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Making SPACE for Australia: Rapporteur's summary

The Royal Society of New South Wales and Four Academies Forum, Government House 7th November 2019

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Abstract

The Royal Society of New South Wales, with the Four Academies, held a Forum on 7 November 2019 with the title "Making SPACE for Australia". In the course of the day, a series of talks covered a spectrum of topics selected to inform the audience of recent developments, opportunities and challenges that Australia is likely to face as it becomes a more active participant in space activities than has been evident for many years. This paper is a summary of the day's proceedings, that draws on the verbatim record of the Rapporteur's summing-up on the day, modified as appropriate, for inclusion in *The Journal and Proceedings of the Royal Society of New South Wales*.

Introduction

I will begin my review of today's meeting with a few comments about myself, to provide some context for my remarks.

I think it's fair to say that I am somewhat more pragmatic than others when it comes to conversations about Australia's place in space. I tell things as they are, and not as some people would like them to be.

One of my last jobs in Defence, was to work with some senior officers to establish what became the Defence Space Office. Before the office was set up in 2002, we had disorganised groups of men and women in different services and in the Defence central part as well. They were brought together, initially under the ægis of the Royal Australian Air Force (RAAF).

I'm also the person, and Dr Clark has said this in public, who bears some responsibility for the Space Agency. In 2011–12, I was asked by the Space Industry Association of Australia (SIAA) to win the bid and then run the International Astronautical Congress in Adelaide in 2017. The success of that congress was such that Christopher Pyne and others in government at the time: saw an opportunity to gain some political capital and to avert some unwelcome and potentially damaging criticism.

I think that Minister Pyne was terrified that the world's space agency heads were going to turn up in Adelaide and ask the government, "So, what are you lot doing?" and he didn't have an answer. Effectively, the success of IAC2017 created an impetus that government determined it could not afford to ignore.

In the decade before IAC2017, many who advocated for Australia to take a more active role in civil and commercial space activities blamed the government for not being interested and looked to government leadership and investment. However, with respect to the IAC, the industry, such as it was, through the SIAA, took responsibility for

our future. We organised the conference, we raised the money and we pulled it off. This brings me back to a comment made to the audience earlier today: it's not about "them", it's about "us." Let's stop talking about "It's their responsibility." Get rid of "their" and insert "I" and "we" and "us," instead. When we make these substitutions, we are defining our role and accepting responsibility.

The Australian Space Agency

Australia absolutely needs a space agency and I say that definitely and unequivocally because there are some bits about the agency that I think are concerning. First, it's tiny. 23 staff, I think, as of today or tomorrow. Second, Dr Clark, who is an inspired choice as the CEO, is part-time. Third, three of the members of the advisory group — it's not even called a board — are either dual nationals or US citizens. Do we not have nine Australians who are competent and capable to advise our own government about space matters? I think this is a dreadful look and if I were the Minister for Finance and the Treasurer, who ultimately fund the Agency, I'd be questioning the seriousness of our commitment on the basis of these three points alone.

Australia's space history. Kerrie Dougherty talked about the technology developments and advancements in Australia's space journey. My PhD focuses on the public policy dimensions of how we got to where we are. Basically, it's by good luck, happenstance and complete serendipity. There is no plan, and never has been. In the 1980s Sir Russell Madigan and his Minister, Barry Jones (Minister for Science). failed to make the case for space so the money asked for was cut away by the Expenditure Review Committee Prime Minister Howard scrapped the Space Office altogether. Today, there is an unholy truce between CSIRO and the Agency. CSIRO, somewhat cheekily, has branded itself as Australia's national space science agency. This is simply confusing and unhelpful. There is one space agency in Australia and it is not CSIRO.

Defence and space

From a government perspective, the money in space in Australia has been and always will be in the Department of Defence. There is a lot of money for space capabilities in the forward investment program of the Department. Some of the money that Dr Clark mentioned today is coming in through the civil sector and can be counted that way. However, these are early investments by companies that are positioning themselves to try to win a forthcoming Defence contract, measured in billions, for remote sensing capability. Their business cases are built around Defence and not the civil sector per se.

My plea is to understand the enduring drivers first America is our strong ally and space activities lie at the heart of the alliance relationship. I make no judgement here about whether this is good or bad, I simply say that, it is. Pine Gap especially has been in the past, is today and will be for a long time to come the long pole in the operational element of the alliance tent. We also host, for civil missions, the Tidbinbilla facility near Canberra.

In hosting these facilities, we take advantage of our geography. We are equidistant between Europe and North America in longitude terms. In terms of latitude, our location in the Southern Hemisphere also bestows great advantage, including for our astronomers. because they can look out from the Southern Hemisphere through the disc

of our galaxy, the Milky Way, and see things that are not visible from observatories in the Northern Hemisphere.

In summary, I come at the problem of Australia's place and future in space from a hard-nosed perspective and approach humanity's overall approach to space activities in similar vein.

Ultimately, sovereign states will make the key calls. I think they will be driven to strategies of restraint as they come to understand the damage they may do to themselves as well as their adversaries if denied the benefits of Earth observation, satellite communications and even fundamental research. I think that a variant of the policy of mutually assured destruction (MAD), that characterised the nuclear stand-off in the Cold War between the USSR and the USA will emerge to provide a de facto policy and regulatory environment for space. An urgent question for Australian policy makers is to determine what role Australia seeks to play, as a middle power, in designing the space security architecture of the future. Sovereign states have common cause in creating a regulatory regime, for space that has little to do with peaceful uses in the interests of humanity and much to do with realpolitik.

Summary of the day

The Governor

Governor Beazley gave an inspiring speech which made an excellent introduction to the day. She talked about the conversation being of singular national importance. She mentioned both the military and non-military applications and spoke about Australia's unique location, which is our differentiator.

I was worried when she referred to all of us here as being scientists. So often when space is discussed in public it is linked automatically and uncritically to science: divorced from ordinary people. Common phrases, such as "This is not rocket science" and "she has a head like a planet" reinforce this view. As we heard today, space is also about ethics, law, morality and politics. And we need more broad engagement. The challenge to all of the Learned Academies, not just the science academy, is to take an action to think about each academy's role and contribution with regard to the future of Australia in space, and human activity in space more broadly.

Keynote Address: Professor Kewley

Professor Anne Green introduced Professor Lisa Kewley from the Australian National University.

Professor Kewley gave a wonderful keynote address. She told us how astronomers are pushing the boundaries closer and closer to the Big Bang and the beginning of time and to our universe. And she spoke of the 200-strong team that she leads through the ARC Centre for Excellence in All-Sky Astrophysics in 3D. Astronomy is an Australian research strength and Professor Kewley provided compelling evidence of this fact.

Session 1. Australia in the space age

Professor Jane Hall, the President of the Academy of Social Sciences, Australia (ASSA), moderated the panel with the title Australia in the Space Age. The panel members were: Ms Kerrie Dougherty (Australia's foremost space historian), Dr Megan Clark (Head of the Australian Space Agency), Dr Kimberley Clayfield (CSIRO) and Dr Adam Lewis (Geoscience Australia).

Ms Dougherty noted that Australia really began to cut its teeth on space science in 1957 in the context of the International Geophysical Year (IGY). Our initial focus was on upper atmospheric research which, in those days, was vital because of our concerns about the threat of nuclear war and radioactive fallout.

In the 1950s, Australia's space interests were tightly linked to those of the United Kingdom. Although Prime Minister Menzies, looked more to London than to Washington, the times were changing. Arguably, space activities accelerated the process whereby the USA displaced the UK as the "Great and powerful friend" to which our national security interests were most closely aligned.

I was growing up in the 1950s. I recall conversations between Mum and Dad and my grandparents about Mr Menzies going to London and wondering why he seemed not to be paying similar or even greater attention to the United States. As a six year old, I recall being taken outside on a cold Ballarat night to look up and see Sputnik flash across the sky, not quite understanding what it was that I was seeing. I did understand that I was witnessing a gamechanger in human endeavour. Thanks to Ms Dougherty for grounding us in what Australia has done in space in the past.

Dr Clark provided an update, through a report card, on the Australian Space Agency's progress. She explained a little about the $150 million that is being invested by the Australian Government with NASA in the Artemis Moon/Mars program. In my view, this is an example of policy on the run. The Prime Minister was keen for a good news "announceable" from his visit to Washington. Investing in a space mission with NASA seemed to fill that need supremely well. In fact, there was an immediate and severe backlash in Australia, notably from farming communities that had endured years of crippling drought. On his return to Australia, the Prime Minister immediately flew to Dolby in Queensland to announce additional drought relief funding. This suggests that proper consideration in government about the second- and third-order effects of the investment in Artemis had not occurred. Somewhat cynically, we know that $150 million buys a State Dinner at the Trump White House. This is not to say that there won't be some good from Australia's involvement in Artemis. Mining companies in Western Australia may well be major contributors and beneficiaries because of the knowledge and experience with advanced robotics and automation. Woodside already has a good relationship with NASA in these technology areas.

Dr Clayfield from CSIRO spoke about CSIRO's space significant heritage. I was a little concerned, though, when she said that. "NASA placed its trust in Australia." Why would NASA not place its trust in Australia? It seemed to me there was an element of cultural cringe that simply is not required. Our science and research agencies may be small by global standards but the quality of their work is second to none. We have nothing to apologise about with respect to quality and we have significant expertise in operating ground stations of all types.

Dr Lewis gave an excellent talk about Geoscience Australia (GA), that focussed in particular on remote sensing. He gave us examples of the sorts of things that are being done by GA, in particular with the Data Cube project and how that has application around the world. He is leading an initiative

to have the Data Cube put into a number of African nations, initially those in the Sahel.

At the end of this session there was conversation around STEM and STEM education. This is one area where all in present have a role to play. Not enough Australian students are studying STEM subjects in their higher secondary years and at the tertiary level as well. Perhaps space science and engineering can serve as a vector that helps to mitigate this situation. At present we are simply not producing enough men and women in this country who are numerate and who can in fact keep our economy and industry running. This is a challenge to us all.

Session 2. Space law, security and ethics

The second session was moderated by Ms Donna Lawler. Donna runs a space law consultancy in Sydney and previously was legal counsel in the space business of Optus. The members of this panel were Professor Steven Freeland (Western Sydney University), Lieutenant Ben Piggott, RAN (Visiting Research Fellow, UNSW), Dr Nikki Coleman (UNSW Canberra).

Professor Freeland had one key message that space "is not a lawless frontier." He made the point that there is a lot of regulation and a lot of cooperative behaviour between nations in the conduct of space activities. Norms of international behaviour in space are emerging that countries dare not violate. Certainly, nations do breach international law and there is no police force, or night watchman to call them to account.

In 2007, the Chinese did behave badly when they conducted an anti-satellite test that shot down one of their own satellites and created a massive debris field. As a consequence, the Chinese suffered international opprobrium that they still feel. There are lines in the sand, and in space that Steven talked about and that countries dare not cross. I suspect that the Chinese learnt a pretty tough lesson in 2007 and we won't see a repeat test any time soon.

Lieutenant Piggott gave a splendid talk about the military and geopolitical challenges in space in his capacity as a student at UNSW. In real life, Ben is a submariner. He's moved from worrying about the submerged environment to thinking about the heavens. I thought that his last slide was compelling because it broke down the complexity of his topic in a form that was easy to comprehend.

Dr Coleman spoke about space ethics and how there are actually questions beyond the technology that we do need to address in order that we have a space environment going forward from which all of humanity may gain benefit. The enduring question is how to sufficiently synchronise selfish with common interests to ensure that the space environment remain open and accessible to all. As mentioned already, perhaps there is place for some form of mutually assured destruction policy in space — as was in place during the Cold War to prevent nuclear war. Fear of loss is a big motivator.

Session 3. Space and people

The third session was moderated by Ms Annie Handmer, a post graduate student at the University of Sydney. The members of this panel were Dr Jonathan Webb (Science Editor at the ABC), Dr Alice Gorman (a space archæologist from Flinders University) and Ms Ceridwen Dovey (a writer and regular contributor to *The New Yorker*).

Dr Webb affirmed that space and dinosaurs are sure vectors to get children excited about anything. He gave us three wonderful words: mystery, danger and wonder. We

need to apply them to our STEM disciplines and to STEM itself. A question might be how to make mathematics mysterious, not necessarily dangerous, but certainly wonderful? If we could figure out some magic around that, we might be in a better place in terms of our future workforce.

Dr Gorman explained briefly the disciplines of archæology and heritage, and how they differ. She then showed how they relate to each other and more broadly to environmental management. She concluded her remarks with an extremely pointed and important comment: that we are some of the few remaining people on Earth who will actually view the heavens, through relatively uncluttered night skies. This is something that our grandchildren and certainly their children will simply not experience. That's profound and might be considered a call to arms.

Ms Dovey provided a challenging critique of the behaviour of some people who have attained cult status in the context of space exploration. She spoke of an alternative, and from her viewpoint, desirable set of behaviours, that she acknowledged some might judge to be naïve, irrational and idealistic. The arrogance, and the ignorance of Elon Musk, in launching a car into space for no purpose beyond advertising, comes to mind in this context. Paul Scully-Power (see below) painted a different picture of developments in space, one that is more likely to eventuate.

The challenge for this audience is to decide whether we want the space environment described by Paul to come about, or has Ms Dovey described an alternative to which we might aspire? If we want change, we are we willing to do to help to bring that change about? This is a conversation that we've got to start and put into our communities. It's a difficult conversation to have because it's not the norm and it challenges the economic basis of our society: sufficiency would be valued more highly than growth.

Session 4. Australia's space economy: prospects for the future

The fourth and final session for the day was moderated by Dr Susan Pond, a senior leader in business and academia, notably in the medical research sector. The members of this panel were Dr Paul Scully-Power, the first native-born Australian to travel to space, Mr Bill Barrett, a Sydney-based space industry consultant, and Group Captain Jason Lind from the RAAF, with responsibilities for space.

Mr Barrett outlined the size of the global space market and of the growth potential of the Australian market. He quoted figures that indicate that investment in space is moving from governments to commercial companies. He also talked about lower barriers to entry to space which helps countries such as Australia to become involved.

In 2002, not long before I retired from the RAAF, I was the security specialist on the Australian team that negotiated Australia's early involvement in the Joint Strike Fighter (JSF) project. At present, through the Centre for Defence Industry Capability (CDIC) in the Department of Industry, Innovation and Science (DIIS), I am helping Australian companies to win some of the work share for the JSF.

This is incredibly difficult to do for two reasons. First, the United States' export control regime, especially the International Traffic in Arms Regulations (ITAR), make it very difficult for technology, even for relatively simple and small components, to be

transferred from the United States to Australia or any of the other 13 other nations participating in the JSF project. Second, anything that gets built for aeroplanes must be built to the most exacting standards of quality control and assurance. Few Australian companies are capable of meeting these exacting standards.

Also, our aerospace industry has been used to supporting a fleet of 70-odd jets in the case of the RAAF's fighter force. Suddenly we're now preparing our companies to support 4,000 jets worldwide over a 40-year period. This means that our companies have to think differently, they have to be equipped differently and they have to meet standards that they never, dreamt about.

All of that may be hard enough. NASA, however, as we become involved in the Artemis program, is going to be even more demanding and more exacting. It is possible that for mass-produced satellites, some of these production standards will reduce. However, for missions that involve putting people in space, going to the moon and onto Mars, there will be nothing but the best and the most demanding quality control and assurance processes put in place for every single component in these vehicles.

The extent and importance of Australia's future involvement in space activities is not, in my view, a lay-down misere. There are some enormous challenges. They are good challenges because we have an opportunity to build some Australian companies that can compete globally in the most exacting of technology and manufacturing areas. A lesson from the JSF project that is likely to apply to the Artemis program as well is that financial commitment to the project does not mean that Australian companies will win work. Not only will our companies need to demonstrate capability and quality, they will also need to be competitive on price. This represents an enormous challenge for business owners, process engineers and investors.

Dr Scully-Power, as noted above, provided a counter view to Ms Dovey, saying, "Look, it doesn't really matter what you'd like to be the case, this is what's going to happen." Dr Scully-Power provided a set of numbers, in support of his argument.

Group Captain Lind provided a Defence perspective. He explained that Australia does not have a lot of Defence space capability at present. He emphasised the importance of the US–Australian relationship and gave provided examples of Australian companies and universities that are doing some innovative and substantial work with regard to space situational awareness.

Building on this point, I am a director of the "space junk" CRC, more formally the Space Environment Research Centre, that has its headquarters at Mount Stromlo near Canberra. For those of you who live in Canberra and for those of you who might be visiting, God willing and all being well, some time in February next year there will be a very bright yellow laser that you will be able to see as far away as Goulburn. Our plan is to use this laser to demonstrate that we can move the orientation of a number of small space objects using the pressure of laser light. In the course of SERC's life, it has produced 25 PhDs. And this, of course, is the purpose and the strength of the CRC program. The laser into space is the cream on the cake but it's the increase in knowledge and skill that really matters. SERC is a compelling example of how Australia is building a space workforce that will help the nation to define its place in space in the latter part of the 21st Century.

Summary

Summarising our meeting in a very few words:

1. Our geography is our differentiator. We should think about that in everything that we do with regard to space
2. The environment is rapidly changing, as many of our speakers have pointed out
3. There are capabilities in Australia, developing in the research sector and nascent in industry. Let us understand and play to those strengths
4. There is certainly tension between the civil and the defence realms in space. And perhaps an even bigger tension emerging between public and private investment in space as we've heard as well.

Acknowledgements

Finally, let me add my thanks to the Royal Society of New South Wales for inviting me to be part of this gathering, to the Governor for allowing us to use this wonderful venue and to all of you all for coming.

Thank you very much.