



COMMONWEALTH OF AUSTRALIA

# Official Committee Hansard

## SENATE

STANDING COMMITTEE ON ECONOMICS

**Reference: Australia's space science and industry sector**

TUESDAY, 23 SEPTEMBER 2008

CANBERRA

BY AUTHORITY OF THE SENATE



## **INTERNET**

Hansard transcripts of public hearings are made available on the internet when authorised by the committee.

The internet address is:

**<http://www.aph.gov.au/hansard>**

To search the parliamentary database, go to:

**<http://parlinfoweb.aph.gov.au>**

**SENATE STANDING COMMITTEE ON  
ECONOMICS**

**Tuesday, 23 September 2008**

**Members:** Senator Hurley (*Chair*), Senator Eggleston (*Deputy Chair*), Senators Bushby, Cameron, Furner, Joyce, Pratt and Xenophon

**Participating members:** Senators Abetz, Adams, Arbib, Barnett, Bernardi, Bilyk, Birmingham, Mark Bishop, Boswell, Boyce, Brandis, Bob Brown, Carol Brown, Cash, Colbeck, Jacinta Collins, Coonan, Cormann, Crossin, Ellison, Farrell, Feeney, Fielding, Fierravanti-Wells, Fifield, Fisher, Forshaw, Hanson-Young, Heffernan, Hogg, Humphries, Hutchins, Johnston, Kroger, Ludlam, Lundy, Ian Macdonald, Marshall, Mason, McEwen, McGauran, McLucas, Milne, Minchin, Moore, Nash, O'Brien, Parry, Payne, Polley, Ronaldson, Ryan, Scullion, Siewert, Stephens, Sterle, Troeth, Trood, Williams and Wortley.

**Senators in attendance:** Senators Bushby, Cameron, Eggleston, Ludlam, Pratt

**Terms of reference for the inquiry:**

To inquire into and report on:

The current state of Australia's space science and industry sector, examining options to strengthen and expand Australia's position in fields that strongly align with space science and industry, giving consideration to any national strategic coordination requirements and taking into account findings and policy options of the National Innovation System Review, with particular reference to:

- a. Australia's capabilities in space science, industry and education, including:
  - i. existing Australian activity of world-class standard, and
  - ii. areas in which there is currently little or no activity but that are within the technical and intellectual capacity of the country;
- b. arguments for and against expanded Australian activity in space science and industry, including:
  - i. an assessment of the risks to Australia's national interest of Australia's dependence on foreign-owned and operated satellites,
  - ii. the potential benefits that could accrue to Australia through further development of our space capability,
  - iii. economic, social, environmental, national security and other needs that are not being met or are in danger of not being met by Australia's existing space resources or access to foreign resources,
  - iv. impediments to strengthening and expanding space science and industry in Australia, including limiting factors relating to spatial information and global positioning systems, including but not limited to ground infrastructures, intergovernmental arrangements, legislative arrangements and government/industry coordination, and
  - v. the goals of any strengthening and expansion of Australia's space capability both in the private sector and across government; and
- c. realistic policy options that facilitate effective solutions to cross-sector technological and organisational challenges, opportunity capture and development imperatives that align with national need and in consideration of existing world-class capability.

**WITNESSES**

**MIDDLETON, Dr Bruce Stanley, Private capacity..... 1**



**Committee met at 6.01 pm****MIDDLETON, Dr Bruce Stanley, Private capacity**

**ACTING CHAIR (Senator Eggleston)**—Welcome. I declare open this Senate Standing Committee on Economics. This is the final public hearing of the committee's inquiry into the current state of Australia's space science and industry sector. It has been convened to hear evidence from Dr Bruce Middleton, the former head of the Australian Space Office, who was unavailable when the committee held its previous public hearing in Canberra. The committee tabled an interim report on 23 June 2008 and will be tabling its final report by the end of October. These are public proceedings, although the committee may agree to a request to have evidence heard in camera, or may determine that certain evidence should be heard in camera. I remind Dr Middleton that in giving evidence to the committee, he is protected by parliamentary privilege. It is unlawful for anyone to threaten or disadvantage a witness on account of evidence given to a committee, and such action may be treated by the Senate as a contempt. It is also a contempt to give false or misleading evidence to the committee.

Dr Middleton, if you object to answering a question, you should state the ground upon which the objection is taken and the committee will determine whether it will insist on an answer having regard to the ground on which it is claimed. If the committee determines to insist on an answer, you may request that the answer be given in camera. Such a request may, of course, also be heard at any other time. Dr Middleton, would you like to make an opening statement?

**Dr Middleton**—Yes, I would like to make a short opening statement. First, I welcome the committee's invitation to provide evidence to this inquiry. I am sorry that I was not available when you held public hearings in August, but I am pleased that nonetheless we managed to meet at this late stage in your inquiry. I want to thank Dr Boyd publicly for stepping into the breach in my absence and, having communicated with him about what was said, I do not disagree with anything that he put in front of the committee.

I would like to make a few remarks about my experience so that the committee members can make their assessment of what weight they want to put on my evidence. I served 17 years in the Australian Public Service, from 1978 to 1994, all of that time in the Senior Executive Service. I was appointed the founding Executive Director of the Australian Space Office when it was established in 1987, and I left it in August 1993. When I took up my post at the ASO I sought to understand the history of Australia's space activity—or its lack of it—the background to the establishment of the office and the political and bureaucratic environment in which it operated. I visited space organisations overseas to understand the international context. I took particular note of government arrangements in the UK and Canada, which seemed to have relevance to Australia at that time. My dialogue with the Canadian officer, who became the first president of the Canadian Space Agency, extended over the period of formation of that organisation. I would add that one of the reasons I approached the secretariat last week was that I was concerned that some of the evidence that has been given to the committee might leave a false impression about the relevance of the Canadian and Asian experiences to Australia.

While at the Space Office, I used the services of two international consultants—one based in the United States and one in Europe—to ensure that the advice I gave on Australia's space activities was well grounded. A major responsibility I had during my term there was

coordinating government support, within both the Commonwealth government and the Queensland government, for the Cape York space port proposal. This involved negotiations with the United States and Soviet governments as well as with the private organisations involved. I subsequently provided support for proposals to establish other launch services based in Woomera.

I left the Australian Public Service in 1994 and established Asia Pacific Aerospace Consultants Pty Ltd, providing support to international companies seeking commercial space business in the Asia-Pacific region. My client list in this successful enterprise included, in the United States: Boeing, Space Systems Loral, Lockheed Martin, Ball Aerospace, Orbital Imaging and Vertical Circuits; in Japan: Mitsubishi Corporation, Mitsubishi Electric, NTT, Space Communications, Rocket System; in Europe: Eurockot; in Australia: Optus, Foxtel, VIPAC, the then Australian Communications Authority and Hawker de Havilland. I travelled extensively, particularly in Asia, but also in North America and Europe. In Asia I regularly visited all of the capitals between Seoul and Tokyo in the north and Jakarta in the south—on one occasion including Yangon in Myanmar.

Over this period I took particular interest in the developing government funded space programs in smaller economies in Asia and I regularly visited the key organisations involved. The relationships I developed enabled me to provide informal advice to the key players in Bangkok and Kuala Lumpur during the period in which their agencies—GISTDA in Thailand and the National Space Agency of Malaysia—were being discussed and then established. This was not by contract; it was just advice between friends. In each place, one of my best contacts was appointed the first head of the agency when it was formed. Those relationships also allowed me to bring together for the first time in October 2000—ironically in the United States—senior officers from the Korean and Taiwanese programs, which up to that point had no contact even though they were quite similar.

I prepared my own written summary of government funded space developments in smaller economies in Asia and I regularly updated it after each visit. Having had a previous visit to the then minister responsible for space, in 1997 he asked me to provide a copy of that after my next trip so I did. His reaction on reading it—remember this was in 1997, just after the Space Office had been abolished and the program shut down—was surprise and concern. Australia has not changed its policy position in the more than 10 years since then, but much progress has been achieved in the Asian space programs. We should no longer be surprised but we should be more concerned.

I have had no financial interest in the space industry since I retired more than five years ago. I have a few quick comments on my own position. I am convinced that Australia is making a serious mistake in not investing significant public funds in space. I am not talking about funds invested by individual agencies in pursuit of their own missions, but funds invested in national activities that transcend individual agencies. I cannot accept that in choosing not to invest, and thereby setting ourselves aside from so many other countries, we know something that they do not. I have seen no evidence of any such wisdom.

I believe that by not investing we are missing out on opportunities and making ourselves more dependent on others. I believe our current policy on space short-changes the educational, scientific, technological, innovation, industrial, environmental, public good and national security



objectives of national policy. I believe we will pay a heavier price in the future if we continue not to invest.

I identify two basic reasons for our current situation. One is that no senior minister of a government of any colour has ever, since space became important in the 1960s, taken the time to understand the significance of this industry for Australia. As a result, space has had little political support in Australia in contrast to Canada and other countries. That has made it easy for economics based policy advice opposing 'intervention' to prevail. I know of no other country that seeks to base its national space expenditures on economic analysis. The benefits and penalties for not investing are much too ubiquitous for that.

Finally, I ask the question: will we continue to underinvest? Successive Australian governments have had this situation drawn to their attention but they have made little or no change. As the committee knows, the Academy of Technological Sciences and Engineering provided the Madigan report as long ago as 1985. In 1991-92 there was a review of the National Space Program that produced another reasoned report, the Curtis report. In late 2005 former senator Greg Chapman provided a submission to the then government based on the work of his space policy advisory group—it was entitled *Space: a priority for Australia*—and there have been some other less high-profile inquiries. Government response to all of this consistent advice has been at best tepid and reluctant as it was to the Madigan report, and at worst adverse as it was for Curtis and Chapman. I hope we do not continue down the path we are treading. I, and I believe what is left of the Australian space research and industry communities, hope that the work of this committee might lead to a better future. Thank you and I look forward to the discussion.

**ACTING CHAIR**—One of the comments you made compared us to Asian countries. Would you like to give us some more specifics there, particularly about Canada and Asian countries? I am particularly interested in the Asian dimension.

**Dr Middleton**—Canada is a particularly interesting case. The Canadians launched their first sounding rocket which they built themselves in 1959. The Canadian government of either complexion became a very strong supporter and so the Canadian public sector, including the research agencies and the departments that could benefit from using space technologies, took an active interest and became very involved. Canada in fact built up its industrial capability to the point that in one generation of their communications satellites they acted as prime contractor—although I would say they overreached themselves in that regard.

I should say, I have seen no evidence whatsoever and heard none from my friends and colleagues over there at the time that there was a defence element to this involvement. There was certainly a communications element—that is, they were concerned about the difficulties of communicating at high latitudes over a sparse area, not unlike some of the problems in Australia. But it was this activity of course that brought to them opportunities for collaboration with the United States and also with Europe. I do not agree with all of the things that they have done but I do believe they have been very impressive in what they have done and their industry has been quite successful. There was one point while I was in the Space Office where the export earnings of the Canadian space industry exceeded the amount the government was spending on space, a fairly impressive achievement.

Asia is even more interesting. There are five, six, maybe even seven countries in Asia which are smaller economies that are now very active in space. The largest of them is the Republic of Korea, whose economy is five per cent larger than ours. When they made their commitment in 1996 it was for approximately US\$4 billion over a 15-year period. They have produced six or seven micro-satellites, most of them built within Korea. They have produced three multipurpose satellites. They are developing a launch service—not for military purposes but initially to have a capability to launch 100 kilogram satellites of their own, and then larger ones. I could go on, but I will not. The Taiwanese program is of a similar size, and I can probably drag out numbers that give you a scale of some of these expenditures while I am summarising them. To give you a feel for the Taiwanese one, their initial commitment was A\$775 million over 15 years. They renewed that in 2004 for about US\$740 million. The Taiwanese economy is 42 per cent the size of Australia's economy, based on IMF figures for last year.

There are now space agencies in Thailand and Malaysia. Thailand is just about to launch its own remote sensing satellite. It was built in France, but with 20 Thai engineers involved in the manufacture. The project cost is about €128 million. The Malaysians formed a space agency in 2002 and approved a program from then to 2010 of US\$310 million. They have built two or three satellites of their own. They and the Koreans have both launched an astronaut. The Singaporeans are building—I think—their third satellite, X-SAT, which has a significant military involvement, and will have some capability that will be of interest to their military. Even Vietnam, with a very small economy compared to Australia, is working its way towards being involved in building a satellite of the FedSat class like Australia launched a few years ago. So there is a great deal going on in the smaller economies in Asia. As I said earlier, that was one of the reasons I felt it might be important if I came along and chatted with you to give you a more accurate impression.

**ACTING CHAIR**—Can I just take you back to Canada. They are associated with the European Space Agency, are they not?

**Dr Middleton**—They are a cooperating state, or a cooperating member I think is the title.

**ACTING CHAIR**—You mentioned how their return on investment was greater than the actual investment. Does that tie up through commercial arrangements through the European Space Agency? We heard some evidence in Adelaide that there were commercial advantages through the sale of, and rights to use, applications if they were conducted through the European Space Agency.

**Dr Middleton**—I am not an expert on the European Space Agency's regulations about the use of technology developed under their program. I should say that Canada's expenditure through the European Space Agency is a minor part of their total program expenditure.

**ACTING CHAIR**—Okay, that is interesting.

**Dr Middleton**—Under the ESA rules they would expect about 80 per cent of what they contribute to come back in contracts to Canada, and it would be technology developed as a consequence of those contracts that would be the subject of restrictions under ESA rules. But that is not a major part of the Canadian space expenditure.

**ACTING CHAIR**—Dr Middleton, one of the banes of the lives of senators is that every so often we have to go and vote, and we have to do that now. If you do not mind, we will suspend the hearing until this vote is concluded and then we will return.

**Proceedings suspended from 6.19 pm to 6.29 pm**

**ACTING CHAIR**—The committee will resume. I might just finish off those questions about the Asian countries. You mentioned that their policy drivers include national security, management of resources, monitoring climate change and other large environmental effects, scientific research, higher education and national prestige. I am quite interested in how you would rate the Asian nations that you have mentioned under those sorts of headings, and Australia. We went and inspected the Optus satellite control system in Sydney last Saturday and we were very impressed by the capabilities of that centre. Would you say that Australia is able to match the kinds of capabilities that these Asian nations have, or do we need to give some more thought to what we should be doing?

**Dr Middleton**—I think it is true to say that in every Asian country, the smaller Asian economies, that has become involved in space there has been some association with the acquisition of their own communications satellite system. In some cases, the government spent money to develop technologies and train engineers ahead of that acquisition; in others, it followed. But in every case there is a connection—an apparent connection. I am not sure if this is the question you were asking, but I would say that the Optus space satellite engineers have a very high reputation around the industry. It was no accident that, when Singapore Telecom acquired Optus and reorganised into a number of international business units, most of those units were, naturally, based in Singapore. Singapore Telecom already had a satellite jointly owned with Taiwan, but their satellite business unit was based in Sydney, and that immediately tells you the Singaporeans' judgement of the relative quality of the two teams. I know that Optus's reputation is quite high. I am not sure if that answers your question.

**ACTING CHAIR**—It does to some degree. I suppose what I am really asking is: should we as a country and as a federal government be investing more in infrastructure for satellite services, and is that in fact what is happening in these countries that you referred to—they have national government involvement in the development of their satellite services?

**Dr Middleton**—I do not see any argument that national government should invest in communication services. The communications satellite business is now a commercial business. It is not totally separate from government programs—I make that comment because many of the new technologies that appear on commercial satellites have their origins in military expenditures in the United States and other places—but the question of whether or not to invest in a new satellite or a new ground system is a commercial question. The original question of whether or not to acquire a communications satellite has in many cases been a political one. It was a political one in Australia. It was a political one in Korea. It was a political one in Taiwan. In many cases that is a fact, but now they are operated on a commercial basis. It is a very different story, however, when you get into earth observation, where the space systems that provide the data have hitherto been owned by relatively few countries and have been designed to provide the services which those countries require, and while they have provided services to other countries they have been less than optimal in terms of the sensors they carry, in terms of the revisit times, in terms of how you get your pictures.

On that particular one, I will give you a small anecdote that illustrates a number of points. The satellite centre at the National University of Singapore has the acronym CRISP—I cannot remember all the words. It was—I do not know whether it is still the case—the only ground station in this region which had an agreement with the American company operating the very first high-resolution satellite to actually task that satellite. By that I mean that that ground station could say, ‘Take a picture now and send it down,’ instead of sending a request to the United States saying, ‘Please, Mr Owner; I want a picture of my area,’ and having the picture arrive in two weeks time. When I visited that centre on one occasion I asked them for details about their budget, and I was told it was confidential. I do not have to be Einstein to connect those two things. I certainly know that there is a flavour of that in Malaysia. I do not see it in Thailand at this point. There is a connection in Korea with their national security concerns. We have never done that in Australia; we are totally dependent on other people’s imaging.

**Senator CAMERON**—Thanks very much, Dr Middleton. Optus gave the impression that it was sufficient to control your satellite from a space station within Australia and that on that basis there was absolutely no need to develop a space industry in Australia at all; that is the impression I got. That might be doing an injustice to Optus, but I think that is a shorthand analysis of what they were saying. They were saying that as long as you control the satellites it does not matter who puts them up there and that as long as we can help design them it does not matter whether they are built in Australia or not, but then they came back to the issue of a skills base within Australia. It struck me that there was a bit of a dichotomy there between the two arguments. Have you got any comment on that?

**Dr Middleton**—I think we get into trouble immediately when we talk about a space industry because this is a very complex industry; it has many pieces. I would interpret Optus’s remark as applying to their business, which comprises buying relatively large communications satellites, of which there are relatively few manufacturers in the world and which there are relatively few companies or countries capable of launching. It is, frankly, totally unrealistic to aspire to develop and build such hardware in Australia.

I think my best illustration goes back to the Canadian example. One of the bidders at the time when AUSSAT, as it then was, purchased its first family of satellites was a Canadian company called SPAR Aerospace. The Canadian government had entered into an informal agreement with this company that if that company would develop the capability to be prime contractor—that is, driving the manufacture of new satellites—then the Canadian government, by whatever means, would ensure that one satellite was bought approximately every two years. By that means and others, they managed to develop the capability where not only would a Canadian company be prime contractor but Canadian companies would supply a fair amount of the hardware. They had done that with the most recent Canadian communications satellite. But they had done it because of the company which built the payload on that satellite. Do you understand what I mean? There is a platform, which is, if you like, the housekeeping, and there is the payload, which is the transmitters and receivers. The company which had built the payload was Hughes, in the United States, one of the largest manufacturers of these things in the world. Hughes, reading the political winds in Canada very well, did not bid, so SPAR got the business and made the satellites for Canada. When the AUSSAT competition came, SPAR bid. Hughes was no longer under political constraint and it bid and, of course, got the contract in Australia. That was the only time SPAR ever bid in an international competition, and the Canadian content of Canadian satellites rolled back down well below 30 per cent. The point I am making is that one has to be

very realistic about what one aspires to do. The Canadians overreached themselves and had to roll back.

Getting back to your question, communications satellites in geostationary orbit are one thing. Optus have made their point—they are correct and I do not disagree with them. Remote sensing satellites in low earth orbit are a totally different kettle of fish: different customers, different technology, different constraints, different opportunities. Optus, I think, would not venture an opinion, because it is not their business on that area. So there are many parts. Designing a program that is appropriate for a particular country requires a lot of thought. Part of that thought is: what is a sensible thing to aspire to and what is not?

All of the Asian countries that are now in the business of building small satellites—and ‘small’ is now getting up to one tonne in size—aspire to command a lot of that technology internally. The Koreans talk of ‘Koreanising’ their communications satellites. Their national program, announced in 1996, aspired to launch five communications satellites, I think. They have not launched one for the very reason I am making: it is out of their control; they cannot crack that business. But they have launched a lot, and they have launched some very impressive earth observation satellites. The point is there are different parts of the business and you have to be canny about where you spend your dollars.

**Senator CAMERON**—I saw a program on the ABC a couple of weeks ago which was about the space station. It showed an Australian bag of seeds in a plastic bag being irradiated and what that would do. The next show was the remote arm on the space station, which was quite clearly Canadian. I thought that was a really good metaphor for where we were—we were sending seeds up in a plastic bag for another country to do an experiment on, but Canada had actually built part of the space station. That is good for national identity, but is that part of the commercialisation of the Canadian industry?

**Dr Middleton**—The Canadians bid for that work originally because they had a capability in robotics and they used the remote manipulator arm to give that industry a stimulus. I think you would be hard pressed to find an argument that said that was a good investment in strictly commercial terms—how you weigh the national prestige that comes from having that name on the arm. The opportunity that comes for Canadian astronauts to fly is a separate issue. Some countries, quite bluntly, say national prestige is one of the reasons. I am not a fan of human space flight, but I do acknowledge that it has that gee-whiz impact. I think there are many things that we can do in space that do not involve risking human life, and we can do them a lot cheaper.

At the time that Dan Golden was the head of NASA, and I was head of the Australian Space Office—I might have been in the corner of his building in relative terms—we had one or two conversations, and his view was that human space flight was the tap that turned on the dollars in congress. That is why they continued with it. You could also make an argument that large projects were a means of ensuring that NASA continued. After the last landing on the moon, there was a huge drawing back—I could waffle on. The point I make is that we do need to be careful where we spend the money. National prestige is one of the reasons, but there are many others.

**Senator CAMERON**—Is it ever too late to enter this ‘space industry’? How could we, from a government perspective, establish at least the first step towards getting coordination across what

we have with a view to moving forward to build something for the future? It seems to me there is nothing of any cohesive nature within Australia at the moment.

**Dr Middleton**—There is expenditure being made by government departments and agencies in Australia today on space services and space technologies which directly address their mission and objectives. Coordination implies a little bit more than knowing what the other guy is doing. It implies occasionally altering decisions to have a more coherent whole. In my 17 years in the bureaucracy I have never seen a department that would do that purely on the basis of someone else's arguments, because it would achieve something. Bluntly, the only reason people change their behaviour in that circumstance is if someone else puts something on the table that will add to what they have got, not take it away. They are very protective of their own little pocket of money. It must be 20 years since we got into envelope funding for portfolios. Anything extra that somebody wants to do somewhere else takes away from over here. Therefore, the two elements for coordination are: some machinery where people meet together—people with sufficient authority to commit their agencies; and a program with enough money to put mortar between the bricks.

I did a very quick analysis a couple days ago of the British situation, because the British National Space Centre has been mentioned in evidence as a possible example. If one looks at the financial figures for BNSC in 2007 you can very quickly calculate that the amount of money that BNSC has put on the table compared to the amount of money that other agencies—three in particular—have put on the table in the UK is one to seven. It is not enough.

The picture is that we—an agency—can see an opportunity to go forward. We talk about it with other agencies of government. Defence is going one way and suddenly they see there is a technology that might develop out of this which will contribute to their mission so, yes, they will put some money in. But if you come along and say, 'I have got \$5 to put in and I want you to put in \$50' it does not happen. From my experience, the two elements are: a central organisation with some executive authority and of a sufficiently high level to bring in people who have authority to commit their agencies; and enough money to be attractive to those agencies to contribute something of their own.

**Senator LUDLAM**—If we could change tack a little, some previous witnesses spoke about the vulnerability of space based assets of all kinds to the weaponisation of space. A couple of examples came to mind—the Chinese government's test of some kind of kinetic device to create a huge debris cloud in orbit. A couple of months or so after that the United States destroyed a satellite of their own. How seriously do you take those threats to the space industry as a whole, and how big a part does that play in the industry—the risk of the weaponisation of space?

**Dr Middleton**—Up until about 10 years ago it was recognised internationally that space was going to be off-limits for weaponisation. I think it was the United States that changed its position and set out to develop its antimissile missiles. Now it bluntly says, 'We are going to command that battle area.' It is of some concern, but I think not yet of major concern, to satellite operators.

Those satellites which are built for military purposes, mainly communication satellites but not exclusively—satellites such as the American launch service monitoring satellites, for want of better terms, and others—are hardened. That is, the electronics are built in a way that gives the resistance to radiation. Except in the instance of a direct attack like that, they would be expected

to last much longer than commercial communications satellites. I am not aware of anybody who is designing or building commercial satellites at this point and going to the expense of incorporating those extra things in the design and the manufacture. I am not sure if I have answered your question.

**Senator LUDLAM**—Do you have any thoughts, as far as Australian policymakers are concerned, about protecting the enormously valuable assets that are already in orbit? Is there any advice that you have for policymakers?

**Dr Middleton**—I think that is a game way above Australia's head, to be perfectly honest. I think the technologies that are being developed to achieve that end and to protect against that end are being developed in countries which have much larger expenditures, much more advanced technologies and much more direct interest in making those developments than we do.

**Senator LUDLAM**—I was thinking more in diplomatic terms or policy terms rather than about hardening up Australian assets.

**Dr Middleton**—Australia's response to that would surely be to maintain its close relationship with the United States and feed off whatever the Americans develop and will make available. I use the latter expression, 'will make available', carefully, because they do not make everything available. But that would be the protection one has.

**Senator BUSHBY**—We have taken a lot of evidence over a number of months on this. Having you present evidence at the end of that process is very valuable, because you bring a wealth of experience. It is quite clear to me, and I am probably not speaking out of turn if I say that most of the other members of the committee would also agree, that the evidence has been overwhelmingly in favour of the need for a greater role for government in terms of coordinating this. Senator Cameron asked you about how you think that might be gone about and you touched on the quantum of it. You also mentioned earlier some examples of how much was being expended by comparably sized economies in the Asian region. What sort of money do you think needs to be expanded to do this properly?

**Dr Middleton**—I would think that if Australia was not committing A\$50 million a year it was not serious and would be seen for that. I would not see \$50 million in a national program as being a honey pot. I would see it as a very careful effort to target that to national objectives, with those objectives being carefully weighed and with a very hard-nosed decision being asked: are we going to address national prestige? If the answer is yes, we might train an astronaut, because that goes a long way to getting people excited about space. If it is no, forget about things like that, forget about things like the remote manipulator arms and focus your money in other areas. Those decisions have to be made.

I became aware during my term at the Space Office, I think partly because the amount of money involved was so small, that there was a little industry building up that saw getting Space Office contracts as a sensible thing to do—'There will be some money this year and some money next year.' We were spending money to try and develop a capability that these companies could use commercially. They saw us as a little industry, and there was a good reason for that. That is, as I alluded to in my written evidence, those countries in which there is an industry sufficiently capable to participate in international markets, however distorted they are—and they

are not as distorted as they were—are without exception countries in which governments are spending public money on something called a national space program. The reason for that is that that is where they are developing their new technologies and that is where they are defraying their non-recurring expenditures.

When we were at the Space Office, we generated some new technologies in companies. The companies, and one springs to mind in Queensland, said to us they won a contract purely on a commercial basis. But they said to us very bluntly: 'If we had had to carry the cost of the development of that technology, there's no way that we would've got the contract.'

**Senator BUSHBY**—Fifty million a year is a substantial amount of money. You mentioned that it should not be a honey pot. You had a budget with the Australian Space Office of only something like \$5 million a year.

**Dr Middleton**—It started at two and it got up to about six.

**Senator BUSHBY**—That would basically have covered the administration and a few small contracts. You touched on it, but how would you see that \$50 million a year being effectively spent, subject to the policy decisions that you mentioned would need to be made as to whether you would want to go for prestige or other things? How much of that would you see as actually running a coordinating office and how much actually out there seeding industry?

**Dr Middleton**—I would see 90 to 95 per cent of it going on program money. I would not see a large bureaucracy. I need to stress that I would see the need for highly qualified engineers in that office. When I was in the Space Office there appeared to me to be an active program in the Australian Public Service of getting rid of engineering grades and replacing them with generalists. You cannot manage a very specialised technical program of this sort with generalists. If you go down that path then you have to hire an intermediary. There is a company in the United States called Aerospace Corporation. It is a creature of the United States Air Force. It operates like a private company but you cannot see a lot of the work it does. When US government agencies need to buy satellites they can hire this company to do their project management because the company has the skills and they do not. It is a dangerous path to take because you are not a smart customer. I make the point that you do need to have some high level skills in the management organisation.

For public accountability reasons you do have to have bean counters. Some of the companies that have given evidence have said that they need to be lean and mean but you and I know that sooner or later something will go wrong. A few dollars will go in the wrong direction and then there will be an outcry in the media and then we will have another 20 accountants on the staff. So the world is not quite that simple. You do need to have accountability as well. You do need to have at the top people of leadership ability and technical capability who are politically smart.

I make one other point, which was made to me a long time ago by a very clever guy called Roy Gibson, who was the first Director-General of the European Space Agency and subsequently the first Director-General of the British National Space Centre. At BNSC his deputy was a high-level officer of the Ministry of Defence—a very smart move. It did not mean he was mole, he had to have a loyalty to BNSC, but I think there is a lot to be said for having some high-level secondment into the centre so there is full illumination into the centre of



Defence's thinking and a reasonable amount of illumination back to Defence—and it is not only Defence; it is the environment department and others.

**Senator BUSHBY**—That leads into my next question. With your experience in the bureaucracy as well as in the space industry how do you think it should be set up? Should there be a board of industry people who oversee it? Should it be an office within a ministry? Should it be a stand-alone agency? What do you think would work best?

**Dr Middleton**—It needs a board of eminent people. One of the reasons that the space council did not work is that it had eight representatives of departments on the council whereas the space board was more effective because these were eminent people who in some cases were politically smart and well connected or well respected in the industry and developed that respect around government.

The work that the agency does involves some unusual things in terms of the way government normally moves. It needs, for example, to enter into multiyear contracts. They might be quite large. If it had a budget of \$50 million, it might enter into a contract that involved the expenditure of \$60 million over four years. Major space programs can easily take four years and longer. From my experience of agencies and departments, I would say it needs to be a separate agency.

Clearly a minister needs to be responsible. I would also say that that minister needs to be a senior minister. A junior minister is a kiss of death. The bureaucracy is very sharp: 'Junior minister? Don't pay it as much attention; he doesn't have the horsepower in cabinet.' And you are on the slippery slope. It needs to be a senior minister. I would say it needs to be a statutory agency. It needs to have enough staff but not too many, and it needs to have expert staff. It needs to have a board of eminent people who command respect in government and in the industry—and in the research community, because let us not forget that the research community is an important part of this.

**Senator BUSHBY**—Dr Middleton, I think I could ask you questions all night on this, but I will try to limit myself.

**Dr Middleton**—And I would happily stay all night, but I know that you can't!

**Senator BUSHBY**—Here is one final question. I noted that in your submission you suggested that those who criticise the need for further investment in the industry should be required to undertake a costing of the cost of failing to make that investment. What do you see the potential costs are for Australia and the industry of failing to make a greater investment? Where do you see the costs are to the economy and to the society in general? Where could they be? What are the risks, essentially?

**Dr Middleton**—I mentioned a number of policy areas where I see it—for example, opportunities lost. In 1993, when I left the Space Office, we had probably half-a-dozen companies that had a capability to manufacture hardware and develop technologies and were in the process of using them. We do not have any of them anymore. Environment: I know of one country in Asia which has designed its own earth-orbiting satellite to give it a revisit time of two days over its area because it has problems on its borders and problems within. Do we have

problems? Do we have a monitoring problem around our border? Perhaps not as much as when we were having refugees, but there is certainly a smuggling issue and other things. I think, with a two-day revisit, we might get a contribution to that.

There are many examples, and with more time I could think of many better examples—national security, earth observation satellites with a radar capability that can see through cloud. It was, I think, no accident that one of the arms of development in Malaysia was a radar satellite, because Malaysia is in the tropics and it gets a lot of cloud. It is very hard to see what is going on on the border of northern Malaysia with Thailand, where you have rebels and people blowing things up. The Thais also have problems with the Karen rebels in the north and Muslim separatists in the south. There are many, many examples like that.

Yes, we can go on in ignorance of what we might be missing, but smart people could sit down and give you pages and pages of what we are missing and how we are proceeding towards our national policy objectives in a suboptimal way because we choose not to invest. I use that word ‘choose’ carefully. We choose by default, in my opinion.

**Senator BUSHBY**—We have also heard that there are sovereign risk issues, in the sense that, if we are relying on satellites that are designed with parameters that are not necessarily suited to Australia’s needs and are also subject to absolute control by other nations, when times are good, that is fine; we get to use it. But, if they need it for their own purposes urgently, they can shut down access that we might have et cetera. So there are issues of lack of control with satellites.

**Dr Middleton**—That is probably not as important an issue as people thought it was, at least in some respects. I am thinking particularly of the GPS system, which as you may know was originally designed with two levels of accuracy. It was designed with the capability to bar access to the highest level of accuracy at the whim of the United States department of defence. In the event, the United States has never done that. They took a rather innovative approach on the occasion of the first Iraq war—they simply bought all the imagery of the Iraq area. That had the same effect but was less disturbing to the customers. President Clinton came to the conclusion that because the rest of the world was now relying on GPS so much, to use this capability would be so damaging to the United States’ reputation that they would not do it. So they have removed the bar—which is my point that it probably is not as serious a threat in that regard as it was.

But in the hypothetical event that the Australian Department of Defence, say, was relying on a radar satellite that had been launched by some country in South-East Asia, the Taiwanese, for example, and Taiwan found itself in a nasty situation with China across the Taiwan Strait then that could be embarrassing. You can think of hypothetical situations—

**Senator BUSHBY**—As you say, it is not necessarily likely but there are risks which could have severe consequences if they eventuated.

**Dr Middleton**—I would not take that so far as to say that it is a reason for trying to do everything. It is not. I suspect that the risk of having your service cut off is probably one of the lower-level drivers compared to the risk of being seen as a country that is not serious about its technology and that continues to be reliant on exports of commodities. A previous government used the phrase ‘the clever country’ to project us in Asia. While when one travels outside of

Australia one is very careful not to bag your home country, I feel that the Emperor is without clothes. Sooner or later they will twig to us, and some of them have.

**ACTING CHAIR**—One of the issues that we have confronted and heard about during this inquiry is the desirability of setting up some sort of national space body or council. How would you feel that that should be constituted if it were set up? How would you like to see something like that set up to enhance our capabilities?

**Dr Middleton**—I would want to see it set up under legislation. I would want to see it reporting to a senior minister. I would want to see it with a decision-making board—not quite on the private model but a board that took the decisions and oversaw everything from financial management to ensuring that the outcomes were the ones that were desired and were done in a timely way. I would staff it, as I said earlier, with experts—with a relatively small number of highly qualified people. Based on what I did when the space office was formed, it would be terribly important for that agency to be in close contact with potential international partners. Let me share another little anecdote. On one of my visits to Kuala Lumpur I made a visit to the headquarters of the Malaysian Armed Forces. There was a reason for doing that—they were involved in some discussions with somebody in the bureaucracy who had some ideas about a remote sensing satellite. I picked up some plans that I thought might be quite interesting to Australia. I talked with the defence attache in Kuala Lumpur and he knew nothing of this. If he knew nothing of this, other people in this town who should have known about it also knew nothing of this. Right across the board—not strictly in the defence area—it is terribly important to know what everybody else is doing, to be able to connect where there are synergies, to partner and to work together. And, where their direction is not in your interest, it is best to know what they are doing.

**Senator CAMERON**—Dr Middleton, most of the initiatives that you spoke about are looking back towards the earth, which is very important for defence, environment and communication. One of the areas of space industry in Australia is the astronomy industry, looking outwards. How would that interrelate to a space agency or Space Office-type approach? Would you see that as being appropriate?

**Dr Middleton**—I will answer that at two levels. Firstly, at the broad level, I think it is very important that whatever arrangements are in place provide for the integration of space science with the rest of the effort—in other words, that there is a capability to support certain areas of experimentation that, for whatever reason, might not get support from the Australian Research Council and from other sources. One of the reasons it might not get support is that doing research in space costs 10 times what it does to do it in Australia on the ground. We in the Space Office were criticised for not supporting space science. Goodness knows that with the dollars we had available and the lack of support we had within the industry department it would have been suicide to start to spend those dollars out in the other area. But in a more ideal world the program would support space science as well as technology.

The amounts of money involved in astronomy are very non-constant. The astronomers step up to the government every 20 years or so and say, ‘Excuse me; we need to expend another \$200 million for another instrument,’ and to my astonishment they often get it. Then they go away for 20 years, do their research and then come back and say this again. My perception is that they do fairly well and that the amounts of money that they ask for in that way—lumpy amounts of

money that would consume a reasonable space budget at the time—are best argued and dealt with separately rather than as part of the pot. That does not mean that, if someone comes along with a smart idea to fly an instrument that has an astronomical application, it should not be considered as part of the national space program—not at all—but I would exclude the acquisition of large facilities. Somewhere in between there will be other things such as whether there should be a program to support Australian astronomers working on the Hubble Space Telescope and other instruments overseas, and I think there is probably a good argument for including something of that sort. That needs to be teased out by people who are much more knowledgeable about the current space science activity in Australia than I am.

**ACTING CHAIR**—Thank you, Dr Middleton. I think you have been an exceptionally useful witness and I thank you very much for your comprehensive submission.

**Dr Middleton**—Thank you. I have enjoyed it.

**Senator BUSHBY**—I would like to stay and ask questions, but we do have other things to get to.

**Dr Middleton**—Yes, I understand.

**ACTING CHAIR**—Presumably, if the secretariat wishes to contact you for further information, you will be happy to be available.

**Dr Middleton**—By all means. If you come to me and say that you want a copy of my summary of Asian space activities, give me some warning; it will take me some time to bring it up to date.

**ACTING CHAIR**—That might be interesting.

**Senator PRATT**—Just for some context.

**Senator CAMERON**—Yes, that would be good.

**ACTING CHAIR**—Should we request that now before we close? Might we request from you some information about Asian space activities, which could be forwarded to the secretariat.

**Dr Middleton**—Okay, I will do some work on it. It was Senator McGauran who read it, and he expressed surprise and said, ‘It’s worrying.’ That was in 1997.

**ACTING CHAIR**—Well, there you are. Thank you very much indeed.

**Committee adjourned at 7.14 pm**