# Submission to 'Inquiry into Developing Australia's Space Industry'

## Developing Resilient Space Capability via Space Industry for Defence and National Security

The 2020 Defence Strategic Update (DSU) and the accompanying Force Structure Plan (FSP) elevates the importance of the space domain for the ADF and Department of Defence.[1] The documents recognise space as a warfighting domain which is contested and congested, and they highlight Australia's dependency on space for undertaking joint and coalition operations in information-based warfare. The DSU and FSP both emphasize the importance of building resilient space capability, including sovereign controlled satellites to ensure space access for the ADF.

To achieve true space resilience its vital to *reduce our dependency on other states and on foreign commercial providers of space capability*. This is not a call for an autarkic space program in which all space capabilities are produced locally. Australia will still rely on overseas (particularly US) aerospace primes to provide some high-end satellite capability.

However, government *should* expand our ability for small satellite design, development, and manufacture, including establishing an ability to rapidly produce large numbers of small satellites for operationally responsive space requirements to *augment* existing space capability in a future crisis. Government must also support the establishment of a sovereign responsive space launch capability from Australian launch sites to allow greater ability to rapidly *reconstitute* space capability lost to threats such as adversary counterspace capability and space debris. Both goals would contribute to strengthening space deterrence against counterspace threats, as well as burden sharing in orbit with key allies to a greater degree than we have done in the past and boost the Australian space industry sector's potential growth and prosperity. Australia needs to ensure that our ground segment for space capabilities is expandable to meet the demands of Defence in a major crisis and be resilient in the face of adversary counterspace threats, including the prospect of cyber-attack on such ground facilities.

Of key concern for Australia is assuring an ability for continued space access. Any loss of access to space services would dramatically reduce the ADF's operational effectiveness. Most of the ADF's combat capabilities depend on space support to function effectively, and our reliance on space capabilities will only deepen in coming years as new technologies and platforms, particularly autonomous systems, enter service.

Broadly speaking the ADF is fully integrated with the space domain. For the ADF, the positioning, navigation, and timing (PNT) support from Global Navigation Satellite Systems (GNSS) such as the US Global Positioning System (GPS) is crucial, not just for precision navigation and targeting of guided munitions, but importantly for transmission of data across command-and-control networks that allow the effective command of military forces in joint and coalition operations.[2] The ADF's reliance on satellite communications (SATCOMMs) is crucial to manage long-range operational deployments beyond Australia's shores, and to ensure rapid situational awareness is disseminated across many different types of ADF units in the modern battlespace.[3] Our access to geospatial systems for intelligence, surveillance, and reconnaissance (ISR), such as those provided by earth-observation satellites allows us not only to understand the force disposition of our own military units, and those of our allies, but also gain insight into an adversary's deployments, and perhaps understand his intentions, delivering a 'knowledge edge' that can be decisive in war. Space support provides other crucial services, such as meteorological data, mapping, missile early warning, and electronic intelligence (ELINT) and signals intelligence (SIGINT).

In strategic terms, ensuring access to space is therefore vital for the effective use of military force, and 'to lose space means we risk losing the next war and losing it quickly', to paraphrase Lord Montgomery of El Alamein.[4] Our entire society is dependent on information systems, including space systems, to function. For example, any disruption to GPS timing signals would throw stock markets into chaos, disrupt global trade, interfere with transportation, shut down power grids, and see massive loss of data from critical information infrastructure.[5]

**Space as a warfighting domain**

Space is contested. Although it is a global common, it is *not* a sanctuary that sits serene, distant, and untouched by intensifying geopolitical rivalry below. Space has been militarised since the 1960s with the deployment of satellites to support nuclear command and control and missile early warning. The growing sophistication of space capabilities in orbit, together with more advanced information-enabled military forces on and over the Earth have seen the role of space capabilities in supporting military forces proliferate vertically, as space systems provide new types of support, and horizontally, as more and more states can 'plug and play' with space capabilities. In doing so, space has become a 'centre of gravity' for military forces, against which an opponent can direct his military effort to deny us a decisive advantage. Accordingly, the 2020 Force Structure Plan correctly reinforced the importance of the 'Space Control' mission, which combines both space domain awareness performed in concert with allies and partners, and '…the development of options to enhance ADF space control through capabilities to counter emerging threats to Australia's free use of the space domain and that assure our continued access to space-based intelligence, surveillance and reconnaissance.'[6]

With the growing dependency on space support for the ADF, we must be cognisant of the risk posed by both deliberate use of counterspace capabilities – also known as 'anti-satellite' (ASAT) weapons – and the challenge of increasing amounts of space debris that could place our critical space capabilities at risk.[7]

The growing capability of China's and Russia's counterspace capabilities directly challenge the ability of the US and its allies, including Australia to ensure access to vital space capabilities in a future crisis.[8] China has operationally deployed direct-ascent ASATs that can threaten satellites in Low-Earth Orbit (LEO), and has demonstrated the ability to hold at risk satellites in higher orbits such as Medium Earth Orbit (MEO) and Geostationary Orbit (GEO).[9] It has demonstrated 'rendezvous and proximity operations' (RPOs) that would enable co-orbital ASAT attacks suitable for 'soft-kill' of a target satellite, through jamming, or electro-magnetic attack through directed-energy weapons, and physical interference. Such technologies also would enable China to exploit 'grey zone' attacks in orbit, by concealing such attacks within commercial 'on-orbit refuel and repair' operations. China has ground-based counterspace capabilities that include jamming, spoofing, laser dazzling, and cyber-attack on satellites. Russia is also pursuing similar capabilities. The establishment of the PLA's Strategic Support Force (PLASSF) in 2015 and Russian Aerospace Force shortly thereafter formalised both states approach to the military use of space, including for counterspace operations against US and allied satellites prior to, or from the outset of a future military conflict. Although China's declaratory space policy talks of using space 'for exclusively peaceful purposes' the reality is that China is developing the means and acquiring the operational skills for warfighting in orbit.[10]

**Space Industry and Space Resilience**

Our response to this growing challenge for Australia should be to deepen our ability to build space resilience and contribute to space deterrence against such threats.[11] Expanding the growth of Australia's space industry is central to this goal and success would allow Australia to 'burden share in orbit' within the US-Australia alliance and amongst five-eyes partners within the Combined Space Operations (CSpO) Initiative, and with other key partners, such as Japan, to a much greater degree than it has done so in the past.

This can be achieved through investing in the ability to *augment* existing satellite capabilities based around large, expensive, and complex satellites (procured from overseas actors) with locally produced small satellites that can be deployed quickly using sovereign launch capability. Ensuring rapid sovereign launch allows *reconstitution* if counterspace systems are employed by an adversary. Greater use of small satellites and fractionated constellations of 'cubesats' would potentially allow *disaggregation* of space capabilities in a manner that would reduce the effectiveness of an adversary counterspace attack, by diversifying essential space services over many satellites rather than concentrating it in a few. By embracing the advantages of the 'small and the many' to reduce the risk of relying on the 'large and the few' an adversary's counterspace campaign becomes less likely to succeed.

Contributing greater capability within military run and commercially provided space-domain awareness (SDA), both on the Earth and in space, denies that adversary the element of surprise and anonymity, with corresponding opportunity for attribution that would then support political and economic sanctions, particularly in

the event of ‘grey zone operations’ in orbit. Australia is well placed, technologically, and geographically, to support such an enhanced SDA capability.

The outcome of a space industry strategy based around the goals of augmentation, disaggregation and reconstitution is greater space resilience and more effective space deterrence by denial, reducing the prospect of an adversary using counterspace capabilities effectively, and thus boosting Australia’s ability to support the US and other partners in orbit. Space Industry development would become key in delivering important strategic outcomes, both to deter the risk of space warfare, and to strengthen space resilience. Investing in an ability for rapid production of ‘small sats’ together with supporting sovereign responsive launch capability also better enables Australia to mitigate risk from space debris that could pose a challenge to critical space capabilities.

**Space Co-Production supercharges and accelerates our space sector**

Approaching our space industry development in this way offers several advantages.

Firstly, it allows Australia’s space industry sector to directly contribute to ADF and allied space requirements to ensure space access even in the face of adversary counterspace capabilities. The US and its allies, including Australia must respond to this challenge, or see their access to space imperilled in a crisis, with all the consequences noted above that go with such a development. Relying purely on ground-based SDA to detect and characterise a threat, and then waiting on the US or other partners to launch our satellites to ensure our defence capability remains effective, as is currently the practice, is an insufficient response to a real and rapidly growing challenge that during war could emerge in a matter of hours or minutes over our heads.

The key to space resilience is rapid response. Having the ability to rapidly develop small satellite constellations on an ‘on-demand’ basis, to augment existing capabilities, and disaggregate space support across the ‘small and the many’ rather than concentrate it in a few, vulnerable satellites, complicates the task of the attacker. Adding a sovereign space launch capability that can rapidly launch additional satellites to augment or reconstitute space capability further complicates the challenge facing an adversary contemplating the use of ASATs. Sovereign launch means that Australia is no longer dependent on a foreign launch provider to launch satellites which are ‘time urgent’ in a crisis. Australia’s space industry should directly contribute to ‘space deterrence by denial’ by having a rapid production capacity for small satellites and a sovereign launch capability. In this way, we are better placed ensure the ADF can maintain effective space capability, as well as directly support burden sharing in orbit with the US and other key partners.

Secondly, Australia’s space industry sector needs to be ready to participate in co-production of critical space capabilities for the US, for other five-eyes partners and for key partners outside the five-eyes. In the same way that discussion is growing about co-production of missile systems with the United States under the US-Australia Alliance, the co-production of space capabilities – both satellites and space launch systems – can further grow the national space sector. Embracing co-production agreements adds demand to our space industry sector beyond that purely drive by national requirements. For example, companies like Inovor Technologies could build satellites for the US Department of Defense, whilst Gilmour Space Technologies could offer rapid launch services to the UK Ministry of Defence.

Co-production could be complemented by co-development of advanced space technologies in a manner that exploits rapid innovation cycles and new approaches to space industry within the 'fourth industrial revolution' (4IR). The space sector, particularly in Australia is already well suited to fast innovation, but government needs to update regulatory approaches, including for space launch in a manner that stimulates these fast cycles, rather than constrains them. The next generation of space technologies is on the horizon, and Australia's space industry sector should be a leader in reaching those capabilities.

Thirdly, a co-production approach primarily driven by defence and national security demands would effectively add new operational capability to the ADF. For the first time in its history, the ADF would have credible space capabilities, which could support joint and coalition requirements. In acquiring ADF space capability, it would make sense for a re-organisation of ADF operational structures, through the establishment of an ADF Space Command within RAAF HQ. This would centralise space expertise amongst a cadre of space professionals comprising uniformed military, civilian defence, and commercial space industry partners. Such a step demands a review of Australia defence space strategy. Our current space strategy for Defence is classified, and thus inaccessible to the space industry sector. It is time for Defence to formulate a new unclassified defence space strategy that facilitates greater ability for the space industry sector and defence to collaborate.

Finally, complementing any enhanced 'space segment' comprising satellites and launch capabilities, is the requirement for an effective ground segment, including facilities for space tracking and communications, space domain awareness and the management and processing of data from satellites. Greater attention needs to be given to ensuring the ground segment is secure and survivable in the face of adversary counterspace capabilities, which can be directed against the satellites in orbit, *and* against the ground facilities controlling those satellites, *as well as* against the data flowing to and from ground station to satellite. There needs to be greater focus within Australia's space industry sector on ensuring resilience in the face of counterspace threats to the ground segment, including an awareness of the long-term risks of cyber infiltration and exploitation of ground systems which could occur months or even years prior to a military conflict.

**ASPI's Role on Space**

The Australian Strategic Policy Institute (ASPI) has become much more focused on space policy and space security issues in recent years, especially following the establishment of the Australian Space Agency in 2018. Several key reports have been released since 2017, and ASPI has conducted a major conference in June 2018 and run workshops and masterclasses on space policy issues. This focus will continue, with an emphasis on supporting Defence in its efforts to update ADF Space Strategy and advise government on specific space policy issues including those considered in this submission. ASPI is also engaging with overseas partners, notably in the US, Japan, and South Korea on space security issues.

ASPI is also regularly engaging with key civil and commercial space sector actors, including the Australian Space Agency, and key commercial companies, notably Gilmour Space Technology and has dialogue with launch site providers such as Equatorial Launch Australia and Southern Launch.

Space policy and security, as well as space industry, is a regular topic in the ASPI Strategist blog, and also in ASPI's engagement with print, electronic and digital media. ASPI has become one of Australia's most visible contributors to national debate on space policy, security and industry issues.

**Conclusions**

The ADF is facing a growing challenge in ensuring access to the critical space domain. Adversary threats posed by counterspace and ASAT capabilities are real and growing. Assuming continued assured access to space is a dangerous risk. The Australian Space Industry sector has a role to play in meeting this challenge. It needs to embrace rapid and responsive production capability for essential space systems, including satellites and launch vehicles, such that it can directly allow Australia to contribute to an 'augment, disaggregate, reconstitute' approach towards space, where speed and agility are key. Our ability to not only support the ADF's space requirements but also those of our key allies against looming counterspace threats from China and Russia must be a priority going forward. In embracing this approach, we would strengthen the space industry sector overall to enable it to contribute to national space requirements.

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