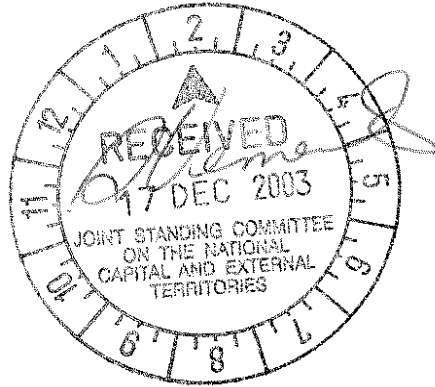


SUBMISSION13.....



Antarctic Science Advisory Committee (ASAC)

**Submission to the Inquiry into the Adequacy of funding for
Australia's Antarctic Program**

December 2003

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- Our Antarctic Future : Australia's Antarctic Program Beyond 2000, The Howard Government Response, May 1998
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- Evaluation of Australia's Antarctic science program, May 2003
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Australian Government

Antarctic Science Advisory Committee (ASAC)

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The Inquiry Secretary
National Capital and External Territories Committee
Parliament House
Canberra ACT 2600

Dear Inquiry Secretary

Please find enclosed a submission prepared by the Antarctic Science Advisory Committee (ASAC) for the "Inquiry into the adequacy of funding for Australia's Antarctic Program".

ASAC is a ministerially appointed advisory committee with the important role of advising Government through the Parliamentary Secretary for the Environment and Heritage on matters relating to the Antarctic Science program. The committee has recently submitted a Science Strategy for the next five years to the Parliamentary Secretary for the Environment and Heritage for her consideration, and hopefully endorsement early in the New Year. As soon as this document is released we will provide you with a copy. It is important to recognise that the science program proposed for the next five years is different from the current strategic plan, and builds on the Evaluation of the Science Program that ASAC recently completed. The Evaluation together with a copy of other relevant documents written by ASAC are enclosed for your consideration.

ASAC was not in a position to cost the requirements to implement the new Science Strategy. ASAC is concerned that the funding required to meet the Government's objectives and recommendations for the science program is above the current budget of the AAD. The details of funding required needs to be explored with the Australian Antarctic Division.

I will be happy to elaborate on the ASAC submission if you would find that useful during the public hearings. My preference would be to attend a hearing in Canberra.

Thank you for the opportunity to provide a submission into this inquiry.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Kurt Lambeck', written over a light blue grid background.

Professor Kurt Lambeck FAA, FRS
Chairman
17th December 2003

Submission by the Antarctic Science Advisory Committee (ASAC)

This submission draws upon several reports submitted by the Antarctic Science Advisory Committee (ASAC) to Government about the Australian Antarctic science program. A copy of each of these reports is appended to this submission. This submission comprises four parts:

1. A summary of the program established in 1997 and entitled "Australia's Antarctic Program Beyond 2000: A Framework for the Future."
2. Comments on the recent evaluation of Australia's Antarctic science program.
3. The adequacy of funding of the Antarctic science program for meeting the Government goals.
4. Conclusions.

1 Introduction

The Antarctic Science Advisory Committee is a ministerially appointed advisory committee that advises the Government, through the Minister for the Environment and Heritage on:

- the broad direction of Australia's Antarctic program, including scientific, operational and logistical support activities;
- priority areas for scientific research, having regard to the Government goals for Australia's Antarctic Program; and
- measures to ensure an effective Australian participation in international scientific and operational programs involving the Antarctic.

ASAC's terms of reference have the overarching statement that their role is "With the objective of assisting in the development of Australia's policies and interests in the Antarctic, and taking into account Australia's foreign policy objectives and international obligations:" ASAC also provides the Government, through the Minister for the Environment and Heritage, with regular evaluation of the success of the Antarctic program in meeting Australia's scientific objectives. The complete terms of reference for the committee are at Attachment A.

2 Australia's Antarctic Program Beyond 2000: A Framework for the Future

In setting the scene about the advice that ASAC has provided to Government, it is worth taking a step back to the ASAC report *Australia's Antarctic Program Beyond 2000: A Framework for the Future* which was submitted to Senator Macdonald (Parliamentary Secretary for the Antarctic) on 31st October 1997. The report has become better known as the "Foresight Report."

This report has made some major recommendations that address the need for developing a more flexible approach to achieving the program goals. This includes the development of air links to Antarctica and the expanded use of aircraft within Antarctica without impacting in a deleterious way on the provision of ship-supply arrangements or on the ability to conduct marine research in the high-latitude Southern Ocean.

The following paragraphs include recommendations and quotes from this report. Most of the issues addressed therein remain very relevant today even though there has been progress toward implementing these recommendations.

"...ASAC examined the goals it should recommend to Government as being in the national interest, given the range of possible future scenarios. It concluded that Australia must continue to conduct a science program in Antarctica and to maintain a national presence on the Antarctic Continent for international and national scientific reasons. In assessing the Antarctic Program it concluded that the conduct of science of practical and economic significance, and science deemed by the Government to be of national significance, should remain as the Government's primary goal. Science deemed by the Government to be of national significance will need to be funded separately from the research which is proposed by ASAC on the advice of its Program Advisory Committees. Research into global climate change will retain its significant international visibility far into the future, and ASAC recommends that Australia maintain and enhance its efforts in this most important interdisciplinary field. In order to manage its Program towards the most preferred of the possible future outcomes ASAC recommends that Australia adhere to its international obligations to protect the Antarctic environment. Finally ASAC's analysis of the work of the groups supports an enhancement of Australia's influence in the ATS as being in the national interest and likely to lead to the preferred future.

ASAC thus RECOMMENDS that:

Recommendation 1

The Government's future goals for the Antarctic Program should be:

- to undertake scientific work of practical, economic, and national significance;*
- to understand global climate change;*
- to protect the Antarctic environment; and*
- to enhance Australia's influence in the Antarctic Treaty System.*

Australia's strategic interests in the Antarctic will be served best by activities which will enhance its influence within the ATS. Its scientists must be able to reach, and work in, any part of continental AAT. A permanent, including overwintering, presence on continental Antarctica must be maintained. Should the Government establish an Antarctic Exclusive Economic Zone (EEZ) an active program of management would be required. Australia must also be able to fulfil its legal and humanitarian obligations with regard to continental rescue.

If Australia wishes to press its claims for an Antarctic EEZ it needs to be able to protect the (primarily biological) resources in the CCAMLR areas over which the world might reasonably expect Australia to exercise responsibility.

This would imply a significant monitoring program. Australia needs to be able to protect the intrinsic and heritage values within its continental and sub-Antarctic responsibility. All human

activity in Antarctica should be conducted with minimal impact, and sites of heritage value should be evaluated and protected.

The future preferred scientific program on continental Antarctica and Australia's sub-Antarctic islands will be driven by a large suite of influences which will enhance Australia's influence in the ATS and in SCAR. Marine science, both biology and oceanography, and marine geology will focus on description of Australia's Antarctic off-shore resources, and research into the requirements of CCAMLR. Research into meteorology, upper atmosphere physics, oceanography and glaciology will be driven by climate change issues as well as the need to provide practical support to all Australian activities in the Antarctic. Through international collaboration Australia may be able to participate in high-cost science, such as astronomy and deep drilling, on the high plateau region.

For Australia to maintain a significant presence in the Southern Ocean there is likely to be a need for a dedicated ship for surveys and for the support of biological, oceanographic, glaciological and geological research.

The Antarctic program needs to be made more flexible if it is to be able to respond to the possible rapidly changing future conditions, thus enabling a much quicker response to changing environments than is currently the case with long-term shipping contracts and fixed continental stations which operate year-round. Accordingly, ASAC RECOMMENDS that:

Recommendation 2

Australia should develop a more flexible approach to servicing its commitments in the Antarctic and sub-Antarctic, to enable it to respond quickly to changed needs and priorities while maintaining the benefits of past investments.

Australia must retain a permanent presence in Antarctica and retain at least one all-year operational station on continental Antarctica, but with the expected increasing automation of data gathering the requirement for three year-round stations may diminish. Bearing in mind the costs of mothballing or closing a station it may be feasible to involve other nations in the operation of the current stations, in order to maintain the benefits of the current program at reduced cost.

Therefore ASAC RECOMMENDS that:

Recommendation 3

Australia retain a permanent presence in Antarctica by maintaining operation of at least one of the existing stations, and move to a flexible logistic infrastructure responsive to scientific requirements capable of supporting existing levels of research in a range of locations, including the use of other stations and temporary field bases as required. In moving towards this arrangement, Australia must continue to fulfil its international obligations under existing arrangements.

ASAC recognises that the current dependency upon a single multi-purpose ship restricts the flexibility of the science program, severely limits the number of scientists who are able to work in Antarctica, and imposes substantial unproductive travelling times. An inter-continental air link coupled to an intra-continental distribution service would provide the transportation flexibility which an innovative and responsive future Antarctic Program requires. It is RECOMMENDED that:

Recommendation 4

In support of the development of a responsive, productive and versatile Antarctic Program, Australia develop a light aircraft intra-continental air transportation system in support of scientific research and for dispersing scientists and their support within the AAT. This system should operate from a single terminus in the AAT which would be served by an inter-continental air link from Australia. In developing this capability environmental, heritage and other impacts must be fully evaluated, as must scientific productivity and economic considerations.

Recommendation 5

Opportunities for close cooperative cost-sharing transportation and ship re-supply arrangements with Australia's Antarctic neighbours should be evaluated and developed.

Recognising the increased emphasis which the future will require of marine science ASAC RECOMMENDS that:

Recommendation 6

To satisfy increased focus on a marine program, Australia charter a dedicated marine research facility, capable of conducting the entire range of components of the marine science program.

To enable resources to be redistributed away from maintenance of year-round stations and into the support of science, efforts should be made to encourage the development of automated data collection systems. Antarctica plays a major role in the global climate system, but systematic observations in the region have been taken for only about 40 years. Bearing in mind that the value of a climate record increases with its duration and that even now the number of high-quality climate observations in the region is low, Australia has an obligation to ensure that its climate records in the region are maintained. Therefore it is RECOMMENDED that:

Recommendation 7

In order to allow more flexibility in the use of resources, Australia should develop alternative and fully automated means of conducting current monitoring programs.

In evaluating the range of future scenarios ASAC is of the view that the co-location of the Antarctic Division with the Commonwealth Scientific and Industrial Research Organisation (CSIRO) Division of Marine Research, the Antarctic Cooperative Research Centre (CRC), the University of Tasmania and the Secretariat of CCAMLR, indicates the suitability of Hobart as the operational base for Australia's future Antarctic Program, though it recognises that the research workforce is widely dispersed around the nation. Accordingly it RECOMMENDS that:

Recommendation 8

Hobart continues as the preferred operational base for Australia's future Antarctic Program.

Current Antarctic science responsibilities include the monitoring of the environment to support operational services and strategic research including global climate change. The past investment in these activities should be continued.

ASAC is of the view that Australia's involvement in innovative international research would further enhance its standing as an Antarctic nation but is concerned about the source of funding to support it. Such research may be of high cost. Much Antarctic research is for the international good, yet paid for by a handful of nations. ASAC RECOMMENDS that:

Recommendation 9

The Government encourages additional international research that is in the national interest, provided it is supported by additional funding, to be conducted in the AAT. It also encourages research conducted for international good, through the development of long-term cost and benefit sharing arrangements. In so doing the Government should maintain its strong support for SCAR as the leading international Antarctic science forum.

The Australian scientific program is delivered by a scientific workforce, only a small proportion of which is employed by the Australian Antarctic Division in Tasmania. Much of the science program is delivered by university and other scientists located around the nation. ASAC believes that this dispersed workforce system serves the national interest well. However, 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. Accordingly ASAC RECOMMENDS that:

Recommendation 10

The Government continues to support a hybrid model for the delivery of the Australian Antarctic scientific program at a level which recognises the changed funding environment in which universities and Government research institutions currently operate.

The Antarctic CRC occupies a special place in the national Antarctic scientific Program. It was established in recognition of the fact that climate change research required the active collaboration of a number of Government agencies. The CRC program has made it clear that funding for the Antarctic CRC will not extend beyond 2003. This is because of their recent policy decision that the CRC program is not a mechanism for the long-term support of strategic research. As the Antarctic CRC is the major vehicle for conducting research into climate change ASAC RECOMMENDS that:

Recommendation 11

The Government and the main agencies in the Australian Antarctic Program examine mechanisms for funding the continuation of inter-agency research into climate change beyond 2003.

The above recommendations are drawn from a planning exercise which looks far into the future to envisage possible factors which will be likely, or may be likely, to influence how Australia plans for its future involvement in Antarctica and its sub-Antarctic islands. What emerges is a perceived need for the future Antarctic program to be able to respond and adapt to changing national and international needs and demands.

The planning exercise has not addressed the costs associated with flexibility of operation, nor the costs of conducting research deemed by the Government to be in the national interest. While considerable savings gained from a rationalisation of continental stations could be used to support enhanced scientific activities, it would be unwise to assume that a more flexible operation could be contained within existing financial forecasts. The need to examine carefully the costs and benefits of the use of ships and aircraft to provide the program with the flexibility it will need, and with the capacity to conduct research deemed by the Government to be in the national interest, has been raised elsewhere in this report. ASAC recognises that detailed planning for a more flexible future Antarctic program is an exercise quite distinct from its long-range analysis of the future, and is outside its Terms of Reference."

3 Evaluation of Australia's Antarctic science program

The JSCNCET inquiry into the adequacy of funding for Australia's Antarctic Program is timely given ASAC has just completed a report for the Parliamentary Secretary entitled "Evaluation of Australia's Antarctic science program". A copy of this report is enclosed. ASAC conducted this evaluation by engaging independent teams of internationally recognised scientists from Australia and overseas, who are not participants in Australia's Antarctic science program. An independent Evaluation Steering Committee provided a report for ASAC to consider.

The work of the Steering Committee and subcommittees provided an extensive and exhaustive assessment of Australia's Antarctic science program and it provided a strong and independent basis for formulating ASAC's evaluation.

The executive summary of the evaluation report highlighted the following elements which are relevant to the JSCNCET inquiry:

- *ASAC considers that Australia's Antarctic Program successfully meets its scientific goals, a view that is supported by the independent Evaluation Steering*

Committee who gives a strong endorsement of the quality of the overall scientific program.

- *ASAC endorses the overall finding by the steering committee that Australia is "well served by its Antarctic science program", that it represents "a remarkable contribution by Australia to world science", and that "the strengths in the individual components of the program be maintained".*
- *ASAC has identified a number of generic issues that it will consider in detail as part of the preparation for the 2004/05-2008/09 Australian Antarctic Science Strategic Plan. These include:*
 - *Increasing the collaboration between existing programs and between Australian organisations and overseas institutions*
 - *Increasing the visibility of scientific output in journals*
 - *Increasing participation in the scientific program*
 - *Raising awareness of the program*
 - *Improving the transparency of the program by developing further the existing performance indicators*
 - *Distinguishing between scientific research and monitoring programs*
 - *Expanding scope of the Antarctic Data Centre, and*
 - *Major equipment requirements.*
- *The Evaluation Steering Committee (SC) notes throughout the report that greater collaboration in a multidisciplinary approach would be advantageous. To achieve this, ASAC recommends that the Australian Antarctic science program shift from the current discipline based programs to overarching Antarctic themes of great scientific merit and practical value. Four themes have been identified:*
 - 1) *Ice, Ocean, Atmosphere and Climate*
 - 2) *Southern Ocean Ecosystems*
 - 3) *Adaptation to Environmental Change*
 - 4) *Impacts of Human Activities in Antarctica*
- *These themes support the first of Australia's National Research Priorities "An Environmentally Sustainable Australia" by addressing the significant environmental challenge of living with climate change in a sustainable way. ASAC considered that there are distinct advantages in delivering Australia's Antarctic Program by*

operating under this thematic approach although it does have substantial implications for the management of current programs. These will be examined in detail at future ASAC meetings. ASAC recognizes that not all science areas may fall within these themes and care will have to be taken that such areas, if important to Australia's Antarctic science program, are not disadvantaged.

- *The fourth National Research Priority "Safeguarding Australia" is addressed by Australia's Antarctic science program through research into space weather, cosmic rays and ionospheric predictions which play an essential role in protecting our critical communication infrastructure. By conducting fundamental science of the highest quality in Antarctica, the "breakthrough science" component of the Australian National Research Priority of Frontier Technologies is also supported. Such activity takes advantage of Australia's proximity to and traditional involvement in Antarctica and should attract international research investment into areas where Australian science can demonstrate a competitive edge."*

The Evaluation also produced several generic recommendations that are very relevant to the JSCNCET inquiry.

Recommendation 1

ASAC strongly recommends that the level of Commonwealth government commitment to support the Australian Antarctic Division and the contributing agencies of the Antarctic Program be maintained as a matter of the highest priority for the nation. Australia's Antarctic Science Program is delivering high quality research in a number of key areas within the new Government National Research Priorities.

Recommendation 3

ASAC recommends the retention of the distinction between scientific studies of the Antarctic and studies which use Antarctica as a platform for first-class science. ASAC maintains its priority to scientific studies of the Antarctic and supports the continued use of Antarctica as a "platform" to conduct externally supported research of high scientific value. Platform research includes areas of astronomy, space and atmospheric sciences, geosciences, and human biology and medicine that do not directly relate to the themes proposed in Recommendation 5.

Recommendation 5

ASAC recommends that to achieve further interagency coordination and cooperation the 2004/05-2008/09 strategic plan should be primarily delivered by 4 themes:

1. *Ice, Ocean, Atmosphere and Climate*
2. *Southern Ocean Ecosystems*
3. *Adaptation to Environmental Change*
4. *Impacts of Human Activities in Antarctica*

Recommendation 7

ASAC recommends that the most significant change to achieve greater participation in the Australian Antarctic science program is through the development of a frequent and efficient inter - and intra -continental air transport system.

Recommendation 8

ASAC recommends that attracting early career scientists into the Antarctic Program is encouraged actively.

Recommendation 12

ASAC recommends that the scope of Australia's Antarctic Data Centre is expanded, particularly in the case of research producing long-term time series data and information.

Recommendation 13

ASAC recommends that scientists within the Australia's Antarctic Science Program investigate all funding opportunities both nationally and internationally to ensure that major equipment requirements for the delivery of high quality scientific data can be achieved into the future.

Recommendation 14

ASAC recommends that automation of data acquisition conducted at the stations continues to enable maximizing the use of resources.

The evaluation report was endorsed by the Parliamentary Secretary in 2003 and ASAC is overseeing the implementation of the recommendations.

4 Adequacy of Funding to Address the Government Goals

ASAC provides an independent overview of the science program and therefore is well positioned to identify areas where funding gaps are appearing. It is quite clear to ASAC that the AAD has approached its maximum capacity with the resources it has available and that it may not be able to meet all the goals set for the program.

4.1 Logistic Support for Science

AAD provides the logistic support for the Australian Antarctic Science program. This includes travel to and from Australia for scientists and support staff, the transport of supplies and equipment to Antarctica, the maintenance of stations and field camps, and transport within Antarctica. It also includes the support of marine science, oceanography and sea-ice research in the Southern Ocean.

A major change in operation is occurring with the introduction of air transport to the Australian Antarctic Territory and with the expanded air transport within the continent. In a 2001 report to Government ASAC (see Appendix B) stated: *"In 1997 ASAC, in its report to Government on the future of Australia's Antarctic Program in the 21st century, recommended that an inter- and intra-continental air transportation system be introduced in support of the development of a responsive, productive and versatile Antarctic Program. In 1998 the Government, in its response to that Report, accepted ASAC's advice that an airlink would provide the transportation flexibility which an innovative and responsive future Antarctic Program requires. The Government also asked the Australian Antarctic Division to investigate air transport options that gave due regard to Australia's environmental obligations and practical considerations, including costs."*

The ASAC report *Australia's Antarctic Program Beyond 2000: A Framework for the Future* also made a strong recommendation on the need for a dedicated marine science research vessel capable of operating in the Antarctic environment, that in order "to satisfy the increased focus on a marine program, Australia charter a dedicated marine research facility, capable of conducting the entire range of components of the marine science program" (recommendation 6 of that report).

The Government response at that time was: *"Without derogating from the essential land-based research program, the Government accepts the importance and necessity of undertaking marine research to support the Government's priorities for the Antarctic Program. Accordingly, this recommendation is supported and the Government agrees, subject to costs, that it is desirable that Australia's Antarctic Program be supported by a multi-ship arrangement when it develops options for shipping support for Australia's Antarctic Program beyond the expiration of the present charter of RSV Aurora Australis."*

The research effort for the next 7 years has a strong emphasis on marine science, including the relationship between the physical environment of the Southern Ocean and its biological productivity and sustainability. This component of the work will be conducted by the recently established Antarctic Climate and Ecosystem Cooperative Research Centre (ACE CRC), which the Australian Antarctic Division is a major partner.

Adequate logistic support, including inter- and intra-continental air transport passenger and a dedicated marine research vessel (for marine biology, oceanography, sea-ice studies, physico-chemical studies and marine geology) is essential for the success of the science program and to ensure that the program delivers on the four Government goals.

4.2 Scientific Equipment

ASAC has identified the need for funding major equipment for scientific research in the Australian Antarctic Territory and Southern Ocean to ensure that the research remains relevant. It is important that major equipment requirements for the delivery of high quality scientific data are factored into the funding of Australia's Antarctic science program to permit long-term planning. This need is factored into the AAD science budget

but increasing pressure on the budget and the increasing cost of major equipment has delayed or prevented purchase of some basic pieces of equipment.

Major equipment needs identified by ASAC as important for meeting the Antarctic science goals include:

- swath mapping for sea-floor surveys,
- ARGO buoys for automated oceanographic measurements,
- upgraded satellite reception with X-band capability at Casey,
- ice coring equipment for a major drill site for climate research.

Australian scientists have been very proactive at entering into international cooperative agreements to share the cost and use of equipment, from ship time to telescopes. But purchase of major equipment that will enhance these cooperative projects will require new funding from bodies in Australia such as the Australian Research Council (ARC) and the Australian Antarctic Division.

4.3 The Australian Antarctic Science Grants

The Australian Antarctic science program is supported logistically and financially by the Australian Antarctic Division. A significant part of this support is provided directly from the AAD science budget as Australian Antarctic Science grants to University researchers. The funds available within Universities to conduct Antarctic research are small. The AAD has been alert to this and has gradually increased the funding available from its science budget to the grant scheme but it is clear that for the AAD to deliver on the Government priorities it cannot provide a significant increase to the grant scheme from its Science budget.

Virtually all University research requires external funding. The Australian Research Council, in particular, provides funding for some of the scientists within the Antarctic program. However the requests to the Antarctic science grants scheme have increased over the years and will increase further as the Antarctic Science goals are pursued. The currently available funding supports only a fraction of what is required. It is the capacity of contributing agencies to continue to participate within the Antarctic Science program, particularly the Universities, that concerns ASAC.

The 03/04 funding available from the AAD for support of Antarctic science grants was \$706,952, with a maximum grant of \$30,000 possible. A total of 57 grants have been supported for this season with grants ranging from \$1300- \$30,000. It is ASAC's view that the funding available through the grant scheme needs to increase. However this must not be at the detriment of funding to the science conducted within the AAD, given that their research is central to meeting the Government obligations. It is ASAC's view that the pool of grant funding needs to be increased to \$1.5M over the course of the new strategic plan. This would increase both the number of participants in the program and the

number of projects that could be supported with grant funds as well as support the scientific projects at an appropriate level.

ASAC is alert to the problem of an ageing population of university research scientists who participate in the Antarctic Science program. It therefore recommends that a proportion of the Grants scheme is made available to early career researchers to develop their scientific careers. ASAC recognises that it is not just a simple matter of dollars to ensure new researchers are attracted to the Antarctic science program. One of the key factors for most early career scientists within universities is the heavy teaching loads they undertake and their limited time to commit to Antarctica to research. Conducting research in the Antarctic and Southern Ocean is physically demanding and logistically difficult, and to attract new scientists to conduct research long term in such an extreme environment is challenging.

5. Conclusion

Australia's science activities in Antarctica serve well the nation's strategic interest in that continent as has been demonstrated by the most recent review of its activities. But it can only continue to do so if these activities are funded at a level that permits the science outputs to remain competitive at the highest international level. Government has recognised the importance of this through its support for the new plans to enhance the access to Antarctica and through its recognition of the importance of enhancing its marine capability. The major world issues of climate change and the sustainability of ecosystems of worldwide importance are impacted strongly by research conducted in the Antarctic and sub-Antarctic. ASAC has already drawn the Government's attention to the uniquely valuable information coming from research in the Antarctic in this regard, but it is worth restating it here.

The conduct of science in the Antarctic is, by its nature, expensive, but the outcomes are significant. The funding consequences of the ASAC Evaluation recommendations, however, have not yet been fully explored. Particular issues that will need consideration in such an exploration include:

- The provision of adequate funding for the maintenance of the air links, the supply requirements, and the Antarctic Marine program at a level of operation that is consistent with the government goals.
- The need for an orderly process by which AAD can replace ageing major equipment and acquire the new equipment that is necessary for meeting its goals.
- The enhancement of the funding support required to carry out the scientific research back in Australian laboratories that underpins much of the Antarctic work.

ASAC is concerned that the funding required to meet these and the Government's objectives is above the current budget of the AAD. The details of funding required needs to be explored with the Australian Antarctic Division.

ATTACHMENT A

Antarctic Science Advisory Committee — Terms of Reference

With the objective of assisting in the development of Australia's policies and interests in the Antarctic, and taking into account Australia's foreign policy objectives and international obligations:

1. To advise the Government, through the Minister for the Environment and Heritage on:
 - the broad direction of Australia's Antarctic program, including scientific, operational and logistical support activities;
 - priority areas for scientific research, having regard to the Government goals for Australia's Antarctic Program; and
 - measures to ensure an effective Australian participation in international scientific and operational programs involving the Antarctic.
2. To recommend to the Government, through the Minister for the Environment and Heritage:
 - five-year strategic plans for Australian scientific activities in the Antarctic; and
 - the type and level of resources necessary for the implementation of these activities.
3. To advise the Government, through the Minister for the Environment and Heritage, of any liaison arrangements between government departments and authorities, advisory bodies, research organisations and individual scientists which may enhance Australia's Antarctic interests.
4. To advise the Minister for the Environment and Heritage, through the Secretary of the Department, on management matters in the Antarctic Division if they have significant impact on the implementation of the scientific program.
5. To provide the Government, through the Minister for the Environment and Heritage with regular evaluation of the success of the Antarctic program in meeting Australia's scientific objectives. A report on Australia's major scientific achievements should be published annually.
6. To undertake other studies or reviews as the Minister for the Environment and Heritage may from time to time request.

Notes: (1) *The Committee's Terms of Reference should be interpreted as excluding matters directly related to diplomatic negotiations with other nations*

- (2) *'Science' is intended to include scientific, technological, environmental, meteorological and cartographic work.*
- (3) *Reference to 'Antarctic' is to be taken as including the 'sub-Antarctic'.*

ATTACHMENT B

REPORT OF OUTCOMES FROM THE ANTARCTIC SCIENCE ADVISORY COMMITTEE'S (ASAC) AIR TRANSPORT WORKSHOP HELD IN CANBERRA ON 18 APRIL 2001

1 Background

In 1997 ASAC, in its report to Government on the future of Australia's Antarctic Program in the 21st century, recommended that an inter- and intra-continental air transportation system be introduced in support of the development of a responsive, productive and versatile Antarctic Program. In 1998 the Government, in its response to that Report, accepted ASAC's advice that an airlink would provide the transportation flexibility which an innovative and responsive future Antarctic Program requires. The Government also asked the Australian Antarctic Division to investigate air transport options that gave due regard to Australia's environmental obligations and practical considerations, including costs.

In parallel to the ongoing investigations into the feasibility of Antarctic air transport ASAC has continued to work closely with the Australian Antarctic Chief Scientist and the various science Program Leaders in considering the advantages of inter- and intra-continental aircraft to Australia's Antarctic science program. In 1999 and 2000 the Chief Scientist provided ASAC with preliminary reports on the likely advantages. On the basis that several of the Antarctic science programs would be able to undertake significant new scientific studies when supported by aircraft, ASAC agreed to host a national workshop in 2001 to engage the broader scientific community. Representatives of scientific societies, universities and the various scientific advisory committees were invited to attend, as were representatives of relevant non-government organisations. The workshop was structured to encourage participants to think laterally when considering the potential benefits of air transport to science while cognisant of the constraints of what is realistically possible within Australia's environmental protection and policy framework. Participants were reminded that the Government would not support the adoption of an air transportation and support system unless its implementation met relevant safety standards and was consistent with Australia's environmental obligations under the Madrid Protocol on Environmental Protection to the Antarctic Treaty as well as with relevant Australian environmental law. Participants were also reminded that the Government considers that tourism in Antarctica should continue to be ship-based.

2 Key Outcomes

An Air Transportation and Support System

The future success of Australia's Antarctic Program lies in the Program remaining productive, responsive and versatile (Government Response to ASAC Report, 1998). An air transport capability will provide the flexibility, which an innovative and responsive future Antarctic program requires. It is essential, therefore, that the inter- and intra-continental links of an air transport capability be well integrated with, and complement, each other and the other modes of Australia's continuing Antarctic transportation system (i.e. helicopters and marine research and supply vessels).

An inter-continental capability, which is not integrated with an intra-continental air transport system will be of little benefit in supporting scientific research, and for dispersing scientists and their support within the Australian Antarctic Territory (AAT).

Increased efficiency and effectiveness of Australia's Antarctic science program

The amount of science undertaken annually will increase, as the non-productive travel time of scientists decreases, and rapid deployment of researchers to remote field locations by air will enable spares and fresh supplies and equipment to be delivered during the same field season. A reduction in travel time will also enable greater institutional support from Australia's universities. Currently, only 18 out of the 37 Australian universities are involved in the national Antarctic program. It is predicted that the reduced travel time will result in an increased number of senior scientists working in the AAT. Over the last five years only three percent of scientists travelling south with Australia for field work have been senior scientists (i.e. Associate Professor/Reader or above). By comparison, New Zealand's Antarctic program figures indicate that 19% of the personnel travelling south to Antarctica to work in the field are senior scientists. The constantly changing operating environment of Australia's universities is such that academics have increasingly less opportunity to supervise students in the field. A greater involvement of Australian universities in Antarctic science is predicted to enhance the quality and relevance of the research output to the goals of the national Antarctic program through increased competition for research grants and operational support. A greater involvement of universities also enhances Australia's ability to provide an interdisciplinary focus for investigating issues of global and regional significance through an optimisation of a scientist's productivity, seasonal access to Antarctica and reduced transit times.

Frequent air access to the AAT will give Australia the ability to attract high profile international scientists with specialist instruments, thus enhancing partnerships and technology transfer prospects, and leading to new areas of collaborative research. Air transport will also enable us to use, service, modify or replace instrumentation/equipment during the Antarctic summer season. This capability will result in a rationalisation of resources through a greater use of leased and/or borrowed expensive equipment from consortia because of the shorter periods of engagement in the field and of a greater certainty of it being returned within agreed timeframes.

Opportunities for new science

Significant opportunities to conduct 'new' science were identified if the national Antarctic program's transportation and support system included fixed-wing aircraft. Access to new and remote areas within the AAT will enable several research programs to be broadened and to complement their existing activities through the use of airborne scientific equipment. Air transport will also provide Australia with the capacity to support scientific instrumentation in remote locations such as widely scattered Automatic Weather Stations, seismometers, GPS base sites, the proposed Douglas Mawson 2-metre IR telescope on the Antarctic plateau or ice coring projects for studies of past climate variability.

Australia is lagging behind other Antarctic nations in undertaking broad scale surveys of aero-magnetism and aero-gravity across the AAT. Such geophysical observations, plus ice radar surveys, will enable Australia to make a first and substantial contribution to internationally endorsed projects to model the sub-ice geology of the Antarctic continent and contribute to the development of the past global climate record.

Inter-continental flights between Australia and the AAT over the Southern Ocean will provide the opportunity for sampling the troposphere providing data on the abundance, distribution and concentration of greenhouse gases. These flights will also provide Australia with the opportunity of sampling the nature and concentration of aerosols, which are known to influence cloud formation and the amount of radiation reaching the earth's surface. Australia's potential to contribute towards the development of accurate and reliable models to advance our understanding of the role of Antarctica in regional and global climate systems will be very significantly enhanced with this new information.

Routine intra-continental flights between our Antarctic stations will provide a very cost effective means of acquiring aerial photography for mapping some of the more remote parts of the AAT as well as the identification of sites and animal and plant communities that may be worthy of protected status under the Antarctic Treaty System. Airborne remote sensing is proven technology.

Flights below cloud cover will enable estimates to be made of the concentration and distribution of phytoplankton through the measurement of ocean colour and, importantly, of the time variation of these concentrations. The Southern Ocean is a

significant source of global carbon dioxide and estimates of phytoplankton concentrations are critical for understanding how the microbial processes influence gaseous exchange and the global climate system.

Opportunities for new science also exist through air transport providing greater access to research vessels and to field stations. Having a research vessel based in Antarctica for long periods, with the ability to change crews and scientists via an air link, will dramatically reduce transit times and "burn-out" rates of technical and scientific staff, and also provides a wider pool of expertise for voyages. These flow-on benefits will greatly assist the conduct of new science in the fields of marine ecology, oceanography, fisheries research, sea-ice research, climatology and biochemistry.

The internationalisation of Australia's Antarctic science program

Air transport will significantly increase Australia's involvement in collaborative research with its Antarctic partners and high profile international scientists. Greater collaboration and cooperation with other national Antarctic programs will strengthen Australia's ability to generate ideas and undertake research. The shorter turnaround times will encourage greater involvement of senior scientists, which helps ensure that Australia remains innovative and influential within the Antarctic Treaty System.

The ability for senior scientists to periodically supervise students, technicians and young scientists in Antarctica will result in a greater output of high quality science against the resources expended. This will significantly increase the value of the research output currently achieved from the expenditure of the annual resource allocation to Australia's Antarctic Program.

3 Concluding Remarks

The adoption and implementation of an Antarctic air transportation and support system will be a clear demonstration of the Government's commitment to "Backing Australia's Ability" to maintain and enhance the Nation's reputation for producing innovative and quality research, science and technology. It will complement the Government's higher education reforms on research and research training by helping to ensure that universities and other research institutions are well placed to contribute knowledge and ideas to business and research sectors, and to capitalise on the opportunities already created as a result of Australia's past and current Antarctic activities. An Antarctic air transportation and support system is supported very strongly by the wider scientific community. Furthermore it will enhance Australia's international standing through an increased leadership role in Antarctic Science.

4 References

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