ('LRWE') was established at a disused munitions factory in Salisbury, north of Adelaide. In 1949 the Australian Defence Scientific Services ('ADSS') was also established to oversee and facilitate this research. Importantly, this led in 1955 to the creation of the Weapons Research Establishment ('WRE') which was to play a key role in the development and launch of Australia's first domestically built and launched satellite.¹¹

Although testing had commenced in 1947, the Joint Project was nearly abandoned in 1948 when the United Kingdom cancelled its long range missile development program, but significant work and investment had already been undertaken in the establishment of the Woomera Rocket Range. Therefore a shift was made at this time to apply the use of both the facilities and the rocket and related technology to various other defence related activities including guided weapons and the development of radar. This constant shift in focus of core projects became a hallmark of the work

⁶ Woomera High School (n 5) 8.

⁷ Alice Gorman, *Dr Space Junk vs The Universe: Archaeology and the Future* (NewSouth, 2019) 93.

⁸ Gorman (n 7) 99, 237.

⁹ Dougherty (n 5) 11.

¹⁰ Coexistence Review (n 4) 11.

¹¹ Dougherty (n 5) 14.

conducted at Woomera, as British Government priorities altered course along with the weapons development of the Cold War.

In 1956 the British Government commenced the Blue Streak project, which involved a launch of the smaller Black Knight rocket from Woomera in 1958 and the first Blue Streak in 1960. The launch of the massive Blue Streak, intended as a ballistic missile capable of delivering a nuclear warhead across Europe from the UK to the Soviet Union, required expansion of the launch facilities at Lake Hart and the installation of enhanced tracking and recording facilities at the Woomera Rocket Range and at the intended test impact point of Talgarno in Western Australia. However, yet again the program was cancelled due to a change of British policy regarding the effectiveness and relevance of the Blue Streak as a weapon.¹² The next phase of the project was to see the repurposing of the rocket as a launch vehicle rather than a weapon.

The project came under the auspices of the European Launcher Organisation ('ELDO') a consortium consisting of the United Kingdom, France, Belgium, the Federal Republic of Germany, Italy and the Netherlands. Australia joined the project as a full partner on the basis of providing the launch facilities at Woomera. Australia's contribution to the ELDO launch project included launch tracking and monitoring and range safety, provided by WRE.¹³ A tracking station was constructed at Gove, also under the management of WRE. The program operated from Woomera from 1964 until 1970 but was unsuccessful in placing a satellite in orbit.¹⁴

After the relocation of the ELDO launch program to French Guiana, the United Kingdom contributed its own tests of the Black Arrow (a development of the Black Knight).¹⁵ The final Black Arrow launch in 1971 placed the Prospero satellite in orbit (the second and last satellite successfully placed in orbit from Woomera). The United Kingdom cancelled the project shortly after this launch.¹⁶

Woomera was also used as the launch site for an extensive and successful research program using sounding rockets, conducted by the University of Adelaide, and many other Australian and international universities. A sounding rocket carries a variety of scientific testing instruments to a sub-orbital distance. WRE was also involved in many of these projects and, on the basis of this experience, began designing a specific Australian sounding rocket. Professor John Carver, a professor of physics at the University of Adelaide, was involved in the early Skylark projects and then collaborated with WRE on the later High Altitude Density (HAD) rockets.¹⁷

¹² Morton (n 5) 409.

¹³ Morton (n 5) 451–3.

¹⁴ Dougherty (n 5) 32.

¹⁵ ML James, 'Into Space from Australia – the Early Days' (Conference Paper, National Conference on Engineering Heritage: Interpreting Engineering Heritage, 5 December 1990), 54.

¹⁶ Dougherty (n 5) 35.

¹⁷ Ibid 38.

This collaboration provided the foundations for the design, building and launch of the first Australian satellite.¹⁸

Provided with the opportunity to use an unwanted United States Redstone rocket, WRE seized upon the chance to build its own satellite, which acquired the somewhat unexciting but descriptive name of WRESAT. Working together with Professor Carver and his team at the University of Adelaide under a very tight timeframe, WRE designed and constructed a range of instruments intended to measure solar radiation. The satellite was successfully launched on 29 November 1967 and operated for only five days, as the design parameters meant it was dependent upon limited battery power. WRESAT remained in orbit until 10 January 1968, after which it re-entered the atmosphere and disintegrated. This project made Australia the fourth country to launch its own satellites from domestic soil.¹⁹

Unfortunately, despite the enthusiasm of the satellite team for a further sequence of launches, capitalising upon their experience with the WRESAT launch, and notwithstanding the offer from the United States of additional Redstone rockets, the Australian government of the day had no appetite for further adventures in space. Several commentators have lamented the failure of the Australian Government to foster or build upon the early successes and know-how of the WRE and Woomera team. There was no attempt to capture, retain or build upon the expertise gained by Australian personnel who worked on the ELDO Project.²⁰ Although others have argued that in many of these projects ‘Australia contributed the real estate and little else.’²¹ As Gorman notes

[a]fter launching one Australian satellite, we retired hurt. Space became a dirty word to politicians and I’ve even heard people say ‘Forget Woomera. It’s all in the past’.²²

Upon the formal conclusion of the Joint Project on 30 June 1980, the Woomera Rocket Range became home to a number of uses including various defence training exercises, some of which extensively damaged the remaining foundations of the launch sites on Lake Hart, continued use for experimentation and testing using sounding rockets, testing and development of autonomous aircraft and the notorious Woomera Immigration Reception and Processing Centre, which operated from 1999

¹⁸ Ibid 38.

¹⁹ Or possibly, the third or fifth such nation. There is debate regarding the characterisation of ‘domestic launch’: see Dougherty (n 5) 45.

²⁰ Morton (n 5) 477; Jo-Anne Gilbert “‘We Can Lick Gravity, But...’: What Trajectory for Space in Australia?” (2009) 25(3) *Space Policy* 174, 174.

²¹ Brett Biddington and Roy Sach, ‘Australia’s Place in Space: Toward a National Space Policy’ (Kokoda Paper No 13, June 2010) 13.

²² Gorman (n 7) 100.

to 2003.²³ Remarkably in 2007, the American Institute of Aeronautics and Astronautics designated the Woomera Rocket Range an Historic Aerospace Site.²⁴

Even prior to the establishment of the Woomera Rocket Range the area was subject to a variety of existing uses. This included the local Indigenous people, the Kokatha, the Pitjantjatjara, the Arabana, the Antakirinja, and the Yankunytjatjara, who remained in the area despite earlier government removal and resettlement programs.²⁵ Other users included the pastoralists, whom it had been deemed too expensive to remove,²⁶ mineral prospectors and the railway line. With the changing use of the Woomera Rocket Range, now known as the Woomera Protected Area ('WPA'), as well as a revised interest in both the mining and tourist potential of the area, a Review of the WPA was announced on 17 May 2010, to investigate the best uses of the WPA in the national interest. That review resulted in significant amendments to the use and access to the area, including the identification of three zones: Red, Amber and Green. The Coexistence Review determined that Defence remained the primary user of the WPA and that Defence should continue to control access to the WPA. There was however increased recognition of the value of other uses, in particular the 'significant resources potential' leading to the recommendation that 'the WPA should be opened up to resources exploration to the maximum extent possible'.²⁷ The increased access to the WPA by non-defence interests was created through a new regime under the implementation of the *Woomera Prohibited Area Rule 2014* (Cth).²⁸ Defence remained the sole user of the Red Zone, but could only exclude other permitted users from the Amber and Green Zones in accordance with the Rules for a prescribed number of days. Existing users of the WPA under the *Defence Force Regulations 1952* (Cth), remained subject to those access arrangements but new users could apply for a permit to be in the WPA for purposes such as mining, research, tourism and

²³ Christine Garnaut, Robert Freestone and Iris Iwanicki, 'Cold War Heritage and the Planned Community: Woomera Village in Outback Australia' (2012) 18(6) *International Journal of Heritage Studies* 541; Alice Gorman, 'La Terre et l'Espace: Rockets, Prisons, Protests and Heritage in Australia and French Guiana' (2007) 3(2) *Archaeologies* 153, 162.

²⁴ Garnaut, Freestone and Iwanicki (n 22) 556.

²⁵ Christine Garnaut, Paul-Alan Johnson and Robert Freestone, 'The Design of Woomera Village for the Long Range Weapons Project' (2002) 30 *Journal of the Historical Society of South Australia* 5, 10; Australian Government, *Woomera Prohibited Area Advisory Board Annual Report 2016–2017* (Report, 2017). For a discussion of the protests associated with the potential impact of the rocket range on the Indigenous peoples, see, Gorman (n 22) 156–7.

²⁶ Morton (n 5) 56–8.

²⁷ Australian Government, *Review of the Woomera Prohibited Area, Final Report*, 4 February 2011, i.

²⁸ For a detailed consideration of these new access arrangements and their legal context, see Melissa de Zwart and Dale Stephens, 'Non-Military Space Testing in the Woomera Prohibited Area: Opportunities for the Australian Space Industry' (2017) 45(1) *Federal Law Review* 39.

environmental activities.²⁹ A further review of these new zoning and access arrangements was undertaken in 2018, with the outcomes and recommendations published in the ‘Coexistence in the Woomera Prohibited Area 2018 Review’.³⁰

The Coexistence Review notes that Australia’s changing geopolitical and strategic environment has created specific new security risks and has prompted a need for a comprehensive program to enhance Australia’s defence capability, especially in the advanced technology domains of space, electronic warfare, cyber, intelligence, reconnaissance and surveillance. Notably

[t]he introduction of such systems will drive increasingly complex testing, training and evaluation programs. As a result, Defence is increasing its investment in the WPA, which will see approximately \$300 million being invested from 2018 through to 2021 to deliver instrumentation system and facilities upgrades. Scoping works are underway for a further \$500 million of investment in redeveloping the Woomera Village and airfield precinct between 2022 and 2025. Other smaller projects over the last five years will bring new investment in the WPA in the decade 2015-2025 to approximately \$900 million.³¹

Particular emphasis on non-kinetic systems and use of the electromagnetic spectrum will increase the unique value and importance of the WPA and as a consequence, the ‘WPA is anticipated to become more valuable as an area for international engagement and cooperation, particularly with the United States and the United Kingdom.’³²

The Coexistence Review found that the coexistence arrangements are basically sound, but suggests the implementation of greater flexibility. These recommendations, whilst recognising the key importance of Defence testing and the security and electromagnetic quietness of the WPA, also reflect a number of other key considerations, including the significance of the area in terms of Aboriginal cultural heritage, mineral exploration, pastoralists and research and scientific activity. In particular, the Coexistence Review notes the need to address national security needs both in terms of the introduction and use of technology in the area and the ownership, control and influence of businesses operating in the WPA. It is recognised that opening up the area to greater access and use creates new complexities.³³ A further review is planned for 2025.

Hence it can be seen that Woomera will yet again play a key role in defence and scientific advancements for Australia and South Australia. The symbolism of the name ‘Woomera’ a word from the Dharug peoples of New South Wales, meaning spear thrower, continues to inspire us to reach beyond the red plains of the South

²⁹ *Woomera Prohibited Area Rule 2014 (Cth)* r 13.

³⁰ Coexistence Review (n 4).

³¹ *Ibid* 3.

³² *Ibid*.

³³ *Ibid* 5–6.

Australian desert (or gibber, a unique geological formation which creates a polished red surface) to greater things above.³⁴

III THE INTERNATIONAL ASTRONAUTICAL CONGRESS 2017

The IAC was held in Adelaide in September 2017, the year of the 50th anniversary of the launch of WRESAT. Significant efforts and lobbying were required to bring this major global conference to Adelaide, reflecting years of work by the bid and organisational team. The Space Industry Association of Australia, under the direction of Adelaide-based lawyer and Chair, Michael Davis, the State Government of South Australia and the Adelaide Convention Centre, played key roles in securing the conference at a time when there was particular interest in both the domestic and international space industry. The IAC even secured a presentation from SpaceX founder Elon Musk, who unveiled his plans for using the 'BFR' as a transportation system across the globe as well as into space.³⁵

The Minister for Industry, Innovation and Science, the Hon Arthur Sinodinos MP, had announced a review of Australia's space industry capability on 13 July 2017.³⁶ An Expert Reference Group, chaired by former CSIRO Director Megan Clark, was tasked with undertaking a nationwide consultation to consider how to 'enable Australia to capitalise on the increasing opportunities within the global space industry sector'.³⁷ After a few weeks of meeting with industry and interest groups around Australia, it was clear to the Expert Group that there was an overwhelming desire and need for an Australian Space Agency. Repeatedly the statistic was dragged out that Australia was the only OECD country apart from Iceland that did not have a space agency. The lack of an official 'front door' through which businesses and space agencies of other countries could make contact with Australian space operators was considered a major impediment to the future development and success of this burgeoning industry. Although not due to report until March 2018, the Expert Group provided the Minister with an *Interim Report* on 14 September 2017, which encouraged the government to make an early announcement regarding the establishment of a space agency to address the overwhelming need for such an agency demonstrated by the consultation process.³⁸ It did not go unnoticed that in the meantime New Zealand had quietly and efficiently introduced its own legislative regime designed to encourage and facilitate

³⁴ Gorman (n 7) 96.

³⁵ SpaceX, 'Making Life Multiplanetary', (YouTube, 29 September 2017) <<https://www.youtube.com/watch?v=tdUX3ypDVwI>>.

³⁶ Ministers for the Department of Industry, Innovation and Science, 'Expert Review of Australia's Space Industry Capabilities to Participate in Global Market' (Web Page, 13 July 2017) <<https://www.minister.industry.gov.au/ministers/sinodinos/media-releases/expert-review-australias-space-industry-capabilities-participate>>.

³⁷ *Ibid.*

³⁸ Expert Reference Group, 'Review of Australia's Space Industry Capability — Report from the Expert Reference Group' (Report, March 2018) Appendix 3.

a space industry, established a Space Agency and had a company ready to commence launching from the Mahia Peninsula.

Therefore, it was with great excitement that an announcement was made during the opening ceremony of the IAC that Australia would indeed be establishing its own space agency.³⁹ Australia had just moved one further step into the new space age, and again, that step had occurred on South Australian territory.

IV THE AUSTRALIAN SPACE AGENCY

The Australian Space Agency ('ASA') commenced operation on 1 July 2018 and on 12 December 2018 Prime Minister Scott Morrison announced that it would be located in Adelaide, with a further announcement that it would be located at Lot Fourteen, the entrepreneurship and innovation hub located opposite the University of Adelaide North Terrace campus and the old site of the Royal Adelaide Hospital. This location was deemed to be the most suitable due to the large number of space-related businesses already operating in Adelaide, 'reinforcing South Australia's long-standing contribution to the nation's space journey'.⁴⁰

Whilst yet to open its doors at Lot Fourteen, much work has already been undertaken by the 'ASA' on international relationship building. This is seen as a vital aspect of the growth of the Australian space industry. The ASA has developed the Australian Civil Space Strategy 2019–2028, which identifies the Strategic Vision for the ASA and the Australian space sector. The key pillars of that strategy are: International, to leverage international partnerships and open doors for Australian innovators; National, to grow the Australian space sector; Responsible, to manage regulation, risk and culture, recognising the unique safety and security aspects of the space industry and compliance with international obligations; and Inspire, to develop a vision and partnerships that build the future space workforce.⁴¹

³⁹ Ministers for the Department of Industry, Innovation and Science, 'Turnbull Government to Establish National Space Agency' (Web Page, 25 September 2017) <<https://www.minister.industry.gov.au/ministers/sinodinos/media-releases/turnbull-government-establish-national-space-agency>>; Brett Biddington, 'The Australian Space Agency: Rhetoric and Reality', *The Strategist* (online, 27 April 2018) <<https://www.aspistrategist.org.au/australian-space-agency-rhetoric-reality/>>.

⁴⁰ Prime Minister of Australia, Premier of South Australia, Minister for Industry Science and Technology, Minister for Cities Urban Infrastructure and Population, 'Australian Space Agency to Adelaide' (Media Release 12 December 2018).

⁴¹ Commonwealth of Australia, Australian Space Agency, *Advancing Space, Australian Civil Space Strategy 2019–2028* (Report, April 2019) 5.

V DOMESTIC SPACE REGULATION AND COMMERCIAL SPACE

Following a period of domestic consultation in 2016, the Commonwealth Government announced a review of the *Space Activities Act 1998* (Cth) and the *Space Activities Regulations 2001* (Cth) to

ensure that Australia's space regulation is appropriate to technology advancements and does not unnecessarily inhibit innovation in Australia's space capabilities.⁴²

The *Space Activities (Launches and Returns) Act 2018* (Cth) will come into effect on 1 August 2019. At the same time a new set of rules will also come into effect, which are designed to be more responsive and reflective of industry needs. However, it remains to be seen how this revamped regime will operate in practice and how the associated costs will scale up for small operators.⁴³

The Adelaide Law School, through its Research Unit on Military Law and Ethics, now hosts a number of space-specific activities. In addition to participating in the Manfred Lachs Space Law Moot,⁴⁴ organised by the International Institute of Space Law, and contributing to the preparation of the annual Space Security Index,⁴⁵ managed by Canadian NGO Project Ploughshares, and undertaken in conjunction with students from George Washington University and McGill University, it is the leader of two key research projects, one commercially focused and one military. The Australian Navigational Guide Explaining Laws for Space (ANGELS) will create online resources based on the identified legal needs of space start-ups and entrepreneurs, providing a step-by-step online guide to the new legal and regulatory requirements which will need to be followed in order to conduct space activities lawfully and commercially under the revised Australian legislative regime.⁴⁶ Research for and writing of the resources will be undertaken by Adelaide Law School students who are working closely with space industry members to understand and address their practical needs.

⁴² Australian Government, Department of Industry, Innovation and Science, 'Review of the Space Activities Act 1998' (Web Page, 28 March 2017) <<https://consult.industry.gov.au/space-activities/reform-of-the-space-activities-act-1998-and-associ/>>.

⁴³ Melissa de Zwart, 'No Launch From Australia: Something Missing From Our Plans for the New Space Race', *The Conversation* (online, 12 June 2018) <<https://theconversation.com/no-launch-from-australia-something-missing-from-our-plans-for-the-new-space-race-97924>>.

⁴⁴ 'About the Lachs Moot Competition', International Institute of Space Law (Web Page, 2019) <<http://iislweb.org/awards-and-competitions/manfred-lachs-space-law-moot-court-competition/about-the-lachs-moot-competition/>>.

⁴⁵ 'Space Security Index', *Space Security Index* (Web Page, 2019) <<http://spacesecurityindex.org>>.

⁴⁶ 'Angels Will Guide Space Start-Ups', *University of Adelaide* (Web Page, 5 December 2018) <<https://www.adelaide.edu.au/news/news103882.html>>. This project is funded by a grant from the Law Foundation of South Australia, and undertaken in conjunction with International Aerospace Law and Policy Group (IALPG).

The *Woomera Manual on the International Law Applicable to Military Uses of Outer Space* is a major, multiyear project, led by staff at the Adelaide Law School, together with the University of Exeter, University of New South Wales (Canberra) and the University of Nebraska-Lincoln, to develop a manual which articulates the existing law applying to military uses of outer space in times of rising tension and conflict. The Manual involves members of various governments and defence forces (acting in their personal capacity), academics from diverse countries and backgrounds, as well as the International Committee of the Red Cross, the Union of Concerned Scientists and the Secure World Foundation.⁴⁷ In this way, the Adelaide Law School is contributing to cutting edge developments in outer space operations at an international level, in the interests of securing peace, certainty and access to this vital domain.

VI CONCLUSION

With the establishment of an Australian Space Agency and the extensive revision of the domestic laws applying to the use of and access to space for commercial operators, Australia truly is entering a new space age. As has been discussed above, South Australia has historically played an important role as a catalyst of space activities in Australia, albeit with mixed success. Despite the failure to transfer the early successes of the ELDO project across to igniting a domestic Australian space industry, there seems to be something in the gibber that keeps space dreamers and space entrepreneurs coming back to this State.

It is clear that in a time of increasing use of and reliance upon space, new problems will arise as space becomes more congested, particularly with the weekly announcements of larger and larger constellations of satellites, bringing with them a burgeoning spectre of space debris. As is now found in the new Australian legislation,⁴⁸ space operators will be asked to develop debris mitigation and remediation strategies prior to launch.⁴⁹ Further, the increased number of nations seeking to establish themselves as space powers and to stake claims to space assets will bring with it risks of increased tensions and the possibility for conflicts of a kind we have yet to behold. The Adelaide Law School is proud to continue to be at the forefront of these developments and, working together as researchers and students, to help shine the light upon some of the answers to these big questions.

⁴⁷ 'The Woomera Manual', *University of Adelaide* (Web Page) <<https://law.adelaide.edu.au/woomera/>>.

⁴⁸ *Space Activities (Launches and Returns) Act 2018* (Cth).

⁴⁹ See, eg, *Space Activities (Launches and Returns) Act 2018* (Cth) s 34(2): 'Without limiting subsection (1), an application for the grant of an Australian launch permit must include a strategy for debris mitigation'.

