Chapter 2

Looking down

Wide uses of satellites

"Satellites gone up to the skies,
things like that drive me out of my mind"
Lou Reed, *Satellite of Love* (Lyrics: L. Reed)

"We take all the telescopes
And we turn them inside out
And we point them away from the big sky
Put your eye right up to the glass, now
And here we'll find the constellation of the heart"
Kate Bush, *Constellation of the Heart* (Lyrics: K. Bush)

2.1 The committee views the most important commercial aspect of space for Australia, as 'looking down', the use of satellites for earth observation. Examples illustrating this dependence include:[1]

- space derived data forms the backbone of modern weather forecasting and storm prediction services;
- satellites provide critical communications links, particularly to the many areas worldwide which do not have access to other forms of communications. They are often the only means of communication in disaster areas and constitute an essential element of disaster response and relief operations;
- timing signals from Global Positioning Satellites (GPS) are used to coordinate transactions in the global finance industry such as ATM withdrawals, credit card transactions and stock exchange transactions, and are used by the mobile phone networks to provide reference timing to coordinate mobile phone calls;
- navigation signals from GPS satellites provide essential positioning data for ships and aircraft and, increasingly, the trucking industry and recreational users. Flight navigation and air safety systems increasingly rely on satellite signals to maintain proper altitude, heading and separation for approach and landing;
- modern agriculture increasingly relies on satellite derived data for long term weather forecasts and navigation data for precision farming practices; and
- the majority of the variables needed to monitor the global picture of climate change can only be measured from space.

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1 Australian Space Industry Chamber of Commerce, *Submission 64*, p. 3.

2.2 One estimate is that global purchases of commercial satellite-based products and services amount to over US$ 100 billion, over half of global space revenue.[2] Many countries now have satellites, as shown by Table 2.1. The Australian involvement reflects the five satellites operated by Optus. Included among the surveillance satellites are 'radar satellites' which can see through cloud cover. The committee notes the increasing emergence in recent years of South East Asian countries into the international space community which is highlighted in Table 2.1

Table 2.1: Active satellites, by country

	Communications	Surveillance/military
United States	193	68
Russia/CIS	43	17
Japan	24	4
China	14	1
Luxembourg	13	0
India	11	0
Saudi Arabia	8	0
France	2	8
Canada	7	0
Australia	5	0
Indonesia	5	0
Israel	2	3
Netherlands	5	0
Spain	5	0
United Kingdom	3	2
Thailand	4	0
South Korea	3	0
Malaysia	3	0
other	29	1

Source: Space Foundation, *The Space Report 2008*, p. 67.

2 Space Foundation, *The Space Report 2008*, p. 6.

Global navigation

2.3 There is an increasingly wide range of applications for satellite-sourced information. This is especially true of the global positioning systems (GPS), which may account for nearly half global spending on satellite services.[3] The best known of these is the US-operated GPS. This is shortly to be joined by the European Galileo, a revamped Russian Glonass and China's Beidou. Australia should have access to all these systems which will give greater precision in establishing locations than just using one system.

2.4 The GPS are vital to the operation of the financial system. The timing signals are used to synchronise our national power grids, the time stamping of financial transactions and our mobile phone networks.

> the timing signals of those satellites are perhaps more pervasive than all of the navigation information…Were someone to deny that time signal, you would have an immediate consequence in the transaction and therefore potentially the economics of our finance industry.[4]

2.5 The committee heard warnings of the vulnerability of GPS systems:

> …jammers can be bought on the international market or constructed from readily available electronics parts to designs that are available on the internet. Australia has conducted no study on the magnitude of our risk exposure. We have no quantification of the risk of denial of GPS, no backup plans at national level, and no national approach to responding effectively to GPS interference events.[5]

2.6 On a more positive note, Professor Sinnott described the opportunities for Australian industry in making more use of GPS systems:

> There is a substantial but very distributed base in Australia's manufacturing industry, small to medium enterprises in the main, that seek to add value to what are a free good in terms of the signals raining down on us, in terms of getting better precision, making these systems work better indoors where a typical GPS receiver does not work too well and adding some bells and whistles in terms of added services such as telling you which restaurant you are closest to and functions like this. A most particularly important one, which I think will come to Australia—it is already in Europe and the US—is reporting where you are from a mobile phone call when you call emergency services.[6]

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3 Space Foundation, *The Space Report 2008*, p. 6. The Report suggests sales of GPS equipment grew by 20 per cent in 2007.

4 Mr Roger Franzen, Earthspace, *Committee Hansard*, 16 May 2008, p. 43. A similar point was made by Professor Donald Sinnott, *Committee Hansard*, 23 May 2008, p. 46.

5 Professor Donald Sinnott, *Committee Hansard*, 23 May 2009, p. 45.

6 Professor Donald Sinnott, *Committee Hansard*, 23 May 2008, p. 46.

Climate change

2.7 An important use of satellite data is monitoring changes in the climate due to the anthropogenic increase in carbon dioxide in the atmosphere. In the United Kingdom, space expenditure:

> is about to go up hugely because the UK sees its needs in climate and environment as really escalating in this century.[7]

2.8 A number of witnesses attested to the importance of satellites in progressing climate change science. The CSIRO noted that space science has resulted in existing projects taking on an international perspective.

> One of the big advantages that Australia has in climate monitoring is that we are forced in some ways to take a continental view in a lot of the work that we do. If you take, for example, the National Carbon Accounting System …that is a CSIRO model that we have developed jointly with the Department of Climate Change… [it] has been turned into the international forest and climate initiative. That initiative is trying to look at the world carbon emissions, particularly from forestry, which will be an important policy issue for other areas, such as discussions in Copenhagen…We are looking in continental areas at Australia's environment, water resources and carbon emissions…[8]

2.9 These views were shared by the private sector who advocated that an Australian investment in space infrastructure could assist with international co-operation in tackling climate change:

> The issues to do with water management and climate change are things that space based applications lend themselves to.[9]

> …future Australian space policy and budgets should be strongly linked to long-term strategic information needs of core government policy…our needs in relation to climate change should be top of the list…The current government's desire is to play a more active role in emissions trading and with foreign policy linked to climate change. Ideally some Australian contribution to space and associated ground infrastructure towards these goals should be planned to show, not only in words, that we are contributing, and to leverage some influence….[10]

2.10 Professor Harvey Butcher felt that Australia in particular needed to be more proactive in satellite programmes given the domestic priority of water management into the future:

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7 Mr Stephen Ward, Symbios Communications, *Proof Committee Hansard*, 1 August 2008, p. 34.

8 Dr James Moody, CSIRO, *Proof Committee Hansard*, 29 July 2008, p. 33.

9 Mr Kirby Ikin, ASICC, *Proof Committee Hansard*, 1 August 2008, p. 25.

10 Mr Stephen Ward, Symbios Communications, *Proof Committee Hansard*, p. 36.

> in the matter of adapting to climate change, managing the environment and so on, the kinds of satellites one has access to are few and far between, and it would behove us to become involved in some of these satellite programs.[11]

2.11 The committee heard that of the 42 elements of climate currently measured some 25 can only be measured by satellite:

> There are satellite constellations put up by Japan that measure precipitation. There are collaborations between Japan and the US that measure moisture to predict precipitation. There are other constellations put up by the Europeans that measure the amount of water that is on the earth's surface. There are all sorts of satellites aimed at scientific purposes that we are really only marginally benefiting from. If Australia decides to head down that path to better use space science to manage its resources and to increase its influence with other countries, particularly with respect to climate change, then whatever we do with climate change we have to be able to measure and monitor the impacts. If Australia is not pulling its weight it is going to be that much harder to convince other countries to take action against it.[12]

2.12 There is a risk that global warming could accelerate irreversibly were the polar ice caps to melt. There are concerns this may happen faster, and with a greater impact on sea levels, than envisaged in many scenarios.[13] There seems to be more attention paid to the Artic ice sheet than the Antarctic in this context. Australian scientists have expertise in the study of Antarctic ice, but the quality of their analysis will depend in part on the data available, and satellite data can make a valuable contribution.

2.13 When a carbon pollution reduction scheme is extended to cover rural emissions, there will be a need to assess these in remote locations to ensure an appropriate amount of permits have been purchased (or an appropriate amount of carbon tax is being paid). Satellites could play an important role in assessing this.

2.14 This is a new area in which Australian scientists and industry has the potential to develop expertise. The space science and industry experts assembled at a recent conference nominated the 'application of earth observation to weather and climate monitoring' as an area where Australia has a comparative advantage.[14]

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11 Professor Harvey Butcher, *Committee Hansard*, 16 May 2008, pp 52 and 56.

12 Mr Tony Wheeler, ASIBA, *Proof Committee Hansard*, 29 July 2008, pp 40-1.

13 Professor Ross Garnaut, *The Garnaut Climate Change Review*, 2008, p. 94.

14 See Appendix 3.

Other areas of monitoring through remote sensing

2.15 Geoscience Australia hosts the Australian Centre for Remote Sensing, which operates satellite ground station facilities at Alice Springs and Hobart to acquire data over Australia.

2.16 Among the applications to which monitoring by satellite is applicable are agriculture, mineral prospecting, weather, water, fire control, tsunami and marine ecosystems.

2.17 A major user is the Bureau of Meteorology. It stressed the importance of international cooperation:

> Through international agreements under the UN based World Meteorological Organisation, the WMO, Australia gains free access to more than $10 billion worth of data annually from more than 180 member countries in exchange for an Australian investment, through the bureau's observations programs, of around $100 million. The bulk of the $10 billion international investment is associated with space based systems, while Australia's contribution is largely surface based.[15]

2.18 There are areas where Australia could get more benefit from using satellite information:

> …there is a lot of data that is available. We use a lot of it but there is potential to harvest that a lot more and use it for a much wider range of applications… There is a lot of data in areas such as oceanographic monitoring, water resource monitoring, climate monitoring—environmental monitoring right across the range. But there are subsequent applications that you can get from those in terms of benefits through improved forecasting of rainfall for agricultural regions. I think there are a large number of specific application areas for which you could derive more value from that data.[16]

2.19 There is potential for using satellites for early detection of forest fires. In Canada:

> apart from just forest fire detection, we are looking at systems that can identify where a fire is likely to occur—where there is a high density of biomass and where it is particularly dry—so that you know where to focus your resources even in advance.[17]

2.20 Improved data will also be useful for earthquake prediction and contribute to early warning systems and aid relief in the event of natural disasters::

> …we will have better understanding of the earthquake risk because we will have better understanding of the deformation that is taking place on the

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15 Dr Susan Barrell, *Proof Committee Hansard*, 16 May 2008, p. 13.

16 Dr Susan Barrell, *Committee Hansard*, 16 May 2008, p. 16.

17 Mr Richard Kolacz, COM DEV, *Proof Committee Hansard*, 22 July 2008, p. 13.

> continent. Currently those rates of deformation are below the limits that we can detect, but when we improve it by an order of magnitude we will actually be in a position to measure some of those movements and have a better sense of which parts of the continent are actively mobile and which therefore have the potential to generate earthquakes... [18]

2.21 A concern for users is adequate access to the radio frequency spectrum.[19] The Australian Communications and Media Authority is forming a radiotelecommunications committee to examine this issue.

Mining and farming

2.22 Before too long it may be commonplace for mining operations to be controlled remotely from city offices. The University of Sydney's centre for Field Robotics is developing this technology.[20] Reliable satellite links are crucial for these operations. [21] There is similar scope for farming equipment such as harvesters to be controlled remotely, or operators to be assisted through satellite information.[22] There is also potential for remote farms to control stock movements with 'virtual fences'; collars fitted to the animals deterring them from straying.

2.23 Satellites are also an important source of information about rural production:

> We have not asked ourselves the questions, what is the value of the flow of all the satellite imagery that tells us what our wheat crops are going to be yielding next season? What is the value of that flow of information going to five other nations overseas who are predicting our wheat yields months before we know what they are going to be? It is good enough for them to do it and we do not do it. For example, from a simple trade based situation, we are putting ourselves at a significant disadvantage. There are many, many examples like that which will be borne out if we did a proper risk analysis.[23]

Inventory management and transport logistics

2.24 Satellites can help keep track of the movement of goods and therefore reduce inventory costs.

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18 Dr Chris Pigram, Geoscience Australia, *Committee Hansard*, 16 May 2008, p. 22.

19 Dr Chris Pigram, Geoscience Australia, *Committee Hansard*, 16 May 2008, pp 20–1.

20 *Australian Financial Review*, 2 June 2008, p. 33.

21 'Spatially enabling Australia', ASIBA October 2007, reproduced in *Submission 37*.

22 'Spatially enabling Australia', ASIBA October 2007, reproduced in *Submission 37*.

23 Dr Peter Woodgate, CRC for Spatial Information, *Committee Hansard*, 23 May 2008, p. 75.

Defence interests

2.25 The committee heard about the involvement of the Defence Science and Technology Organisation:

> DSTO has long been involved in applied Defence space support research and technology innovation in the operation of systems to access and exploit satellite communications, remote sensing and position, navigation and timing products.[24]

2.26 Defence also described their involvement with the US wideband global satellite constellation:

> Defence has signed an MOU with the US Department of Defence. The value of that is $927 million, and that covers the life of the system out to 2029. I will give you a little bit of background. The US has an authorised program to develop five satellites. Defence is funding the capital cost of the sixth satellite, the costs of launching the satellite and incremental costs associated with managing the construction of the satellite, the launch services and the operation of the satellite in the constellation of five others out to 2029…It will be a US manufactured and US launched satellite and it will be controlled from US facilities…[25]

Coastal surveillance

2.27 A Canadian witness described how satellites can be used in maritime surveillance and could assist with early detection of illegal operations in Australian waters:

> Canada, like Australia, has a requirement to achieve maritime surveillance, to understand what vessels are approaching our coasts out to a range of 1,000 nautical miles. So there is a requirement; there is a budget. We presented a solution to the government of Canada by which we could satisfy this with a small spacecraft platform. The way that I see it is that we are not looking to provide a space mission; we are looking to provide a solution to their problem but it just so happens that it involves the use of a space asset.[26]

Policy aspects

2.28 One witness from industry argued strongly for a more active focus by government on the sector, criticising the:

> lack of a national strategic policy for ongoing implementation of satellite navigation throughout Australia and for its future economic development. Today Australia spends several hundred millions of dollars on imported

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24 Ms Rebecca Skinner, Department of Defence, *Proof Committee Hansard*, 29 July 2008, p. 3.

25 Brigadier David Welch, Department of Defence, *Proof Committee Hansard*, 29 July 2008, p. 5.

26 Mr Richard Kolacz, COM DEV, *Proof Committee Hansard*, 22 July 2008, p. 3.

> satellite navigation products and services. This technology underpins transport, precision agriculture, mining, precise timing for telecommunications, e-commerce and, of course, the national defence network…So where is the national policy that ensures this vital enabling technology is managed in a coordinated and efficient manner in the best interests of the Australian nation? The truth of the matter is that there is no policy…Today our local industry is small and at typically Third World levels. All the navigation products in service today are imported. Simply put, with respect to satellite navigation, Australia takes the technology handouts from the rest of the world. With virtually no domestic industry, no coordinated policy and totally inadequate government funding to secure the science for growing a national skill set, I am wondering what national event it will take to wake this nation out of its current complacency.[27]

Is there a case for (more) Australian-owned satellites?

2.29 The only Australian-operated satellites are those owned by Optus.[28] Its tenth satellite will be launched in early 2009.

2.30 While Optus is now owned by Singapore Telecommunications Ltd, it points out its strong Australian linkages:

> Every Optus satellite is owned by a company registered in the Australian Capital Territory. The launch of every Optus satellite is subject to the issue of an overseas launch certificate by the Australian Government….Optus agreements to supply satellite capacity to the Commonwealth Government are governed by Australian law…Under the existing arrangements the Commonwealth has extensive powers to exercise legal and security control over the Optus satellite fleet and the associated ground stations... a number of specific agreements with the Commonwealth which, among other things, ensure that all decisions in relation to the satellite business are consistent with Australian national interest and Australian national security.[29]

2.31 A number of witnesses argued that Australia can afford to, and should, have its own satellites, or least share in the ownership of satellites. The main arguments involved reliable access to data and being able to access data in a timeframe that suits our unique purpose. Several witnesses pointed out the need for a risk analysis of our current investment to clearly highlight the benefits of our current involvement against the risks of being denied access to data..

> …you do not know exactly when you might be denied access. The best way for a country our size to try to cover the risk to some extent is to be actively involved with other nations in developing observing programs and make

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27 Mr Graeme Hooper, *Proof Committee Hansard*, 29 July 2008, p. 106.

28 Optus had taken over the formerly government-owned Aussat. *Submission 63*.

29 Mr Paul Sheridan, Optus Networks, *Proof Committee Hansard*, 1 August 2008, pp 44-6.

> some contribution, whether it is in terms of providing an instrument or part of an instrument so that we have some involvement in the game and therefore some influence as to what happens.[30]
>
> [Australia is] …totally dependent on external satellites for its defence, earth observatory, meteorological aspects and the growing needs across our whole sector. Therefore, it is a bit like totally outsourcing your most strategic asset and having somebody else make the decisions for you.[31]
>
> …we have become very, very trusting, if you like, of our ability to obtain what we need from elsewhere…[32]
>
> Australia needs to participate financially and collaborate in their missions and deploy sensors that are purpose-designed for Australian issues.[33]
>
> if we seek to have influence in the changing world of space…then we need to be a voice at the table and to do that we need to operate a couple of satellites.[34]

2.32 Not owning a satellite means Australia has no input into its capabilities:

> …without having an indigenous capability, we do not have the possibility of being part of programmes that are specifying and designing new systems that will be useful for Australia. We really can be limited by the products that we end up buying, basically.[35]

2.33 The Bureau of Meteorology commented:

> While Australia can exert some influence on internationally coordinated efforts through forums such as the WMO Space Programme, key decisions on mission payloads are, not unexpectedly, driven strongly by those that are making the investments. [36]

2.34 The Canadian Space Agency told the committee that it shares this view:

> By not owning a satellite, you are along for the ride and you get what is available… When you piggyback on somebody else's constellation, you are at the mercy of that programme.[37]

2.35 From a defence perspective, the Department noted:

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30 Professor Peter Dyson, *Committee Hansard*, 23 May 2008, p. 29.

31 Mr Warwick Watkins, Australian Space Consortium, *Proof Committee Hansard*, 29 July 2008, p. 37.

32 Mr Shaun Wilson, Engineers Australia, *Proof Committee Hansard*, 29 July 2008, p. 95.

33 ASIBA, *Submission 37*, p. 6.

34 Mr Brett Biddington, *Proof Committee Hansard*, 29 July 2008, p. 47.

35 Professor Alexander Grant, Institute for Telecommunications Research, *Committee Hansard*, 23 May 2008, p. 5.

36 Dr Susan Barrell, *Proof Committee Hansard*, 16 May 2008, p. 14.

37 Mr Jocelyn Dore, Canadian Space Agency, *Proof Committee Hansard*, 22 July 2008, pp 6-7.

> Noting Australia's strong alliance arrangements with the US, we maintain unique access and support from US space systems. Additionally, continued assured access to the support provided under the alliance is critical to the ADF's ability to operate independently as part of an international coalition or in a leadership role in a regional force. This access to allied space systems has largely met Defence's needs, in particular for intelligence and more recently for satellite communications. The higher operational tempo of recent years and consequent demand for space products has highlighted that assured access to allied systems may not necessarily be guaranteed in all circumstances and is subject to host nation priorities.[38]

2.36 Canada is reducing its dependence on the US:

> they have begun focusing on some specific areas where they need to develop their own capability. Some of those areas are related to the remote-sensing capabilities. Their needs, I guess, may be slightly different to those of the US, in the sense that their focus is north, around the Arctic region, and on issues associated with global warming.[39]

2.37 As shown in Table 2.1, many Asian economies, smaller than Australia, have significant satellite programmes:

> … they are now building and flying substantial satellites (eg Korea, Taiwan, Thailand, Malaysia and Singapore), and using the experience to develop industrial capability and professional skills.[40]

2.38 On the other hand, aiming for self-sufficiency is generally very inefficient. It was argued to the Committee that Australia is not self-sufficient in many other important areas:

> I am sure you all have Microsoft Office on your desktops. This is made by a company in Seattle; 98 per cent of computers in Australia are dependent on a foreign company for their applications software. Every commercial aeroplane that flies in Australia is built not in Australia.[41]

2.39 Most agencies seemed to think the prospect of being locked out of access to date was remote:

> I think the risk of losing international collaboration and access to international satellites across the board is very low.[42]
>
> It has not been a problem for us to date and I do not foresee it will be in the future.[43]

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38 Ms Rebecca Skinner, Department of Defence, *Proof Committee Hansard*, 29 July 2008, pp 2-3.

39 Group Captain Davison, Department of Defence, *Proof Committee Hansard*, 29 July 2008, p. 7.

40 Dr Bruce Middleton, former head of Australian Space Office, *Submission 87*, p. 2.

41 Dr Michael Green, Department of Innovation, Industry, Science and Research, *Committee Hansard*, 16 May 2008, p. 9.

42 Dr Susan Barrell, Bureau of Meteorology, *Committee Hansard*, 16 May 2008, p. 17.

2.40 However, while the risk of being denied access to satellite data is not necessarily large, it would have severe consequences if it eventuated.

Benefits of collaboration

2.41 Some witnesses therefore argue there were better uses of funds in collaborative approaches:

> …we would see the ideal investment, if the cost-benefit analysis took us that way, in sensors and instruments, not in satellites themselves. Through the collaborative arrangements we have, particularly with Japan, the United States, China and Korea, who are about to launch a geostationary satellite in a year or so, there would certainly be some capacity, I would hope, to collaborate in designing an instrument—perhaps a hyperspectral instrument—that would sit for example on a Japanese satellite which is very conveniently located …to the north of Australia. That would potentially allow us to get a lot more detailed information about the atmospheric profile, temperature and humidity and really understand a lot more about the atmosphere above Australia. Investments like that would be very worth while.[44]

2.42 The committee heard of the potential for cooperative projects, sharing satellites with Canada:

> if we do a fifty-fifty mission…when the satellite is flying over Canada looking for forest fires, we are using it and operating it. When it is flying over Australia, for example, looking for fires, you have 100 per cent control and operation.[45]

> an incline LEO constellation of 10 to 15 satellites which would provide continuous coverage of both poles, north and south. To us, northern coverage is certainly important. But there may be some benefits for a country like yours which has an interest in the Antarctic.[46]

2.43 An alternative to ownership of satellites is making some important contribution to their operation, so that access will be maintained. One witness referred to this as having 'skin in the game'.[47] The committee heard of two examples:

> At that time there was pressure from the Japanese to contribute to the cost of their operating the GMS satellite. The bureau solved that very cost effectively, I think, by providing them with ground support from Melbourne

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43 Dr Chris Pigram, Geoscience Australia, *Committee Hansard*, 16 May 2008, p. 30.

44 Dr Susan Barrell, Bureau of Meteorology, *Committee Hansard*, 16 May 2008, p. 17.

45 Mr Richard Kolacz, COM DEV, *Proof Committee Hansard*, 22 July 2008, p. 9.

46 Mr Jocelyn Dore, Canadian Space Agency, *Proof Committee Hansard*, 22 July 2008, p. 6.

47 Mr Brett Biddington, *Proof Committee Hansard*, 29 July 2008, pp 46-8; and his booklet *Skin in the Game: Realising Australia's National Interests in Space to 2025*, Kokoda Papers, no. 7, May 2008.

> at their cost, and that support was essential for the satellite to maintain its position and attitude.[48]
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> We have a very good in-kind type of relationship with the United States Geological Survey where, as their satellite passes over Australia, we receive data about the health of the satellite—its telemetry data, what it is doing. We then give that straight back to them, which gives them an increased knowledge of how their satellites are going when they are in that part of the world they cannot see. They value that very highly. They value the fact that we give them the data and that we are very reliable and competent, and that comes back to us as a better deal on access to the satellite.[49]

2.44 Australia is, literally, well-placed for downloading data from satellites, allowing us to 'earn our keep' in joint satellite projects:

> Where we sit … equidistant from Europe and the Americas, makes us an ideal place for ground stations… no matter where the earth is in terms of its daily rotation, one of those ground stations is always in contact with the satellites being supported. [50]

Cost of satellites

2.45 Launching objects into space is generally expensive:

> If you want to send something up into space through the space shuttle, you have to allow approximately its weight in gold for the value of getting it up there.[51]

2.46 However, there are ways of launching small satellites cheaply. The committee was impressed by the initiative of some students at the University of New South Wales building a satellite within a budget of about $30 000 by using volunteer labour and off-the-shelf components, and being allowed free use of some testing facilities by the university and some businesses.[52] The Canadian Space Agency has small satellite programmes planned in the near future in which Australia could collaborate.

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48 Dr John Boyd, *Proof Committee Hansard*, 29 July 2008, p. 80.

49 Dr Adam Lewis, Geoscience Australia, *Committee Hansard*, 16 May 2008, p. 31.

50 Mr Brett Biddington, *Proof Committee Hansard*, 29 July 2008, p. 48.

51 Professor Richard Morgan, Centre for Hypersonics, *Proof Committee Hansard*, 29 July 2008, p. 17.

52 They also referred to a team of ten amateurs who over two years in the early 1970s built and launched a satellite; Mr Anthony Wicht, *Proof Committee Hansard*, 1 August 2008, p. 5.

Militarisation of space and space debris

"And now I'm mad about space junk
I'm all burned out about space junk"
Devo, *Space Junk*, (Lyrics: G. Casale, R. Mothersbaugh)

2.47 The Department of Defence warned:

> As space becomes more accessible, it will also be more congested and contested, and there is a growing demand for access to specific orbital planes in both low earth orbit and geosynchronous orbit. Access to, and utilisation and disposal of, satellites from these orbits will require increasingly careful monitoring. The destruction of, or interference with, satellites providing space services can adversely affect other national applications. As space utilisation increases, space debris will also become a growing threat to satellites.[53]
>
> We are very reliant on a lot of our space capabilities in support of national security, and they do come under threat from space debris... Most of the threat is to low earth orbit satellites and that is where most of the debris is concentrated at the moment.[54]

2.48 Concerns about both the militarisation of space and about space debris were heightened in January 2007 with China's test of an anti-satellite weapon on an aging weather satellite. The impact created a cloud of debris, perhaps accounting for about a quarter of the current space junk in orbit.[55]

2.49 Defence expressed their concern about the test from a geostrategic viewpoint:

> …the development of new and disruptive capabilities such as the anti-satellite missile (tested in January 2007) could create misunderstandings and instability in the region.[56]

2.50 However they did not make any public comment on its effect on satellites.[57] The Department flagged that the deployment of weapons in space will be addressed in the Defence White Paper, due with the Government by the end of the year.

2.51 Some witnesses expressed opposition to weapons testing in Australia:

> I think all of us who are in what might be called broad space science would view our primary objective as the peaceful use of space, whether it be on

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53 Ms Rebecca Skinner, Department of Defence, *Proof Committee Hansard*, 29 July 2008, p. 3.

54 Group Captain Dennis Davison, Department of Defence, *Proof Committee Hansard*, 29 July 2008, p. 10.

55 *Orbital Debris Quarterly News*, NASA, Vol. 12, Issue 1, January 2008; *The Economist*, 19 January 2008.

56 *Australia's National Security: Defence Update 2007*.

57 Response from Department of Defence to question taken on notice on 29 July 2008.

> economic, social or environmental grounds. I think any weaponisation or perceived weaponisation of space would have concerned me as an individual, let alone the community. I think there is a clear view that outer space is to be used for peaceful purposes.[58]

2.52 Another witness had concerns about the militarisation of space and Australia's (indirect) involvement in it:

> The US air force has the stated policy to ultimately destroy any space capability—and that can include ground stations anywhere in the world—that the US government determines is inimical to its national interests. As a close ally to the United States, it should occur to us to have a view on that, on whether or not that is a good thing to do, bearing in mind also that we host in this country both facilities and research which is important to the future of that relationship and which, indeed, can be expected to have impact on the sorts of capabilities that the US air force would draw on to impose or inflict its policies, should that unfortunate event ever happen.[59]

2.53 A submission refers to a United States Government commission which argued that the US needs to 'develop the capability for power projection in, from and through space'; a State department official claiming 'our Government will continue to consider the possible role that space-related weapons may play in protecting our assets'; and the US being the sole opponent at the United Nations to resolutions aimed at preventing an arms race in outer space.[60]

2.54 It has been suggested that the destruction of ten satellites could create enough space debris to start a 'chain reaction' of debris destroying satellites and creating more debris, potentially ending satellite usage for decades.[61]

Conclusion

2.55 The committee opposes any moves towards militarising space. It wants the government to call for a halt of any weapons testing, particularly tests that would result in the creation of further space debris.

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58 Professor Andrew Parfitt, *Proof Committee Hansard*, 29 July 2008, p. 104.

59 Mr Brett Biddington, *Proof Committee Hansard*, 29 July 2008, p. 46.

60 Women's International League for Peace and Freedom, *Submission 84*, pp 9, 25 and 26.

61 The claim is attributed to the US Centre for Defence Information; T. Allard, 'Battle lines in the final frontier', *Sydney Morning Herald*, 25 April 2008, p. 31.