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JOINT STANDING COMMITTEE ON THE NATIONAL CAPITAL AND EXTERNAL TERRITORIES

Reference: Adequacy of funding for Australia's Antarctic program

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JOINT COMMITTEE ON THE NATIONAL CAPITAL AND EXTERNAL TERRITORIES

Wednesday, 23 June 2004

Members: Senator Lightfoot *(Chair)*, Senator Crossin *(Deputy Chair)*, Senators Hogg, Lundy, Scullion and Stott Despoja and Mr Causley, Ms Ellis, Mr Neville, Mr Snowdon, Mr Cameron Thompson and Dr Washer

Senators and members in attendance: Senators Hogg, Lightfoot and Lundy and Mr Causley, Mr Cameron Thompson and Dr Washer

Terms of reference for the inquiry:

To inquire into and report on:

The adequacy of funding for the Australian Antarctic Division to meet he four goals set for advancing Australia's Antarctic interests:

Enhancing Australia's influence in the Antarctic Treaty system;

Protecting the Antarctic environment;

Understanding Antarctica's role in the global climate system; and

Conducting scientific research of practical, economic or national significance.

That the basis of the inquiry into the adequacy of funding for the Australian Antarctic Program be extended to include the Annual Report of the Department of the Environment and Heritage for 2002-03, which was presented in the House of Representatives on 4 November 2003 and stands referred to the Committee for any inquiry it wishes to make.

WITNESSES

Committee met at 5.01 p.m.

CHAIRMAN—I declare open this public hearing of the Joint Standing Committee on the National Capital and External Territories inquiry into the adequacy of funding for Australia's Antarctic program. In September 2003 the committee resolved to conduct an inquiry and report on the adequacy of funding for the Australian Antarctic Division to meet the four goals set for advancing Australia's Antarctic interests. They are: enhancing Australia's influence in the Antarctic treaty system; protecting the Antarctic environment; understanding Antarctica's role in the global climate system; and conducting scientific research of practical, economic or national significance. The committee has received an extensive briefing from the Australian Antarctic Division at its headquarters in Kingston, Tasmania, spoken via telephone hook-up to expeditioners spending the winter at Casey and Mawson stations in Antarctica, and held public hearings in Hobart and Albany, Western Australia.

At the conclusion of the inquiry, the committee will table its findings and recommendations in the parliament in a report which will be publicly available. The committee normally authorises submissions for publication, and they will be placed on the committee's web site. To date, the committee has received 33 submissions from interested parties. I now turn to the proceedings at hand.

[5.03 p.m.]

ALLEN, Mr Rodney John, General Manager Corporate, Australian Antarctic Division, Department of the Environment and Heritage

PITT, Mr Kim Frederick, General Manager Operations, Australian Antarctic Division, Department of the Environment and Heritage

PRESS, Dr Tony, Director (First Assistant Secretary), Australian Antarctic Division, Department of the Environment and Heritage

STODDART, Professor David Michael, Chief Scientist, Australian Antarctic Division, Department of the Environment and Heritage

CHAIRMAN—Welcome, gentlemen. These hearings are legal proceedings of the parliament and warrant the same respect as proceedings of the parliament itself. Giving false or misleading evidence is a serious matter and may be regarded as a contempt of parliament. The committee prefers that evidence be taken in public, but if you wish to give confidential evidence to the committee you may request that the hearing be held in camera and the committee will consider your particular request. The committee has received submission No. 24 from the Australian Antarctic Division. Are there any corrections or amendments you would like to make to your submission?

Dr Press—There are not.

CHAIRMAN—Before we ask some questions, do you wish to make an opening statement?

Dr Press—Of course we would be willing to take any questions, either here or on notice. We would give you a quick turnaround on anything that we may not be able to answer this evening. But I thought that I would make a brief opening statement covering a range of issues that have either been of interest to the committee itself or have been raised in submissions or in the public hearings. It will not be comprehensive; it will be just the ones that we believe we are able to shed some light on for the committee. We are very pleased to be before you. The Australian Antarctic Division has had a proud history of leading Australia's Antarctic program and providing, through the Department of the Environment and Heritage and on behalf of the whole of government, leadership both in Antarctica and internationally.

You have been advised previously, but it is worth noting here, that the operation of the CASA 212 aircraft in Antarctica this season will mark a significant event in Antarctic logistics and begin a new area of operations for Australians in Antarctica and for the Australian Antarctic Division in supporting scientists and others in Antarctica itself. We believe, looking at it from this end, that the provision of this intracontinental air transport capability will significantly improve and make more efficient our Antarctic operations. There have been some concerns raised about whether introducing air transport will detract from the science that is being done in Antarctica. On balance, we believe that the science that will be done in Antarctica will be much more efficient and much more comprehensive as a result of the introduction of air transport. We

have funded the intracontinental air transport component using the CASA 212s by reallocating resources within our current budget.

Issues have been raised about sub-Antarctic research, and the Chief Scientist has provided information previously on our scientific program. Just let me say that we have always kept our research programs under review, and we are still supporting both operations and science at Macquarie Island. But we do have a great deal of interest in whether we can expand our scientific effort around the Heard and McDonald Islands, which are an important part of Australia's external territories and of both scientific and strategic interest in the Southern Ocean for Australia.

Issues have been raised about operating the Australian Antarctic Division from Hobart. There is not much really to say about that except that we have been there since the early 1980s as a result of government decisions. We have a great deal of infrastructure there, as you have seen. Also, Hobart has become a significant base for Southern Ocean science and for Antarctic science. The research community that exists in Hobart—throughout the university, inside the Australian Antarctic Division, inside the CSIRO division of marine science and in other organisations, including in state government agencies—is such that Hobart is a significant world player in polar science. I say 'polar science' because it is not only significant for the work that we do in the Southern Ocean and in Antarctica. Comparatively, it is also a big intellectual capacity compared to polar sciences in the Northern Hemisphere, as well as others in the Southern Hemisphere.

In one of the submissions there were some issues raised about the setting of the catch limits for the Heard Island fishery. I thought I might take some time to cover a few of the issues that were raised. One was that the catch modellers treated IUU fishing as a competitor—a predator—in their analysis and as a result discount legal catches while allowing illegal, unregulated and unreported fishers to keep on fishing. That is not an accurate description of how the Commission for the Conservation of Antarctic Marine Living Resources actually calculates its total allowable catches. What happens is that the models that are used to set the total allowable catches—which I will call TAC from here on—do take into account all of the fishing that has been undertaken previous to the assessment being made, and that will include estimates of illegal fishing. But in setting the future catches it assumes that illegal fishing will be zero so that the TAC that is set for the future does not have within it a discount for illegal fishing.

In the same submission there was a statement that the CCAMLR approach was conservative in setting the TAC. Conservative is not really an accurate description, either. It is precautionary in so far as it makes allowances for unknown components of the ecosystem. This is entirely consistent with the Convention on the Conservation of Antarctic Marine Living Resources and with Australia's national and international obligations. One of the advantages of having a precautionary approach is that the fishery is able to take into account in a smooth way the impacts of illegal fishing and/or other environmental issues that may occur from time to time.

Another issue was raised about the surveys that are undertaken by industry into the fishery at Heard Island. I am not quite sure whether the submission actually meant to say this but it indicated that the Australian Antarctic Division is the primary recipient of those surveys. We do receive the surveys that industry undertakes but these surveys are in fact provided, through our scientists and directly, to the Sub Antarctic Fisheries Assessment Group, which is established

under guidelines of AFMA, the Australia Fisheries Management Authority. So the surveys are actually provided to the Sub Antarctic Fisheries Assessment Group and to CCAMLR as a part of Australia's responsibility for managing the Heard Island fishery.

The SAFAG, the Sub Antarctic Fisheries Assessment Group, is actually composed of scientists from CSIRO; the state Department of Primary Industry, Water and Environment; AFMA; industry; the Department of Agriculture, Forestry and Fisheries; the Bureau of Rural Sciences; and the Australian Antarctic Division. So there is a wide range of clients and interest groups in SAFAG and those data are provided widely across government and agencies.

There were issues raised about whether Casey is the best option for an airstrip that is the receiving end of air transport out of Australia and whether Davis would be a better option. There were a number of background studies done before Casey was chosen as the preferred destination for any air service out of Australia and out of Hobart. We also included an analysis of the appropriate kind of runway. I would like to say that providing a rock runway at Davis was a rather expensive option, leaving aside any environmental issues that may have been involved—and in the past there has been a great deal of environmental concern about building a rock runway at Davis.

But in purely economic terms, back in 1997 Sinclair Knight Mertz did a costing for the construction of a rock runway at Davis station and in 1997 dollars it was in the order of $40 million, which is an order of magnitude higher than any costs associated with the provision of a glacial ice runway at Casey. There were other reasons why Casey was chosen but I just though I would provide that piece of information in relation to Davis and Casey.

We would be quite willing to answer questions about eligibility for grant funding to the Australian Antarctic program, but let me say that all scientists in Australia are eligible to apply for grants and the criteria are open and transparent and available to anybody who wishes to apply. We do not usually fund government agencies, as distinct from universities or their researchers, that are already funded to undertake research. But the provision of grants over and above that is broad.

There were questions raised about our role in the management of Mawson's huts. There was also a question raised about what may have happened at the recent Antarctic Treaty meeting in relation to the Mawson's huts historic site. Just for the record, the Australian Antarctic Division is the part of the department that is responsible for Commonwealth property in the Australian Antarctic Territory and on Heard Island and we are therefore the responsible body for Mawson's hut. We take those responsibilities seriously. We have commissioned a major study of Mawson's hut. Over the last five years we have undertaken a number of expeditions to Mawson's hut in order to protect what is Australia's most important and most iconic Antarctic heritage site. Mawson's hut is a valuable pieces of Australian heritage, a valuable piece of Australia's Antarctic heritage and valuable pieces of Antarctic and world history.

We have a number of specialists who provide us with advice on the conservation of Mawson's huts and it is our belief that, other than catastrophe of one sort or another, the future conservation of Mawson's huts can be secured by strategic intervention and by good and careful management. With that, I conclude my opening remarks. I would be quite happy to receive any questions, and so would my colleagues.

CHAIRMAN—Thank you. Are any islands that are the responsibility of Australia within the Antarctic area, such as Heard Island and McDonald Islands, under the same mining ban as that placed on the continent?

Dr Press—Any islands?

CHAIRMAN—Yes. I do not mean the ones immediately adjacent to or contiguous to the continent but those such as the discrete islands of Heard and McDonald. Are they, for instance, subject to the same ban as that which is on the continent?

Dr Press—No. The provisions of the Madrid protocol apply only to the area south of 60 degrees south. So the provisions of the Madrid protocol do not apply to Heard Island and McDonald Islands, nor do they apply to Macquarie Island.

CHAIRMAN—Given the extraordinary cost for a rock strip at any of the bases there—that is, at Mawson, Davis or Casey—I understand the imperative to work to a budget. But, given the inconvenience of Casey, which is 40 kilometres away from the base—and 40 kilometres is probably the equivalent of 100-odd kilometres or perhaps 110 or 120 kilometres under normal circumstances where you had normal traffic access and normal roads and so on—in retrospect, are you happy that that was the right choice given that Antarctic tyranny of distance from Casey to the base?

Dr Press—I will answer briefly and my head of logistics may follow up with some additional information. The short answer is: yes, we are happy. We did look at the alternatives, and there are other potential alternatives as well. With the kind of operation that we have envisaged and the ability to use the CASA 212s, it will not provide an impediment to our operations and it will be cost-effective.

Mr Pitt—The distance is 62 kilometres. The site has been chosen because it is particularly good in terms of weather. The terrain is what we term self-ablating—that is, it naturally cleanses itself of any wind blown snow that crosses it and it is very easy to maintain in terms of usage during the seasons. The distance from Casey station is a minor impediment in terms of Antarctic travel. The number of people that we would expect to be taken there will easily be delivered either by the use of vehicles that we have tested in the past two seasons—modified four-wheel-drive vehicles with large low-pressure tires that have demonstrated that they can travel at between 40 and 80 kilometres per hour between the station and the runway site—or by the use of the smaller CASA 212 aircraft that are available to meet incoming aircraft from Australia. So there is not really an impediment of significant proportions in terms of that distance. That would put that runway site ahead of others that were considered in the studies.

CHAIRMAN—Could you give the committee the cost of the base—that is, the testing and all of the aggregated costs to have an established and completed ice strip there? What do you expect the cost to be for other infrastructure such as hangars, fuel depots, accommodation et cetera?

Dr Press—We can. Can we take that on notice?

CHAIRMAN—Yes.

Dr Press—My question would be whether you want that comparative to any other options.

CHAIRMAN—I was looking for a comparison with the $40 million cost that you mentioned, unless you would like to refine that one on notice too, Dr Press.

Dr Press—The $40 million cost is a robust one.

CHAIRMAN—It is about right?

Dr Press—Yes. As a matter of fact, I actually asked Kim to check up today because it was one of the issues that was raised. We will provide that to the committee on notice.

Senator STOTT DESPOJA—Dr Press, I know you referred to the strategic intervention on Mawson's huts. We have a submission from a witness appearing this evening, Godden Mackay Logan Heritage Consultants. In their submission they recommend:

The Australian Government should extend the role and responsibility of the Australian Antarctic Division to include conservation of Mawson's Historic Site in accordance with this Conservation Management Plan; and

Resources should be allocated to the Australian Antarctic Division to enable implementation of the Conservation Management Plan's policies and recommendations.

What is your response to that? Do you want to comment on the adequacy of the resources that you have for conservation and protection of the huts?

Dr Press—Godden Mackay Logan were commissioned to write a management plan, which is now the framework for the management of Mawson's huts. The work that they have done now forms the basis of our management of Mawson's huts and in fact forms the basis of the management plans for Cape Denison and the Mawson's huts themselves that were adopted by the recent Antarctic Treaty meeting in Cape Town. Under the EPBC Act and its recent amendments we are responsible for the management of Mawson's huts and we take that responsibility very seriously.

Of course, I cannot look accurately into the minds of those who wrote that submission, but I might just hazard a guess that they are referring to the fact that we may never have been provided with specific funds for the management of Mawson's huts themselves or for other heritage management. If that is what they are referring to then of course any government agency would like to have additional funds to carry out its responsibilities. Let me say that we have, over the last few years, invested a great deal of time, and also effort and money, into the conservation of Cape Denison and Mawson's huts themselves. Have I covered all the issues?

Senator STOTT DESPOJA—Yes, you have. For your information, the authors of that submission are David Jensen, chairman, and Richard Mackay, managing director. Perhaps it relates more to prioritisation of resources. I do not mean to misrepresent them. They will be here, so I will probably question them separately. How many expeditions are required to undertake conservation work on the huts? Logistically, how often is it possible to do it? I understand there was a 2002-03 expedition. How often can that kind of conservation work take place?

Dr Press—That is really a financial and logistic issue rather than whether it is physically possible. It is physically possible to go there every year if you have the resources. We believe that the work that was undertaken in conjunction with other people with interest in Mawson's huts, including the AAP Mawson's Huts Foundation, over the last few years, including the last expedition, has secured the hut for a period of time but not forever. We are now looking at detailed conservation work that may include specific work to protect the fabric of the hut—that is, the actual panels themselves, the boards; the material the hut was made of. We do not believe that that is urgent—in other words, we do not think that it needed to be done last season or that it needs to be done tomorrow—but we do need over the next few years to go down there and do a significant amount of work, which we will do. We will schedule that into our program.

You may be interested to know that we are also looking at the ways we may work with others in order to finance and carry out those kinds of expeditions. They are very expensive. Depending on the amount of work, the amount of time on station and the number of people and the equipment involved, they cost in the order of $500,000 a trip, which is not inexpensive. We believe that, when we get our air transport system settled down, the ability to fly from Casey to Mawson will assist us much more in the management of Mawson's huts than having to go to Mawson's hut by ship every time we need to go there.

Senator STOTT DESPOJA—I think you may have pre-empted my next question on this issue.

Dr Press—Sorry.

Senator STOTT DESPOJA—No, that is always good. My question is about what kinds of logistical costs or resources you would need to conserve the site in accordance with the conservation management plan. Is that $500,000 figure—

Dr Press—That is how much a trip by ship costs.

Senator STOTT DESPOJA—That is per trip.

Dr Press—That is flexible. Sometimes it might be a bit less; sometimes it might be more. It is a round figure.

Senator STOTT DESPOJA—Lastly, you mention the EPBC Act as an example. In terms of protection and your role in administering some of the protections of the environment and the area, I think a number of members and senators have been interested to read about the Steve Irwin example that has received some media recently. I am wondering whether you are able to give us an indication of where that investigation, that issue, is up to and your role in that.

Dr Press—I think you will accept that I have to be fairly conservative on this particular issue. There were a number of allegations made in the first instance, fairly remotely—via web sites and the like—about certain events that might have happened in Antarctica. When we were made aware of that we looked into those allegations, and we are continuing to do so. Because it is an ongoing inquiry, I am not really in a position to say where it is up to. But let me say that, whenever anything like this comes to our attention, we look at it in an objective way and we try

not to single anybody out for any particular investigation or treatment one way or another. We try to do it as objectively as possible.

Senator HOGG—I am actually doing a calculation. Maybe you people will be able to assist me. I want to turn back to the issue that has fascinated me since we had an informal briefing in one of the committee rooms last year about the funding for the organisation. Can you give me an idea of the change in funding from the 2003-04 year to the 2004-05 year?

Dr Press—Are you looking at a quantum figure there?

Senator HOGG—Yes. Has it increased or decreased or is it static?

Mr Allen—I can answer that. Our funding has actually remained remarkably constant over that period of time. You are probably referring to the 2003-04 year because there have been a lot of variations with things like the capital use charge, which has been dropped.

Senator HOGG—Yes, I understand that. I think I have got a table that you people supplied that has taken out the capital use charge, which I can say everyone around this place is extremely grateful for—not just on this committee, but every other committee as well. It has put just a modicum of sanity back into our lives. The table that you have provided and is incorporated in the briefing documents that we have shows changes starting from 1999-2000 and then goes through to 2003-04. It shows a change of negative 0.4, 1.4, 2.3 and then 0.2. I am wondering what the change is for this year.

Mr Allen—It is in the order of two per cent.

Senator HOGG—That is why I had this out making a calculation.

Mr Allen—It is 2.245. That is largely the parameter adjustment that has been applied and some increase in supplementation for the increase in our insurance premiums.

Senator HOGG—Some of that I would imagine mainly meets the change in the increasing costs due to the staff that you have there. Would that be correct or are they met elsewhere?

Mr Allen—No, the actual increase in the cost of staff, which is salary increases that we apply through our certified agreement, has to be absorbed within that two per cent framework.

Senator HOGG—So that two per cent covers everything?

Mr Allen—That is correct.

Senator HOGG—Staffing and operational changes?

Mr Allen—Yes.

Senator HOGG—Does it also cover capital purchases?

Mr Allen—Yes.

Senator HOGG—Correct me if I am wrong, but the impression I gained at our briefing last year, which was not part of this inquiry but led to the inquiry, was that there was very little change in the funding, if any, over a long period of time—and this also applies to the government that preceded the current coalition government. It was fairly static.

Mr Allen—That is correct.

Senator HOGG—The Antarctic Division essentially made up for funding shortfalls by becoming very efficient in its operation, and that included energy efficiency in particular, where the costs of fuel were substantially reduced. Is that a reasonable summation?

Mr Allen—Yes, I would say that is a reasonable reflection of what has happened.

Senator HOGG—With no real increase in funding this year, I understand that you have committed to those two CASA aircraft which are in the process of being built or have been built. When are they due for delivery and will that come out of existing funds that the division holds?

Mr Allen—One of those aircraft has been delivered and is currently undergoing testing. The delivery of the other one is imminent.

Senator HOGG—Does that mean they will become operational this summer? Is that the intent?

Mr Allen—Yes, that is correct. The $5.9 million cost is to be absorbed within our budget. That will be very largely done by rearranging our logistics capability within the envelope that we normally spend on logistics—I mean by that shipping, helicopters and aircraft. Our shipping budget will come down somewhat, as will helicopters, to make way for the two CASAs. There will be some other efficiencies, but it is mostly by rearrangement of our logistics.

Senator HOGG—I turn to the documents—again, these were documents supplied by you, but they would be available from other sources—relating to the financial statements for the last two years. I think they are last year's financial statements for the year ended 30 June with comparisons between the year ended 30 June 2003 and year ended 30 June 2002.

Mr Allen—Yes.

Senator HOGG—It seems to me that in those two years there was a net surplus of approximately $28.6 million and $25.2 million made by the division. Is that correct?

Mr Allen—That is correct.

Senator HOGG—I presume those surpluses that you make are real surpluses. Are you required to pay those back?

Mr Allen—No.

Senator HOGG—Are they notional surpluses?

Mr Allen—Yes, most of them are accounting adjustments rather than actual money and expenditure. Indeed, under the current arrangements, you do not need to pay back that cash.

Senator HOGG—In terms, then, of the funding for the two CASA aircraft, you are going to make that up by a rearrangement of the resource allocation within the division?

Mr Allen—Correct.

Senator HOGG—Will that include operational costs as well?

Mr Allen—Yes.

Senator HOGG—Including the fuel for those and so on?

Mr Allen—Yes.

Senator HOGG—That leads me to the next question. I understand that there has been no funding for the Falcon 900.

Mr Allen—That is correct.

Senator HOGG—Yet I gained the impression when we met with you last year, in the briefing that was provided as well as in the meetings that we have had surrounding this inquiry, that there was a high expectation that the Falcon 900 would come on stream for this coming summer—if I am correct—and that of course now is not the case. Is that right?

Dr Press—I think it would be fair to say that you never pre-empt budget outcomes.

Senator HOGG—No, I am not asking you to pre-empt budget outcomes!

Dr Press—We went out to tender to provide a model for an air transport system that incorporated intercontinental as well as intracontinental components. So far we are able to fund the intracontinental component by savings efficiencies and reorganising our logistics program, but we are not able to fund the intercontinental component from our existing resources. Of course, we are still in discussions with government about that. If anybody gave you the impression that we expected that the Falcons would be operating this season, that is probably not an accurate reflection. We may have been able to accommodate the operation, but—

Senator HOGG—Let me put it to you this way: there was a bit of excitement, a bit of a buzz, around the division. I might be misinterpreting that, but nonetheless it just seemed to me that the advent of the Falcon 900 was going to improve the capability of the division substantially over the current way of moving scientists, in particular, down to the Antarctic bases.

Dr Press—That is a fair enough statement.

Senator HOGG—I cannot recall whether this was when speaking with a witness after we had completed the hearing or whether it was on the *Hansard* record, but it also came to me that the advent of the Falcon 900 was likely to attract more senior scientists, if I can put it that way—I do not want to offend those who are down there—to travel down to the Antarctic, because it would take away the time of travel on the *Aurora Australis*. That is quite long, in their minds, as I understand it. How will the delay in this contract for the Falcon 900 affect scientific research and the attracting of those more senior scientists to the bases on the Antarctic shelf?

Dr Press—Let me just comment on your statement and then I will deal with the question. Anecdotally, it is believed that getting in and out of Antarctica quicker will attract senior scientists, and I think this can be borne out by looking at the New Zealand program, which is smaller than ours but nonetheless culturally and economically similar to our program. They have a higher ratio of senior scientists going in and out because they can fly from Christchurch. Those scientists will not to go there in the proportion or the numbers that they may while long sea voyages are involved. Your question was: how will the delay affect senior scientists' involvement? It will probably keep it at the same proportion and the same level that applies at the moment for those activities that are mainly terrestrial based.

Senator HOGG—What is the additional cost associated with the operation of the Falcon 900 over the summer period if it were to operate? I have a figure in the back of my mind but I do not want to mention it because I might be way out.

Mr Allen—It is in the order or $10 million.

Senator HOGG—I am not too bad; that was the figure that I had in mind. So you really need an additional $10 million in order to operate the service in and out of Hobart down to Casey—and it would be a recurrent $10 million.

Mr Allen—Yes.

Senator HOGG—Would any of that $10 million come out of the reduced effort that would be required from the *Aurora Australis*?

Mr Allen—Probably not, because we still need the *Aurora Australis* as a marine science platform to do our marine science, and we will still need to resupply our stations by ship. Most of the savings that may come out of that have already been used on the internal CASA aircraft—by those rearrangements.

Senator HOGG—So when we are talking about the Falcon 900 we are really talking about the need for extra funding or for the division to be able to find $10 million out of its existing funding. One does not have to be Einstein to work out that that would be a well nigh impossible task.

Mr Allen—That is correct.

Senator HOGG—That is given that the funding for this year is, as I understand it, in the order of $87 million.

Dr Press—If that money was available, I think it would be being invested now.

Senator HOGG—I understand. I did not want to misrepresent the view that came across to me, Dr Press, in my visit. I thought there was an expression of a great deal of warmth for the Falcon 900. Let me say that that view is shared by me and probably a number of others on this committee who see it as a very viable alternative source of supply.

Dr Press—I would like to make a clarifying statement. There are other aircraft that have the same, similar or slightly better capacity. We are talking about an aeroplane like the Falcon 900.

Senator HOGG—Yes, that is the plane that was mentioned to us. I am not saying that you are signed up to a contract; I am just using that as the example because that is what has been presented to the committee. As you know, we were given the opportunity to travel to Albany to look at Albany as an alternative site for the servicing of the division's need in the Antarctic, on the basis that Albany was closer. What difference would Albany make in terms of that $10 million that it would cost to run the likes of the Falcon? Let us assume it is the Falcon; let us not get into competing aircraft at this stage. Can you give us a rough idea of whether it would be all that much cheaper to operate out of Albany as opposed to Hobart? Are there other things that we should be taking into consideration when considering operating out of Albany?

Dr Press—The proving process, the background work that we did leading up to going with the current service provider, and also the model which we proposed to use in Antarctica, was such that the most efficient operation—and when I say 'efficient' I am also talking about economy, the amount of dollars that has to change hands and the impact on our budget—was the one that operates out of Hobart to Casey. It is possible to operate out of Albany theoretically, but there are significant costs associated with doing that. I might refer to my head of logistics to elaborate somewhat.

Mr Pitt—Each of our three continental stations is located to the west of the Australian landmass, to the west of Albany. The furthest away is Mawson station, and it is a difficult place to operate aircraft in. Because of the daily katabatic winds and the general conditions in the vicinity, it is not a favoured site for a runway. It is certainly closer to Albany than it is to Hobart, by a long distance. The next closest of the three stations is Davis station. It is a particularly difficult site, because of the underlying shape of the land, which has a dramatic effect on the way that ice flows over it. Therefore, it is not possible to develop the simple style of glacial ice runway that has been built elsewhere in the Australian Antarctic Territory. The station is closer to Albany than to Hobart by some distance. The only way a runway could be built at Davis is to consider a rock runway. As you heard Dr Press say earlier, to construct that runway would cost, in 1997 dollars, at least $A40 million.

The site where a runway can be built cost effectively is at Casey. I believe Casey station is 40 nautical miles closer to Albany than it is to Hobart. It is just a coincidence of the shape of the earth. There is not a big saving in operational cost. In the studies that have been undertaken that have led to our consideration of this air transport link, there is an acceptance that on occasion it may be efficient to fly out of Albany. But that does not consider infrastructure costs or any of the difficulties or costs of moving people across the Australian landmass if we were to operate out of Albany.

Senator HOGG—My last question is: what is the likelihood of some resolution to an intercontinental aircraft being decided before the opening of the next summer season? Even if a decision were taken reasonably soon, you would still find that it is too late for this season and that you are really then aiming for the next season. Could you give me some idea of the timetable?

Dr Press—It would be inappropriate for me to comment on the likelihood; that is really a government decision, not a decision of mine. But any decision, regardless of whether it would be taken in the future or was taken in the past, still requires an amount of work to be done at Casey itself. Kim might describe what that work is.

Mr Pitt—About two seasons of work is required to complete the runway to the standard that would meet Civil Aviation Safety Authority requirements. If a decision were made to enter into an agreement for the purchase or lease of an aircraft today, the earliest a test flight could be conducted would be in the 2005-06 summer.

Senator HOGG—I did not appreciate before that there is a long lead time before you can actually start landing the aircraft there.

CHAIRMAN—With respect to the proposed removal, if it has not already been initiated, of the debris on that continent and on some of the islands, which it is the responsibility of Australia to rectify, do you have a budget allocation for those projects in 2003-04?

Dr Press—Not one specifically granted for that purpose. At the moment, we do have an unfunded liability on our balance sheet.

CHAIRMAN—How does that affect your accrual accounting, then, Dr Press?

Dr Press—I will hand over to my Chief Financial Officer.

Mr Allen—As the director mentioned, we have a liability on our balance sheet of some $40 million which is unfunded at this point in time. That liability affects our balance sheet.

CHAIRMAN—Do you show that as a liability in some of the figures that you carry forward each year?

Mr Allen—Yes, as a provision for liabilities.

CHAIRMAN—Could you give the committee some idea of what your plans are, how long it is going to take, where you are going to deposit the debris and any other salient points you might care to make?

Dr Press—We are in the process of developing our plans there. This season just past saw the first operational scale use of modern environmental management techniques and systems to remediate any of the old waste sites in Antarctica. There are not many of them. As my colleagues mentioned to the committee before, what we are dealing with here is something like a very small country town rubbish tip situation that may have occurred, say, in the fifties and sixties where

material was just put conveniently in a shallow gully or something near the station. That is the way things used to operate.

This season we trialled and then carried out an operation where we actually cleaned up one of these sites. Let me say that from an environmental management point of view it was very effective. We were able to remove the rubbish and transport the rubbish from the site and we were able to bring it back to Australia in a way that did not cause any further environmental damage at the site itself. We were able to minimise any environmental impacts and we were able to leave the site in a way where it no longer poses an environmental threat to the immediate environment.

CHAIRMAN—What was the ultimate destination for that debris?

Dr Press—That material was brought back to Australia. It was imported, with Australian quarantine approval, into a quarantine approved area at the Hobart wharf. It was treated there in such a way that it met Australian quarantine standards, state government standards and local government environmental standards for municipal waste. It was then transported to a local tip at Hobart and dealt with as municipal waste would be dealt with.

CHAIRMAN—Have you considered using the private sector and getting a lump sum contract price to clean up the mess?

Dr Press—Let me say that this work was substantially carried out under two sets of arrangements. The actual remediation and treatment of the material, once it was on site in Australia, was carried out by Collex-Onyx, the Australian subsidiary or part of what used to be Vivendi Environment; it is now Veolia.

CHAIRMAN—Is that an acronym?

Dr Press—It is a large European multinational company.

CHAIRMAN—Is it a private company?

Dr Press—Yes, it is a private company.

CHAIRMAN—It is not a government instrumentality?

Dr Press—No. Collex-Onyx is the company that carried out that work under contract to us. I will also say that Vivendi Environment, as an international gesture of commitment to the environment, donated to Australia about $2 million worth of purpose-built containers, which were used this year to transport that material from Antarctica to Australia. The short answer to your question is that it was a collaboration, under contract, between the private sector and the government. Of course, the ship that we brought the material back to Australia on was also a private sector ship; it was not a government ship.

CHAIRMAN—Before I move on to some questions about recruitment, I might mention that Albany in Western Australia, because of its location, would be sympathetic to any request that was made for the disposal of debris from any of our bases, former bases or joint bases in those

territories for which we have responsibility. I understand that the recruitment over the years has shown a graphic decline, if our report is right. Particularly with tradesmen, there seems to be a rate of decline—perhaps not disturbing—in the number of skilled personnel going to the Antarctic. There could be many reasons for that. I have never gone into it. I assume that one reason is that it is seen to be something of a conquered frontier these days. I have been down there and I can assure anyone who has that opinion that it is still a big frontier and it still requires a lot of conquering.

However—and once again I am speaking about Albany—is there any merit in the recruitment of skilled tradesmen from, say, that part of Western Australia? The reason I mention that is not solely that I am a senator from Western Australia but that we do have a lot of skilled tradesmen there who are used to working for long periods in isolation, particularly in mining camps and on vast stations, which I have been associated with for a great deal of my life. There are relatively isolated farming areas and so on and this perhaps does not apply in places like Victoria, Tasmania, south-eastern Queensland or any of those eastern seaboard states. If it came to the point where there was a critical lack of skilled tradesmen, would the division consider perhaps a recruitment program in that part of Western Australia and, given the airstrip facilities there, which are excellent and adequate, using that as a point to transport Antarctic personnel from Albany down to Antarctica? Is there any merit in that?

Mr Allen—You are certainly correct in saying that the applications generally for tradespeople have declined over the last few years, but not to a point where we cannot actually fulfil our recruitment areas. It does vary for a number of reasons. Some of those are economic reasons—to do with the economy of the country. We are in competition with many other employers for those sorts of skills. But, as part of our recruitment drive, we do target areas that you have been talking about, particularly mining areas. We know that quite a lot of our tradesmen come from those areas. Certainly, quite a number of our tradespersons come from mining areas in Queensland and Western Australia, mostly the iron ore mines in the north of Western Australia such as in the Pilbara and those sorts of areas. We conduct quite extensive advertising campaigns in those areas and, indeed, in some of the regional papers. For instance, I know that we advertise in the press in Kalgoorlie and around that part of Western Australia also. In the order of 25 to 30 per cent of applications come from people in regional areas, which we class as being 100 kilometres outside of a capital city. So they make up quite large percentage of our recruitment area. Obviously, we are trying to increase that as well.

Dr Press—I think you would be pleased to know that I had a discussion with the parliamentary secretary for the Antarctic, Dr Sharman Stone, recently. She emphasised that our commitment to advertising regionally needs to be strong. Any help from anybody about which newspapers and local regional facilities could be used for our recruitment process would be most welcome.

CHAIRMAN—We have gone a bit over time but it has been most interesting. I will ask a bit of an obtuse question. On this continent there is no permanent habitation and people are itinerant, and I understand why. But there are other areas of the world, for example, in the Northern Hemisphere—say, Iceland, which is just on the Arctic Circle, and Greenland, which is not green, but was named Greenland by a Danish king wanting to attract settlers there—which are very harsh types of country. The other islands around Canada have Inuit and others who live

there on a permanent basis. Do you think there is a likelihood of the establishment of a permanent free enterprise style settlement on any part of the Antarctic?

Dr Press—There are a number of reasons why that would be difficult. My chief scientist would probably be able to elaborate further on this if we have the time. The ability to carry out free enterprise type activities would be difficult because of the circumpolar current that isolates the Antarctic from the rest of the world. It is also the reason why Antarctica is colder as a continent and why the sea ice extends to such a great extent in the winter. This makes land based economic activities difficult. There is also the issue of ownership of title. If you ever wanted to invest in Antarctica, one of the things that you would not be able to do is secure a deed that said you owned a piece of it.

CHAIRMAN—There is no problem with native title at this stage.

Dr Press—I would not go there—I cannot comment on that. I do not think it would be possible to get a Torrens title for a 1½-acre block and therefore the ability to have a private investment would be limited.

CHAIRMAN—That has not been much of an impediment in Canberra, but I take your point. There are rumours about Mawson station closing down. Are all the stations going to be maintained, say, up to 2010? Can you project up to that period?

Dr Press—I can project my answer by going back to the early 1990s and the government's response to the ASAC report in 1998. We keep our options open. There are rumours about all of our stations from time to time. We keep open our options for how we operate in Antarctica. The ASAC review outcome was that we should keep at least one continental station open in order to carry out our activities in Antarctica. I notice the issue of automation was raised in the notice for this meeting. Automation will make it easier for us to reduce the number of people we need on station.

CHAIRMAN—But not to make it devoid of people.

Dr Press—It could eventually be—not Antarctica as a whole and not our operations in Antarctica. We have a strong commitment to be being down there. But if we were able to operate from a particular area without having to support the infrastructure costs of maintaining a station, then we would certainly take that on as an option.

CHAIRMAN—You are giving a definite perhaps.

Dr Press—I am giving you a definite perhaps.

CHAIRMAN—We have gone well over time, and it has been most interesting. All of us would be delighted to ask questions of you for a longer period than we have been allocated. On behalf of the committee, thank you very much for your attendance here this evening. If there are any matters on which we might need additional information, the secretary will write to you. You will be sent a copy of the transcript of your evidence to which you may make editorial corrections.

[6.14 p.m.]

LAMBECK, Professor Kurt, Chairman, Antarctic Science Advisory Committee, Australian Antarctic Division, Department of the Environment and Heritage

CHAIRMAN—Welcome. Is there anything you would like to add regarding the capacity in which you appear before us today?

Prof. Lambeck—I am a professor of geophysics at the Australian National University, but I am here tonight in my capacity as chairman of ASAC.

CHAIRMAN—Thank you. These hearings are legal proceedings of the parliament and warrant the same respect as proceedings of parliament itself. Giving false or misleading evidence is a serious matter and may be regarded as a contempt of parliament. The committee prefers that evidence be taken in public, but if you wish to give confidential evidence to the committee you may request that the hearings be held in camera and the committee will consider your particular request. The committee has received a submission, No. 13, from the Antarctic Science Advisory Committee. Are there any corrections or amendments you would like to make to that submission?

Prof. Lambeck—No.

CHAIRMAN—Before we ask you some questions, I understand you would like to make an opening statement.

Prof. Lambeck—The first thing I would like to say is that ASAC is made up of scientists who are not necessarily experts in Antarctic research. ASAC instead is made up of people who are experts in their own field who have, over the years, developed an ability to see beyond their disciplines and to identify what is important for the broader scientific community. We therefore may not always be on top of a lot of the detail of the operational side of things, but we are very much kept informed by AAD on this information. We essentially look at the reports that come out from AAD and make our assessments on the basis of the information we are provided. I understand the main reference of this committee is to look at the adequacy of funding for Antarctic research. If you ask any Antarctic researcher whether there is adequate funding, then you will get a resounding no, of course. We all would like to do more, but I will try to offer a more sober assessment of that position.

One of the activities of ASAC has been the review of the program. When I call it an ASAC review I have to make it clear that it is very much an international review. You have the reviewer report before you. You must agree that this report gives overall resounding nods of approval for the quality of the science being done. They obviously raise a number of issues, questions, recommendations. In the coming year ASAC will be working through those recommendations in detail. A number of them have already been acted on, but we will be working in detail on a number of these issues to try and put the outcomes of ASAC into account.

You will have to excuse me a little bit; I have just stepped off a long flight aircraft. I have been dealing with international scientific relations and I have to make a quick switch to Antarctic matters. Before I went away, I prepared a brief statement which could be construed as a supplementary statement. I sent this to Mr Baker this afternoon and I would like to table that statement rather than talk my way through it now.

CHAIRMAN—Is it the wish of the committee that the submission by Professor Kurt Lambeck be tabled and authorised for publication? There being no objection, it is so ordered. You can proceed, Professor Lambeck.

Prof. Lambeck—The question of adequate funding is obviously a difficult one. It is not for us to say what funding is required. We have been working within the framework of trying to make the best of the funding available and to maximise the scientific output from that. Throughout our evaluation of the program, we have recognised that funding is not open-ended and that, in wanting to go in new directions, some areas may have to cease. That is, in a sense, one of the challenges that ASAC have: what areas we go into and at what cost to existing programs.

There is obviously a desire for much more ship time for marine research in the Southern Ocean and at the ocean-ice interface. ASAC recognises that this is important. The anticipation is that that may become possible from partial savings in transport costs, such as from ferrying scientists back and forth to the continent. The other thing we would like to have is more mobility within Antarctica. To expand the science program, we want to get away from the bases. There are a number of science disciplines where we want to look at new locations to get new observations. For example, in the climatology area, if we want to understand the past climate of Antarctica then we need to look further afield. We need to collect ice cores, for example, and lake sediments where these occur and that sort of thing. So we would like to see greater mobility within Antarctica. This may have to come at the cost of making operational savings at some of our bases. These are the sorts of issues that ASAC is going to have to grapple with in the coming year to try to meet the recommendations set by the evaluation committee.

We are experiencing bridging problems. How do you go in new directions without abruptly terminating existing programs? One of the things that we may require in terms of funding is a bridging funding solution—to permit us to introduce the air transport, for example—to make our programs more diverse and more efficient in anticipation that there will be savings further down the road. I do not think we can properly make savings today and start with the transport tomorrow.

The other area where flexibility in funding is important is where new initiatives suddenly arise. You may have heard about the International Polar Year that the international community is putting together. This is an exciting program which will focus the international effort on Antarctic science for a period of about two years. In a sense, it is going to be a very concentrated two-year period. I think there is a wonderful opportunity here for Australia to play a very major role in directing this program. The National Committee for Antarctic Research—that is, the Academy of Science committee—has made a number of recommendations that are now being discussed at the international level.

CHAIRMAN—I am sorry to interrupt you but did you envisage that that would be contributed to by the Australian Antarctic Division? That would be a logical source.

Prof. Lambeck—That will be contributed to by the Australian Antarctic Division but the challenge is going to be: can the division make that contribution without damage to its existing programs? A lot of the programs are of a long-term nature. If you start making breaks in your observational and sampling records, you tend to spoil the effect of the past work. So that is going to be one of the challenges. ASAC would very much like to see flexibility whereby funding can be accessed—I may be totally unrealistic here; I am a scientist after all—for purposes of this kind. Another example is with major equipment. From time to time there is a need to acquire special pieces of equipment.

The Antarctic Division is beginning to fly aircraft within Antarctica. It is a terrible shame not to equip those aircraft with ice-penetrating radar, for example. The reason we want to do that is that we want to know what the subglacial topography is like, because that is one of the boundary conditions that determines how ice flows and how rapidly ice may move towards the coast. In a sense, what I am saying is that there should be greater flexibility in the funding for projects that are assessed and that go through a proper evaluation process for the Antarctic Division so that they can take advantage of situations when they arise, more so than they can now.

CHAIRMAN—Before I go to Mr Thompson, could I ask about the contribution that the private sector could make. It is often easier—although not necessarily easy—to get money from the private sector for some of these projects. It becomes more limited, I have noticed over my lifetime, the further south you go from the Australian continent. But there is still the proposal that there are fairly significant and sophisticated ships that work in the area. Firstly, they could carry some scientific instruments. Secondly, there might be a proposal whereby the sovereign government or governments could auction fishing areas. It may be that there are some areas there that are—perhaps to introduce a distasteful element—conducive to oil exploration that could be auctioned too. Some or all of that money could then be directed to Antarctic research. It seems that keeping it pristine is a bit of a pipedream. It is no longer pristine, from either the oceanic or the terrestrial point of view. Is there some other area that you could exploit, and the committee could perhaps assist you with exploiting, other than government funds?

Prof. Lambeck—The exploitation has to be done within the protocols to which Australia is a signatory, so there are probably some limitations to what can be done in the exploitative sense in the immediate future. That brings me to the point that the importance of having the science base is to be able, in the future, to influence these protocol issues—what can be done and what cannot be done. That is an aside. But I believe that that is one of the important reasons why we do the science.

On the fisheries front, I would prefer that one of my Antarctic Division colleagues addressed that issue. I will let you ask that question of them because I am not familiar with the commercial aspects of Antarctic fishing. We look more at the scientific issues related to the fish that are there.

CHAIRMAN—Perhaps if the Antarctic Division personnel are still listening they may take that on notice.

Prof. Lambeck—On the petroleum one, and sometimes one talks about mineral exploration in Antarctica, I am a geophysicist and it is the one thing I do know a little bit about. The concept of searching for minerals in Antarctica is, to me, a little like going to Western Australia and

landing in half-a-dozen places and making an assessment of the mineral wealth of Western Australia on the basis of that. In other words, there is not the exposure to even contemplate serious mineral exploration in that part of the continent, let alone any exploitation costs and environment issues that would be associated with that.

CHAIRMAN—There is a small thing called the Madrid protocol too that would not assist you.

Prof. Lambeck—That is right. On the petroleum or the hydrocarbon one, my instinct and every geologists' instinct must be that there is potential for hydrocarbon on the shelf area. We have it on the Australian submargin in parts. The two were joined. They have had a similar geological tectonic history, so there must always be potential for that. Whether the industry is prepared to invest in the research at this stage, knowing that there is a protocol in place that I think is indefinite, I would not know. I am aware of the difficulties of operating in that area partly because I have done some work for the Norwegian petroleum companies on their shelf.

CHAIRMAN—That could certainly be complementary too, and your opinion is more weighted with that experience.

Mr CAMERON THOMPSON—I have been reading your submission, or report, and there are a couple of points I want to talk to you about. You talked about the need to have an automated monitoring program down there. What is the potential for that? There must be potential for quite a lot of straight-out savings. What is the size of the program? What is the potential for that to deliver benefits?

Prof. Lambeck—A lot of the observational systems can be automated. They are automated in Greenland, for example. They are automated in most Arctic and difficult environments. These can include seismic stations that measure the activity of the region, nuclear monitoring systems and anything dealing with upper atmosphere and meteorological observations. I believe all of these can be automated in the fullness of time. The difficulty of working in Antarctica is to make your instruments survive the winters, but there has been a certain amount of work done on a small scale that shows this is possible. We run GPS receivers, for example, that measure the motion and deformation of Antarctica. They go to sleep some time after the sun goes down. When the sun comes up, the batteries recharge and they send us a telephone call saying, 'We're awake.' When things are operating again, when there is enough energy collected, off they go again. There are methods for doing this without requiring people to be down there all the time. The geomagnetic observatories would be the same. The transmission of data back to Australia is now relatively simple with the Iridium satellite system, for example, or the SATCOM type systems. It is really a question of how many resources you can put into that—that is really the issue.

Mr CAMERON THOMPSON—I have seen some of the really good instrumentation packs and things that the Antarctic Division has been putting together, working on and distributing down there, and I am sure there are other people also doing that, but do you have any examples where a lot of manpower and effort is going into making recordings that could in fact be automated? I am trying to quantify the potential benefits we can get out of this. If you could give us an example, that would be good.

Prof. Lambeck—Survey operations is an example where previously the operation closed down when the last ship left Antarctica. Now we can extend the programs. It is still experimental to some degree, so we do have to send somebody from time to time to look at these things—at least once a season. It is a case where it is not so much that you cut down on the manpower, it is more that you would not do it if you did not have that capability. That is more what that is about. I have not personally been to the Australian bases; I have only been to the New Zealand sector because I can fly down there and check up on my students.

Senator HOGG—Touche. That is a point well made.

CHAIRMAN—It shows a high element of circumspection, Professor.

Prof. Lambeck—It may be a point that you may wish to explore.

Senator HOGG—I think it is game, set and match.

Prof. Lambeck—I believe a lot of meteorological operations can now be automated. One of the reasons why it can be done is because the satellite communication system has become much more effective and much cheaper using the Iridium system rather than SATCOM, which requires larger antennas and more power et cetera. I believe there is much more scope for it. I believe the only area where there may be problems is—and I stand to be corrected on this—in the radiosondes where they actually want to launch balloons that go up into the upper atmosphere for monitoring. I believe that is one area that is still not successfully automated.

Mr CAMERON THOMPSON—On another, perhaps bit more controversial issue, in your submission you say:

> ... changes to the way in which universities and Government research agencies receive their funding, and likely future changes, put at risk the supply of varied expertise which has hitherto been available.

Can you elaborate on that? What are the particular areas? Why are you worried that the range of expertise will narrow?

Prof. Lambeck—This is, in a sense, a broader issue about research funding generally. I will try to avoid going down that path. The actual analysis of data that you collect and the actual laboratory work that you do, as distinct from data gathering or getting people down there, is to a large extent unfunded by the research sector. The Antarctic Division's own resources are limited. They essentially provide seed money. They make it possible for people to get down to Hobart, to get their field experience and to get their medicals et cetera. If there is a little bit of money left over, this can go towards the actual research efforts. So the research funding traditionally would have come from the universities' own research budgets, in a sense. These are getting tighter and more directed at specific targets.

The Research Council does fund some of this research but there is a tendency, I suspect, for the Australian Research Council to say, 'That's Antarctica. That's AAD's responsibility.' I think a lot of research tends to fall between the two. What we are seeing is increasingly more work done in filling the spare capacity that the researchers may have. At some point that is going to fail, of course, particularly if you have large programs. For example, if we go down the path of

participating in the International Polar Year, how would the research itself be funded? Assuming that the AAD can find the money to put in extra ships and to fly additional aircraft to get more people out there, how is the actual research, which has to be done with the data for the next two or three years after that, going to be done?

I suspect that we are seeing increasing delays in the publication of output. People go down and collect their data but, because the research back home is not funded, it is done in spare time with spare capacity that they may have. So it tends to delay the process to some extent. Again I would have to ask my Hobart colleagues but I suspect that from my own observation of and familiarity with researchers that is what is happening.

Mr CAMERON THOMPSON—One of the points that has been made about the air link is that it might encourage more senior scientists to go down and participate. Do you agree with that? In the context of what you have just said—that is, that the work is done and it has to be followed up and completed back at wherever they are from—realistically, is it going to bring those people down there? Is it going to help them complete that work more effectively?

Prof. Lambeck—I think my own experience is fairly typical. I have an interest in certain parts of polar research because of the climate, ice sheets and sea level linkages. I have had a series of students working in different parts of Antarctica and my observation is that they always need to go down there twice—the first time to learn and the second time to undo the mistakes they made the first time, because it is difficult when you do not know the terrain to prepare them properly.

My other example is a student who works in Greenland. I have a joint project with Sweden, and I am able to get out into the field relatively easily. All I need to do is fly to Copenhagen, hop on the plane to Greenland and if there are helicopters around then I can typically be there within 48 hours. The difference is that with my Swedish student I know exactly the environment that she is working in. If she is doing some analysis and says, 'Look, I have some problems I don't understand,' I can say, 'But did you think about that situation up there or that?' I cannot do that with my students in Antarctica, except for the ones who have worked in the New Zealand sector, where I have been able to drop in on them to get that experience. I suspect that that is a fairly common situation. With the air link, the quality of the work would improve, the training that the students get would improve and the program overall would be more efficient.

Mr CAMERON THOMPSON—You have included in your submission the need for a dedicated marine research facility, and later on you refer to a dedicated vessel. Are they the same thing?

Prof. Lambeck—I think they are the same thing. At the moment—as I think you well know—some of the ships that go down try to do both. That generally leads to compromise. If ships get stuck in the ice while they are doing marine work, it plays havoc with the entire program for the rest of the season.

Mr CAMERON THOMPSON—In regard to putting together the air link, including the link back to Australia and the intracontinental work as well as the marine research facility, it was said in here that you want more flexible logistic infrastructure. Is that basically the sum of it or are there other elements that need to be addressed further down the track?

Prof. Lambeck—I suspect that is probably the sum of it. There is nothing wrong with separating the two in parts, and I think it is an excellent idea if the cargo ships go down to instrument them. The British do that—from the Southampton Institute, for example, a lot of the ferries that go back and forth across the channel are instrumented, and I suspect there would be no reason not to do that; it depends on the sophistication of the equipment. But the ability to separate the transport parts from the marine parts would lead to major improvement in the situation without necessarily requiring additional infrastructure.

Mr CAMERON THOMPSON—You talk about cooperative cost-sharing arrangements with our Antarctic neighbours. Is that in the provision of that infrastructure?

Prof. Lambeck—The cost sharing, as I understand it, to a large extent comes about on a project by project basis. If the Italians or the French have a ship in the area or a flight to their site, Australian scientists can go along if the projects are acceptable. I have to turn to Dr Press to ask if there are long-term agreements for cost sharing or not at this stage.

Dr Press—There are long-term agreements. There are long-term memoranda with a number of institutions and Antarctic organisations for cooperation. Long-term funding is not a feature of that, but from time to time we do do cost sharing with other nations like we have with the Germans and the Italians. PC mega, the big project in the Prince Charles Mountains was substantially funded by a cost-sharing arrangement between Australia and Germany.

Senator HOGG—The issue of bridging funding that you mentioned is, I think, something we have not heard about before. Have you pursued a model or a concept as to how this could be applied to the research that is going on and the needs of the Antarctic Division, or is it just something in its very embryonic stage?

Prof. Lambeck—At the moment it is something that is very much in its embryonic stage. It is a realisation that, if you look at the figures of shipping costs and aircraft costs, for example, certain trade-offs between the two are possible but that we cannot switch fully to an aircraft operation tomorrow; there is going to have to be a period when we may have to do both.

Senator HOGG—I accept that

Prof. Lambeck—That is what I mean by bridging funding.

Senator HOGG—I would be interested if you and your colleagues could take it on notice—it may well come after the committee has delivered its report, but it may nonetheless be worth while—to provide us with some sort of thumbnail sketch of the sort of proposal that you have in mind and how it might operate. It is not necessary to give us accurate dollar figures—I am not after that—but give us something as to how the transitional arrangements would work. I think that would be of assistance.

Prof. Lambeck—These are issues that are on ASAC's agenda. Unfortunately, I do not think we can provide a full answer in the time frame. But we can take that on notice.

Senator HOGG—I accept that. Given that it is an idea that has not been put to the committee during this inquiry—or maybe it has but has not been expressed as succinctly as you have now

put it to us—if you can give just a little bit of flesh to the bones it would help us in compiling the report.

Prof. Lambeck—I am happy to do so.

CHAIRMAN—Professor, we have gone over time as usual. We do not seem to have enough time to be able to satisfy our own inquiries, let alone what we are supposed to ask eminent people like you. We do thank you on behalf of the committee for your attendance here this evening, particularly getting off an international flight to come here. It seems that we should have had you here for half a day instead of half an hour.

Prof. Lambeck—Thank you very much.

CHAIRMAN—It is a pleasure. If there are any matters about which we might need additional information, the secretary will write to you. Once again, on behalf of the committee, thank you so much for attending this evening.

[6.48 p.m.]

IRELAND, Dr Tracy Jane, Senior Heritage Consultant, Godden Mackay Logan Pty Ltd

CHAIRMAN—Welcome. Do you have anything to add to the capacity in which you are appearing?

Dr Ireland—I am the Canberra representative of Godden Mackay Logan Pty Ltd, heritage consultants. I am sitting in today for the Managing Director, Professor Richard Mackay, who is, unfortunately, in China.

CHAIRMAN—Where is your organisation's head office?

Dr Ireland—In Sydney.

CHAIRMAN—These hearings are legal proceedings of the parliament and warrant the same respect as the proceedings of parliament itself. Giving false or misleading evidence is a serious matter and may be regarded as a contempt of parliament. The committee prefers that evidence be taken in public, but if you wish to give confidential evidence to the committee, you may request that the hearing be held in camera and the committee will consider your particular request. The committee has received a submission from Godden Mackay Logan Pty Ltd—submission No. 8. Are there any corrections or amendments that you would like to make to your submission?

Dr Ireland—No.

CHAIRMAN—Before we ask you some questions, do you wish to make an opening statement?

Dr Ireland—I have prepared a couple of brief points to emphasise the main issues in our submission. Our firm has been very closely involved with the activities of the Australian Associated Press Mawson's Huts Foundation since 1996. We prepared the conservation management plan which currently guides the management of the Mawson's hut site. The main point of our submission is that, in line with the current Australian government policy and legislation, the management of the cultural heritage of the Australian Antarctic Territory should become a key goal for the Australian Antarctic Division's program and this should be recognised through an appropriate allocation of funding.

While we wish to strongly endorse the efforts made by the division and individual staff members over the years to support cultural heritage management, the stated interpretation of the AAD's charter has been that cultural heritage management falls outside their core responsibility. The recent passing of the amendments to the Environment Protection and Biodiversity Conservation Act show that the Commonwealth government is indeed committed to the proper protection and management of the cultural heritage sites that it owns or controls. So it is no longer in line with this policy and is not acceptable to the public at large for a government agency to avoid these responsibilities when this lets highly significant sites such as Mawson's hut fall through the gaps.

Australia also has, as you know, existing obligations under the terms of the Antarctic Treaty through the Madrid protocol for the protection of these historic sites. Mawson's hut site is of national and international significance. It is the only surviving site of the Australian expedition of Antarctic exploration from what has been called the heroic era of exploration from the early period of the 20th century—a period of adventure and drama which continues to fascinate and capture the attention of the public at large. As well as sites of scientific research and exploration, to which Australia has made a highly significant international contribution, Australia's Antarctic Territory and the sub-Antarctic islands contain an array of cultural landscapes which reflect the interaction of humans and the environment over time, such as the 19th century sealing sites on Macquarie and Heard Islands.

Protecting the Antarctic environment is currently one of the stated goals of the AAD's program. It is now widely acknowledged across the sciences and earth sciences, geography and the humanist disciplines that natural and cultural environments are intertwined in complex ways. We have seen, for instance, an enormous change over the recent decades in the management of Australia's national parks, which are now approached not as untouched wilderness but as landscapes of human interaction stretching back over 40,000 years.

The significant cultural sites of the Antarctic Territory are an integral aspect of the unique Antarctic environment. Regular and recurrent funding should be made available to identify, assess and properly manage Antarctic cultural heritage in line with the Commonwealth's new heritage regime. It is only with this kind of long-term holistic approach that we can understand the relative significance of various heritage places and where active conservation is needed. Over the past decade, for instance, some very important research and conservation expeditions have been carried out at Mawson's and at other Antarctic sites. However, without a long-term cyclical approach to heritage management, work has always been reactive rather than planned and proactive.

We suggest that initial resources be put towards employment of a staff member who can draw together and consolidate important existing research and work towards integrating heritage management into existing environmental impact assessment and environmental management systems, infrastructure and operational planning—a step that has been taken by many other Commonwealth government agencies since the passing of the new legislation. Excellent resources to support this work have been developed under the Commonwealth's new heritage regime. In the non-government sector, ICOMOS, the world's peak heritage conservation body and an affiliate of UNESCO, has established the International Polar Heritage Committee, which is committed to providing expert scientific and technical advice to support the conservation of these globally and nationally significant aspects of human history.

CHAIRMAN—Thank you. Mr Thompson.

Mr CAMERON THOMPSON—One of the things that interests me is cleaning up various sites in Antarctica and removing rubbish and that kind of thing. How do we tell where sites are just rubbish dumps and where they have heritage value?

Dr Ireland—We have well-established heritage management procedures for assessing the significance of sites. The Australian ICOMOS Burra charter is the industry benchmark statement on procedures for answering exactly the question that you have asked. We look at the cultural

heritage values that are represented by rubbish dumps. One of the main issues here would be their archaeological research significance. For instance, quite a lot of archaeological research has already been undertaken at Mawson's hut sites, where there have been many questions about the expedition's work and life on the site. So there it was found that they did have research potential. On other sites, the research potential might not be so high.

Mr CAMERON THOMPSON—Has there been a survey of all these potential sites?

Dr Ireland—I do not believe there has been a survey across the territories, but there is certainly quite a large number of sites already listed on the Register of the National Estate. Individual studies have certainly been undertaken.

CHAIRMAN—Half a million dollars seems to be a lot of funding for what could be described, if it was in Australia, as a modest wooden hut. I understand its historic significance on an international basis, not merely for Australia. Could you divide up that half a million dollars into parts? Was, say, $100,000 used for travel? How would you spend half a million dollars on what is really a modest hut?

Dr Ireland—Did we mention that figure in our submission?

CHAIRMAN—Yes, the 2002 allocation from the Commonwealth was $500,000 to remove the snow and ice from Mawson's huts structures. Incidentally, I have been down to the Antarctic. I have been to Ushuaia, on Tierra del Fuego, as well. I am not an expert, but I am not naive about the sorts of conditions that exist.

Dr Ireland—The detailed and technically challenging conservation issues that Mawson's hut gives rise to because of the ingress of snow and ice into the building and the weathering of the timber because of the winds and the harsh climate—

CHAIRMAN—Yes, I have seen it. It is bleached and scoured, almost as though it is sand blasted.

Dr Ireland—I believe that this gives rise to a range of quite difficult and challenging technical questions about the best way in which to conserve it. Indeed, there has been quite a deal of debate about whether, for instance, ice should be removed from the interior of hut and whether that would preserve it in the long term or whether the ice should remain and the ice is in fact preserving aspects of the interior of the hut itself. My point here is that Mawson's hut is a very fragile and vulnerable site. Therefore a great deal of technical expertise was necessary to answer those conservation questions.

CHAIRMAN—Can you give the committee some idea of that particular expertise and how that expertise was harnessed, either in Australia to give advice or perhaps down at Mawson's hut, where it was probably more appropriate.

Dr Ireland—I am not completely familiar with the entire scope of the project but I do know that various individuals with materials conservation expertise—

CHAIRMAN—From Australia?

Dr Ireland—Yes.

CHAIRMAN—How did they get there? I do not have a picture of it yet, unfortunately.

Dr Ireland—There have been a number of expeditions to Mawson's hut. I believe the first was called Project Blizzard in the 1980s. I think there was a second one—

CHAIRMAN—I am really trying to concentrate on the half a million dollars. I am trying to get some idea of how taxpayers' funds are spent to try to preserve what is an iconic Antarctic structure. Perhaps we could leave the previous activities aside, important as they may be, and see if we can concentrate on the Mawson's hut allocation of half a million dollars since 2002. I am trying to work out how, without any great physical change to the hut, you spend half a million dollars on preserving it.

Dr Ireland—I am at a disadvantage here in that—

CHAIRMAN—Can you take it on notice and perhaps give us a breakdown? Would that assist you?

Dr Ireland—Certainly.

CHAIRMAN—Could you give us a breakdown on how that half a million dollars was spent?

Dr Ireland—I do not know, for instance, whether it included salaries of the experts or just covered the actual materials and application of techniques in the Antarctic.

CHAIRMAN—What sort of role did the Australian Antarctic Division, which I know fairly well, play in the preservation? Were they are of great assistance to you?

Dr Ireland—Yes. I believe they played a crucial role in providing logistical support, access and—

CHAIRMAN—Do you mean getting down there and getting back?

Dr Ireland—Yes. They also provided an enormous amount of goodwill in terms of facilitating the projects.

CHAIRMAN—Could you have done that without the support of the division?

Dr Ireland—No, I doubt that it could have been done without the support of the division.

CHAIRMAN—Was an allocation made from the half a million dollars to help defray or in fact defray the costs associated with the logistics of getting your people down there?

Dr Ireland—I do not know the answer to that.

CHAIRMAN—Would you like to take that on notice?

Dr Ireland—Certainly; yes.

CHAIRMAN—It might turn out that much more in fact was spent on Mawson's hut than the initial figure. I am not opposed to the preservation of the hut—do not get me wrong; I just need to find out, as part of the responsibility, whether that has been the most appropriate way to spend those funds.

Dr Ireland—Our point is that the work to date has been reactive. It has been fighting fires, or the opposite to fires in this case. There have been three expeditions to save Mawson's hut but we are saying that, as an agency that has the responsibility for managing this portfolio, it has to be undertaken in a planned and best practice manner, which means working out—

CHAIRMAN—Talking about best practice, what is your opinion of having inspections once every now and then? Should there be an inspection of the hut once every three months or once every second expedition down to Casey or the other bases on Antarctica—not necessarily dedicated trips to Mawson's hut—to defray costs? Perhaps you could tell the committee whether you have a formula that gives us an idea of when the inspections will be, who is going to inspect them and what you propose to do for the future to maintain that.

Dr Ireland—An appropriate monitoring program and long-term actions are set out in the conservation management plan that we have prepared. I think there is every possibility that those activities will be—indeed, it is desirable for those activities to be—integrated with other activities to make them as cost-effective as possible. Indeed, there should be an enormous amount of flexibility in working in with other programs.

CHAIRMAN—Cost sharing.

Dr Ireland—Yes. That is behind my point about integrating this into normal operational activities.

CHAIRMAN—In reasonably descriptive terms, could you tell the committee at what stage Mawson's hut is in terms of its preservation? Is it fully restored to the position that you think it should be at this stage?

Dr Ireland—Mawson's hut remains vulnerable to unforeseen changes in its condition. The work that has been undertaken has been designed to stabilise the structure.

CHAIRMAN—So it is not deteriorating any more at this stage?

Dr Ireland—No. Ongoing deterioration is occurring and is perhaps unavoidable, so we need an ongoing—

CHAIRMAN—It wants further stabilisation?

Dr Ireland—I think we need further monitoring and stabilisation as conditions change and areas thaw and refreeze. Changes in conditions will continue to occur, as will the erosion and deterioration of various elements. With any cultural heritage site, it is never frozen in time.

CHAIRMAN—This one is frozen on the inside!

Dr Ireland—Yes.

CHAIRMAN—I thank you very much on behalf of the committee for your attendance here this evening, Dr Ireland.

Dr Ireland—Thank you for the opportunity.

CHAIRMAN—If there are any matters on which we might need additional information, the secretary will write to you. You will be sent a copy of the transcript of your evidence, to which you may make editorial corrections. Thank you so much for coming in this evening.

[7.06 p.m.]

WALSH, Dr Wilfred Michael, Research Associate, Department of Astrophysics and Optics, School of Physics, University of New South Wales

CHAIRMAN—Welcome. Do you have any comments on the capacity in which you appear before the committee?

Dr Walsh—I am here on behalf of the Antarctic group at the University of New South Wales. My particular experience has been to run an observatory at the South Pole station, so I have lived there for a year and have been to Antarctica on several occasions.

CHAIRMAN—The University of New South Wales Antarctic astronomy group sounds very interesting. These hearings are legal proceedings of the parliament and warrant the same respect as proceedings of parliament itself. Giving false or misleading evidence is a serious matter and may be regarded as a contempt of parliament. The committee prefers that evidence be taken in public, but if you wish to give confidential evidence to the committee you may request that the hearings be held in camera and the committee will consider your particular request. The committee has received submission No. 11 from the University of New South Wales Antarctic astronomy group. Are there any corrections or amendments that you would like to make to your submission?

Dr Walsh—No.

CHAIRMAN—Before we ask you some questions, would you like to make an opening statement?

Dr Walsh—I will just make some general remarks to reflect my attitude and to amplify the sentiments in our submission. Basically I would like to point out that Australian astronomy has been very successful on an international level. That is acknowledged by a report produced by the Department of Education, Science and Training recently, which, in a review of the scientific output of scientific disciplines within Australia, indicates that the citation rate for astrophysics papers is 42 per cent higher than the international average for other scientific papers. Basically, this means that Australia is punching above its weight in the field of astronomy research.

The University of New South Wales Antarctic group's contribution to astrophysics research has largely been that of testing the Antarctic continent as a site for potential future observatories. In the last 10 years, our group has quantified the belief that it is an excellent site for doing astronomical research in some key areas. We now believe—and I think we have convinced the international astronomical community—that the Antarctic plateau is probably the best site on earth for doing some infrared and submillimetre astrophysics research. So there is a significant potential for astronomy to become an increasingly large part of research done in Antarctica.

At the International Astronomical Union meeting in Sydney last year there was a special session dedicated to future research likely to occur in Antarctica, and it seems that many groups are interested in building new structures, new telescopes, down there. Already several hundred

million dollars of US funding has been allocated for two large installations at the South Pole station in addition to the several that there are already, and it is likely that there will be others in the future.

The next generation of optical telescopes, so-called extremely large telescopes with primary mirrors between 30 metres and 100 metres in diameter, are quite likely to be built in Antarctica. The sites that are almost certainly the best for these telescopes all lie within the Australian Antarctic Territory. So I think there is great potential for Australia to become engaged in these projects and to increase our international profile by playing some role in these developments, which are probably inevitable. Some investment by Australia will be greatly leveraged by the international character of these future observatories.

CHAIRMAN—That is very interesting. Before I go to my colleagues, I have a question about the North Pole that aroused my interest. Through the triangulation in the late 18th century, when the metre was introduced by France, it was calculated that a metre is one ten-millionth of the measurement from the North Pole down to the equator, in that arc. But they never allowed for the flatness of the top part of the globe, at the North Pole. So it is not one ten-millionth; it is one ten-millionth plus 40,000 or something. I think Isaac Newton determined that there were flat parts—that the poles were actually flat. Is that the same in the South Pole?

Dr Walsh—I will have to take that question on notice. I do not know.

CHAIRMAN—It is just an interest of mine. I should not really have brought it up; I should not have tried it on you. I do apologise for that. But I would appreciate if you can get back to the committee on that, seeing that I have asked the question. Otherwise it will be a question mark in our report forever. People will be searching around for it, missing divisions and all sorts of things, if they cannot find a resolution to the question.

Mr CAMERON THOMPSON—I want to ask about the air links and the location of the infrastructure as it is envisaged in Antarctica. I notice that you have specific areas of interest, such as Dome C and other places. From your perspective, is the intended infrastructure there well located? Is it going to serve your needs better than, say, the Hercules or the Twin Otter type connections that you have talked about in your submission?

Dr Walsh—The proposed air link is a wonderful thing for all kinds of research in Antarctica, particularly astronomy. We are still looking for the best sites to locate observatories. We need to be able to get to those potential sites, and an air link is the only way to do it in any reasonable way. Having an Australian based air link would be just terrific, so we are very happy that that has been proposed.

Mr CAMERON THOMPSON—In terms of the siting, where the aircraft would land and those sorts of things, from your perspective is that optimised? Are there other options that would be better, from your perspective?

Dr Walsh—Are you asking about the proposed sites within Antarctica?

Mr CAMERON THOMPSON—Yes, that is right.

Dr Walsh—I think for this program to be effective for astronomers it would need initially to be flexible enough for aircraft to land more or less anywhere on the plateau. Then, when there is a base established somewhere, there would need to be a regular link to that base. I am not personally familiar with the proposed air link in enough detail to comment specifically on how useful it would be.

Mr CAMERON THOMPSON—You have put in a pitch for Australia to be a partner in the high plateau station of Concordia at Dome C. You said that you have not yet identified the best potential locations. What is it that commends that particular location so much?

Dr Walsh—It is a very high and very dry part of the Antarctic plateau, so the atmosphere is transparent—in certain electromagnetic bands that are not transparent at any other accessible place on the earth's service. Also, the sky background is very low in certain wavebands, so that makes that location particularly good for a variety of astronomical instruments. It is also a very benign environment to work in compared to the Antarctic coast, because it is at a maximum of altitude. There is very little wind at that site, so it allows one to work there relatively easily and to build large, fairly fragile structures at low cost.

Mr CAMERON THOMPSON—There were some criticisms in one of the earlier reports about the access to funding for research. What is your perception on that? I notice you are not eligible for funding under the Antarctic program. You are reliant on funding from outside. What is your perception on the range of funding sources you can access, your effort to expand rather than reduce over time?

Dr Walsh—Yes, there is a problem there. The problem is that there is no mechanism by which we can apply for funding to build new infrastructure. That infrastructure will be required for ongoing astronomical research on the plateau. For example, the American system is to have a certain amount of funding allocated for their logistics and then another part of their funding is available for the scientific community to apply for. Whichever research is considered to be the best by an independent review mechanism gets funding. Most other countries have something similar where they typically would allocate 20 per cent of their research funding to peer reviewed, competitively applied for funding. The astronomy community does not have a clear target to aim for when it comes to applying for Antarctic funding, and particularly in the case of applying for funding to create new infrastructure.

Mr CAMERON THOMPSON—What kind of infrastructure? What is the cost of the sort of infrastructure you are looking at?

Dr Walsh—I will have to take the question of cost on notice. We think Australia should have a presence on the Antarctic plateau. Initially it should probably be at the station at Dome C, which the French and the Italians are building. Australia does not have any formal presence there. Our scientists go there by the good grace of the French and the Italians, and to the South Pole by the good graces of the Americans. It clearly seems to be in Australia's interest to have a formal part of this new station which is being built at Dome C. This would provide a base for Australian astronomical and other scientific research to occur at that station.

Mr CAMERON THOMPSON—Okay, you do not have an idea of a budget, but what specific items of infrastructure would you want Australia to contribute to that?

Dr Walsh—Accommodation, a research lab, a workshop—the things that scientists need to run scientific equipment.

Mr CAMERON THOMPSON—How many people would you look to support as part of that exercise?

Dr Walsh—Again I cannot answer that specifically because that would change depending on what kinds of instruments we build down there, but there would probably be only a handful of people required. For example, the American astronomy group at the South Pole has a modest size building and at any given time there would be perhaps 10 or a dozen people there to run the three telescopes that they have. If we had one telescope, we could cope with a proportionately smaller group.

Mr CAMERON THOMPSON—Are these radio telescopes?

Dr Walsh—At the South Pole there are three substantial radio telescopes, particularly in the submillimetre. The Antarctic plateau is probably best suited to doing radio research in the submillimetre wavebands. Our research has also identified optical and infrared windows that are very well suited to being exploited on the Antarctic plateau.

Mr CAMERON THOMPSON—Are there any opportunities—I suppose this is a radio telescope thing—where they can link those telescopes up? Is that a possibility that could be explored?

Dr Walsh—Yes, that is a possibility, and that has been proposed. In fact, Australia is a world leader in radio interferometry. The Australia Telescope National Facility runs one of the world's premier interferometers here in Australia, and an interferometer has also been proposed for the Antarctic plateau. Australia has clear expertise that could be used to be part of such a project.

Mr CAMERON THOMPSON—Apart from your university, how many Australian researchers, and from what areas, are engaged in the type of research you are talking about?

Dr Walsh—At the moment there are astronomers at the Australian National University, the Anglo-Australian Observatory, the University of New South Wales and, I believe, the University of Melbourne who are directly involved in doing Antarctic research. Given the great interest that was shown at the International Astronomical Union meeting last year for these new generations of telescopes, I think that many other Australian astronomers would be interested in getting involved in Australian Antarctic research if there were funding mechanisms that would allow them to do so.

Dr WASHER—It sounds fascinating. So the environment you speak of is not too harsh; it can sustain infrastructure reasonably easily.

Dr Walsh—Particularly on the plateau there are certain problems in designing hardware to survive the cold, but our experience is that those problems can be overcome and working down there is not too bad. I lived there for a year and walked out to the telescope every day, and I learned to enjoy it.

Dr WASHER—It sounds great. What about the alternative, satellite? Surely we now have satellite technology, and you were talking about a reasonable cost in the multinational project. Why would you not launch this from geostationary satellites?

Dr Walsh—You are quite right—the astronomy that we would like to do would be much better done in space than anywhere on the earth's surface. The atmosphere is a problem at all wavelengths. But the costs of going to space are probably 100 times—perhaps even a much larger factor—greater than it would be to do the equivalent science from Antarctica.

Dr WASHER—It sounds great.

Mr CAMERON THOMPSON—How much of an advantage do you get for those kinds of observations by being in Antarctica compared to other sites on the earth's surface?

Dr Walsh—That is a complicated question, and I can answer that on notice. But one example of a quantified comparison of this nature that we have published showed that, in the infrared, a two metre telescope at Dome C can produce equivalent scientific results to an eight metre telescope at a temperate site—for example, the best astronomical sites in Hawaii or Chile. That means that for a few million dollars you can get a telescope that will do what would otherwise cost many tens of millions of dollars.

Mr CAMERON THOMPSON—In the submission, reference is made to the neutrino telescope. Can you go into that in a little more detail? It uses a cubic kilometre of ice—what is the story there? Does it use the ice as a reflector or something?

Dr Walsh—That is the Ice Cube Project. It is an amazing instrument; it will be one of the premier physics research tools of this century. It uses a cubic kilometre of ice as a detector and it uses the earth as a shield. It looks north, and it is designed to detect subatomic particles that come through the earth and interact with atoms in the water of the ice. When they do that they emit a burst of radiation. The telescope consists of many thousands of photomultiplier tubes which will detect this burst of light that is produced when a subatomic particle goes through the earth and interacts with some water molecules in that cubic kilometre of ice.

Mr CAMERON THOMPSON—I am completely ignorant—what does that mean? What do you determine by doing that?

Dr Walsh—It lets you study neutrinos in a way that you cannot study any other way. They tell you about subatomic and cosmological processes that no other particle can teach you about. It is a unique window into the universe and it is like a completely new branch of astrophysics. It is like going from optical to radio; now we are going from radio and optical to neutrino astrophysics. It has huge potential.

Mr CAMERON THOMPSON—Are there other locations where they are doing this in the world?

Dr Walsh—Yes. The University of Sydney has long had a small experiment in a mine out near Broken Hill to prove the concept that such telescopes work. The Japanese, the Canadians and the Europeans all have—

Mr CAMERON THOMPSON—They would be digging around to find a square kilometre of ice at Broken Hill!

Dr Walsh—That is right. They just use water. Similar telescopes using the same principle exist around the world, but this will be the biggest of them by a huge factor. It will be a spectacular experiment.

CHAIRMAN—If there was an investment made—and it appears on the evidence that you have given us, Dr Walsh, that it is going a big investment and we will need international assistance for that—what guarantee is there that the science of the telescope would not be obsolescent within a few short years before you are able to, say, recoup the cost of the telescope? I understand the Hubble cost tens of millions of dollars to put up and it has pretty well outlived itself now. If the government were to assist in an investment, could it become obsolete in a few short years?

Dr Walsh—That is a reasonable question. I think the answer is no, there would be no such concern. To put a telescope in Antarctica is now no more difficult than putting it anywhere else on earth. We understand the problems associated with doing research in Antarctica. If one were to build a state-of-the-art telescope, you could put it in Antarctica as rapidly as anywhere else.

CHAIRMAN—Why would you put it in the Antarctic, where you limit the scope of the range of the telescope? Why wouldn't you put it on the equator, where you have rotating assistance giving you 360 degrees of scoping?

Dr Walsh—There are certain kinds of radiation that you simply cannot see from an equatorial location. There are many kinds of astronomy, particularly cosmology, where there is no advantage to being able to see more of the sky. One can indeed see more of the sky at a higher latitude, but that is irrelevant for the cosmological research that much contemporary astronomy is concerned with. For example, the submillimetre telescope currently being built at the South Pole station is a 10 metre submillimetre instrument that will search for clusters of galaxies and they are randomly distributed over the sky. You do not care where on earth your telescope is. You are going to see half the sky wherever you are. That holds for much of what we are interested in doing. Also, from the South Pole or from anywhere in Antarctica we have a great view of the southern sky, which has the Magellanic clouds, our nearest neighbouring galaxies. It has the centre of our own Galaxy and much of the plane of the Galaxy is accessible to us. You get roughly half the sky from Antarctica, and that is plenty for what we envisage doing.

CHAIRMAN—What is the depth of probe on the proposed telescope in the Antarctic, given that the cosmos is expanding as we speak? Unfortunately, it is light escaping at greater speeds than what the cosmos is expanding. Does the expansion of the cosmos create a problem for you, seeing that you have limited yourself with a certain direction because of the shadow of the earth behind you?

Dr Walsh—No, not at all. The next great challenge for astronomy is probably to understand the earliest history of the universe and the events that occurred shortly after the big bang.

CHAIRMAN—I think it was 13.8 billion years ago; is that right?

Dr Walsh—Yes. That is about right. There is a region called the dark ages after the big bang but before stars and galaxies formed about which we know nothing. This is one of the great challenges of astronomy in the next few decades and there will be telescopes built to probe that time range in particular. You can do that using submillimetre telescopes or infrared telescopes from Antarctica in a way that you could not do anywhere else on earth.

CHAIRMAN—I could stay here all night, but my last question is: would you need to duplicate the telescope in the Northern Hemisphere?

Dr Walsh—No.

CHAIRMAN—You could you derive enough information to warrant the significant investment here in the Antarctic without having to duplicate it in the Arctic to be able to achieve a full notebook of what you wanted to.

Dr Walsh—Yes, absolutely.

CHAIRMAN—That sounds very interesting. I wish I had another life; I would not be a politician. Dr Walsh, thank you so much for your appearance before the committee. If there are any matters on which we might need additional information, the secretary will write to you. On behalf of the committee and the secretariat, I thank you for your attendance.

Dr Walsh—Thank you.

Resolved (on motion by **Senator Lightfoot,** seconded by **Mr Cameron Thompson**):

That this committee authorises publication of the evidence given before it at public hearing this day.

Committee adjourned at 7.32 p.m.