

# Australia's Space Science and Industry Sector

Submission to the  
Senate Economics Committee Inquiry

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National Committee on Space Engineering  
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ENGINEERS  
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## 1. Introduction

Engineers Australia is the peak body for engineering in Australia, representing all disciplines and branches of engineering. Membership is now approximately 84,000 engineers Australia wide and Engineers Australia is the largest and most diverse engineering association in Australia. All Engineers Australia members are bound by a common commitment to promote engineering and to facilitate its practice for the common good.

Engineers Australia has a number of specialist groups, including national committees and panels. This submission has been developed by the Engineers Australia National Committee in Space Engineering, whose chief aim is to raise awareness of the economic, industrial and intellectual value of developing and retaining Australian expertise in space technology.

Engineers Australia is pleased to have the opportunity to provide this submission to the inquiry. We regard the space science and industry sector as very important to Australia in a number of ways. Consequently, we suggest that government should take a more active interest, both to facilitate the country taking advantage of opportunities and to mitigate potential risks to the national wellbeing.

Our submission covers three aspects of the space science and industry sector that Engineers Australia considers to be of significant import to the nation:

- The need for government-led risk management of certain space-derived information services;
- The need for a mechanism to act as a focal point for Australian involvement in international space activities; and
- The significant benefits to the national skill base of involvement in space-related activities.

## 2. Risk management for space-derived information

The focus of our submission is on what we consider to be an issue of considerable significance to the long-term well-being and security of Australia: the need for ongoing whole-of-government assessment of the risks of acquiring all of our space-sourced information services from foreign sources that are typically beyond our control or even influence.

This does not apply to all space-sourced information, but only to information that can be considered to be strategic in nature and that does not clearly fall into the Defence Department's area of responsibility. For the purpose of this submission, Engineers Australia considers that space-sourced information services can be categorised as follows:

- **Commercial** – Degradation or loss of the information service would be of little or no consequence beyond the companies and consumers concerned and, most likely, could be easily replaced or substituted. Pay television delivered by satellite is an example of this category of service.
- **Military-strategic** – Degradation or loss of the information service would be of significance to the Australian national interest. However, the information service is of sufficient interest to the Department of Defence to already be monitored and risk-managed by Defence. Given that Defence has, in recent years, recognised space-related information services as vital to Australia's military capability and has taken significant steps to manage these, such as through the formation of the Defence Space Coordinating Office (DSCO), we see no specific need for additional government intervention. Military satellite communications delivered by Optus and, in future, by the Wideband Global SATCOM (WGS) system are examples of this type of service.
- **Civil-strategic** – Degradation or loss of the information service would be of significance to the Australian national interest. However, the nature of the loss would not fall within the purview of the Defence Department and, under present government arrangements, risk assessment and mitigation might not be adequate or even performed at all, thus leaving the nation exposed to an unmanaged vulnerability. Examples in this category include space-sourced weather data and less obvious, but even more pervasive, services such as the global timing signal from the GPS satellite constellation.

This last category (civil-strategic) is of concern to Engineers Australia and, in our opinion, warrants more active government involvement. Those pervasive services upon which much is dependent but for which there is no obvious steward represent a particular vulnerability. GPS is an excellent example given that many day-to-day activities in our society have become dependent upon it, such as:

- Synchronisation of the national power grid;
- Registration of stock exchange and other financial transactions;
- Control of all the cellular telephone networks; and
- Automatic Teller Machines (ATMs) time-stamping of transactions.

Even where there is an obvious steward, as in the case with space-sourced weather data and the Bureau of Meteorology (BOM), these agencies may not be resourced to implement any meaningful risk management measures such as securing weather data via alternative means.

Furthermore, we consider that the risk is arguably less for those services that have been in place for years or decades as compared to those services which are only beginning to become important or will only become important in future.

That is, Australia's changing needs for space-sourced information services will create new, unmanaged vulnerabilities unless suitable risk management measures are put in place.

Examples include:

- Much-increased provision of remote sensing data to support climate change management, including how we should adapt agricultural and other land-use practices over the coming decades.
- Heightened monitoring of Australia's maritime areas to prevent illegal resource exploitation in the face of global factors such as transnational migration and depletion of fish stocks in other parts of the World.
- Surveillance of that portion of the Antarctic land mass which is claimed by Australia as other countries move to exploit resources once the current prohibition on doing so ends.

Noting the vulnerabilities of current and future space-sourced information services, Engineers Australia's recommendation to the Senate is that government should put in place mechanisms to assess and initiate treatment of risks to those civil-strategic space services that are not otherwise already well-secured. In some cases, these treatment measures might be simple and low cost (such as making alternative arrangement for supply of information from different foreign sources). However, in other cases, the only practical treatment may be significant investment into space systems over which Australia has sovereign control or even significant influence.

### 3. Coordination

A long-running issue in the Australian space sector has been the perceived need for some form of national coordination mechanism to act as a focal point for Australian involvement in international space activities. This idea has previously been advanced by Senator Chapman and others before him and, in Engineers Australia's assessment, the need remains.

In essence, whilst Australian public-sector agencies (CSIRO, universities, etc) and companies can, of course, choose to independently attempt to become involved in space-related activities overseas, doing so has often proven to be unsuccessful for the simple reason that this is not the international norm and the involvement of some form of national body is usually expected by international partners. For example, large scientific infrastructure projects are usually done by collaboration with multiple governments involved. The Square Kilometre Array (SKA) radio telescope is a case in point.

This situation is clearly very different from many sectors where direct cooperation between private entities is the norm and government involvement is unusual or, at least, peripheral.

By contrast, and with some limited exceptions, the history and current practice of the space sector globally is for government involvement in some form whether as activity leader, as sponsor or as lead customer.

Even in those areas of the space sector where commercial entities (such as Singtel Optus) clearly take the lead, such as satellite communications, the hand of government is present in the provision of launch services, all of which are government-sponsored in some manner. The only case where there is little or no government involvement is in the emerging space tourism sector where companies such as Virgin Galactic are using entirely private resources.

This reality, whilst probably uncomfortable for those who generally prefer government not to be involved in industry or science, means that where Australia *could* be involved (science projects) or *should* be involved (provision of space services to address national needs such as climate change management) we typically are not and will likely continue not to be. Or we are involved but at a level of participation that makes us a secondary player and, typically, not a key decision-maker. There are exceptions to this, such as optical and radio astronomy and hypersonics; however, in the majority of cases success is at least partially predicated upon the involvement of a national coordinating body in some form.

Therefore, Engineers Australia suggests that government needs to consider how this might best be achieved. We are not suggesting an expensive US-style national space program. Instead, we are merely suggesting a body to act as a central point-of-contact and coordinator to enable Australia to take advantage of opportunities, both foreign and locally-initiated, as they arise.

Some of these opportunities may justify direct government sponsorship because they align with government strategic policy and have limited or even no potential commercial return. Others will offer sufficient commercial potential to entice private industry. In this latter case, there are existing funding mechanisms available from government to assist industry as appropriate.

#### **4. Benefits to the national skills base**

That Australia is currently suffering a deficit in technically-skilled workers is broadly acknowledged. How to address this deficit continues to be the subject of debate. In our view, successful ongoing development of the national technical skills base needs a lifecycle view. That is, we must consider how engineers and members of other technical occupations choose their career path and how they continue upon it throughout their working lives:

- There must be sufficient inspiration to study mathematics and the physical sciences when at school;

- Later, when making choices about trades and professions, sufficient confidence in future opportunities to commit to years of arduous study and, clearly, to forego choosing other, potentially-rewarding career paths; and
- Throughout a career, ongoing motivation to continue to build skills and contribute to the economic well-being the nation.

Involvement in space activities offers a very visible means of achieving all of the above and it has paid dividends for the nation over several decades, particularly in astronomy and hypersonics (in both of which, Australia is a World leader).

Typically, our excellence in specific areas has been born by some competitive advantage or driven by clear need. In the case of astronomy, we had clear dark southern skies and large radio quiet areas. In the case of sensors and remote sensing, necessity drove logical thought in the direction of using other people's wide area monitoring systems to our best advantage. In the case of hypersonics, our dogged determination to overcome the tyranny of distance probably played more than a minor role.

The point is that our needs and advantages were facilitated to an outcome by choices made at both government and community levels. Without the means to 'do' our most talented citizens might be constrained only to 'say'.

Skilling does not happen overnight and it requires a society to stimulate the inspiration of its youth to aspire to technological achievement. As an example, Germans have for decades been recognised as outstanding engineers because German society holds the professions of science and engineering in high esteem. Germany has recognised that commercial forces alone will not drive national growth in technological capability and excellence. Sometimes, state intervention is required to provide the 'learning infrastructure' necessary to produce graduates with appropriate domain awareness and skill.

Europe and America have demonstrated excellent examples of well structured and funded space activities, often run out of their universities, which have resulted in experimental satellites and technologies being launched inexpensively into orbit by students. Those students then moved on to be employed by the enterprises involved in a range of technological applications, not just in space but in broader industry. Rather than just producing theoretically clever graduates, those universities have produced (and continue to produce) graduates inspired by national participation in space activities to study the sciences and engineering and, where able, to enter the work force with solid practical knowledge of the theoretical expressions.

Engineers Australia recommends that similar strategies are considered for application in Australia and would be keen to assist in their development.

### 5. Conclusion

Several government-led inquiries have been conducted into the state of Australia's space science and industry sector over the past two decades, notably the *Madigan Report* in 1985, the *Expert Panel Report* in 1992, the *International Space Advisory Group Report* in 2002 and most recently, the *Space Policy Advisory Group (Chapman) Report* in 2005. All of these inquiries have pointed to proactive engagement by Australia in the delivery of strategic space services, linked by common themes such as the need for a national space policy and a central point of coordination.

Yet, despite promising past government initiatives leading to active Australian participation in space-based remote sensing programs of regional and global importance, the current state of Australia's space science and industry sector is at its lowest ebb since the series of inquiries commenced (with the key exceptions of astronomy and hypersonics, both of which have substantial public-sector involvement).

Engineers Australia consequently believes there is a strong case to support Australia's ongoing economic and strategic security through deeper involvement in space activities. In this context the ability to actively participate in space – independently and/or collaboratively (via leveraging niche expertise) – becomes an important national 'core competency'. This includes taking a risk management approach to related issues of potential national significance, better coordination of Australian interests in space so as to align with the practices of other nations with whom we might collaborate and use of space to encourage ongoing development of a sustainable, highly competent technical workforce.

The current Senate inquiry, coinciding with the election of a new government and fresh examination of Australia's strategic needs, has the potential to finally provide direction towards meeting Australia's expanding requirements for space-derived services over the next decade and beyond.

Engineers Australia looks forward to assisting this outcome, recognising the multitude of national benefits that will flow, not the least of which is contributing to the skilling of current and future engineers and scientists.