DAVIS AERODROME PROJECT

FUTURE SCIENCE OPPORTUNITIES

A report on the series of webinar workshops with the Antarctic science community, organised by the Australian Antarctic Division in collaboration with Scientell

MAY 2020 | SYNTHESIS REPORT

Australian Government
Department of Agriculture, Water and the Environment
Australian Antarctic Division

AUSTRALIAN ANTARCTIC PROGRAM

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Cover photo: Nathan Bourke

INTRODUCTION

For more than a century, Australia has been at the forefront of Antarctic endeavour. Our operational and research capabilities have developed rapidly since Sir Douglas Mawson led the nation's first expedition to the continent in 1911.

Scientists on the Totten Glacier
(Photo: Ben Galton Fenzi)

Our activities in Antarctica are coordinated through the Australian Antarctic Program, led by the Australian Antarctic Division (AAD) on behalf of the Australian Government. The AAD is responsible for Australia's presence and operations in the Australian Antarctic Territory and the Southern Ocean.

The Australian Government is committed to the delivery of a modern Antarctic program that enables us to continue to lead a world-class science program and maintain our position as a leading Antarctic nation well into the future.

In 2016, the Government released the *Australian Antarctic Strategy and 20 Year Action Plan* setting out a roadmap for our engagement with the continent, and committing to investigate year-round access between Australia and Antarctica.

In 2018, the Government announced its intention to construct an aerodrome near Davis research station supporting year-round access, subject to environmental approvals.

The proposed Davis aerodrome represents a major capability enhancement for the Australian Antarctic Program and, if approved to proceed, will create new opportunities for ambitious and logistically complex research projects.

In preparing this report, the AAD has engaged with Australia's Antarctic science community to better understand and articulate the benefits for Australia's leadership, operations and research capability that would come from year-round access to Antarctica.

Following on from the Scientific Committee on Antarctic Research (SCAR) Science Horizon Scan in 2014, a paper written by an international cohort of scientists notes that future research on the continent will require expanded year round access.[1]

The Council of Managers of National Antarctic Programs (COMNAP) Antarctic Roadmap Challenges (ARC) report (2016) also clearly outlines the multiple benefits of expanded, year-round access to the continent, and expansion of flights and access to deep field sites within the continent.

If approved, the Davis aerodrome will deliver exactly this – overcoming one of the most significant barriers facing the Antarctic community and enabling Antarctic scientists to focus on answering critical questions of global significance for the generations to come.

Kim Ellis, AAD Director

SUMMARY

PROJECT BACKGROUND

An aerodrome at Davis research station is being considered to build on Australia's role as a leader in Antarctica, support a modern and sophisticated Antarctic program, facilitate future research, and build on Hobart's status as a premier global Antarctic Gateway. If approved and constructed, the Davis aerodrome would become operational around 2040, providing year-round access from Hobart, Tasmania, and increasing efficiency and adaptability for deployment of scientific and support personnel and equipment. It would also extend the operating and science season across the entire year, enabling more research to occur in winter and shoulder seasons.

Four webinar workshops were held in March 2020 to provide researchers with an interest in Antarctic science the chance to identify, discuss and further develop the future science opportunities that could be enabled by improved access via a year-round intercontinental air link and a modernised Davis research station. The webinars were attended by a total of 56 participants located in Hobart, Melbourne, Sydney and Canberra. Workshop participants identified research activities and other inputs that will be considered in the planning phase for both the station modernisation master planning process and the Davis Aerodrome Project.

CHALLENGES OF WORKING IN ANTARCTICA

Year-round access would potentially alleviate many of the challenges researchers face working in Antarctica, making research activities more effective.

The limited number of research projects that are possible in Antarctica would increase if there were easier and more frequent access. The lack of flexibility across seasons would be improved as timing and duration of field work could be changed depending on weather conditions and researcher availability.

Due to Antarctica's isolated location and current limited seasonal access it can be difficult to provide a wide variety of researchers access to the continent. Lengthy time commitments restrict some researchers from ever visiting. Increased schedule flexibility would make access to Antarctica more equitable for scientists and would be especially pertinent for early-career scientists, providing increased access early in their research careers and potentially influencing their careers in Antarctic science.

The remote and hostile nature of Antarctica presents a formidable hurdle for the effective deployment and sustained maintenance of observational equipment. Calibration and repair of in-situ monitoring equipment throughout the inaccessible winter months also present a challenge. The lack of winter access means that if monitoring instruments break during the off-season, they cannot always be repaired, potentially reducing data quality and accuracy.

In Antarctica there are many components of the Earth system that are too scarcely or inaccurately observed to adequately support ice sheet, weather, climate and ecosystems research. Our lower confidence in Earth system processes, trends and future scenarios stemming from these observational gaps translates directly into greater societal, economic and environmental risks.

An overall challenge of Antarctic research involves the uncertainties, limitations, and lack of continuity of funding, particularly for early-career researchers. Regular and reliable flights would enable shorter trips, which may be more cost-effective.

NEW AND ENHANCED RESEARCH

An aerodrome would increase innovation by supporting research initiatives and allowing scientists to test more ambitious and novel hypotheses. Increasing access for larger teams of researchers would enable more coordinated, large-scale projects that link several research disciplines and address multiple regions of Antarctica. Seasonal and multi-year studies that have not previously been possible may then further prompt new questions. Such access could enable research in previously inaccessible areas.

Year-round access to Antarctica would enable observations of the transition periods between seasons and reduce seasonal biases in data. Increased access could enable improved data collection across breeding and non-breeding cycles of Antarctic species. There would be greater opportunity to instrument seabirds and seals with oceanographic sampling devices to capture winter oceanographic data.

Winter access has significant benefits for biological studies, as learning about the roles of Antarctica's many endemic species of flora and fauna can improve management strategies. Access to new and remote sites would enable researchers to collect data on more species and better understand ecosystem processes. An increased ability to survey species could facilitate the discovery of new species and habitats.

Having year-round access to Antarctica offers the opportunity to collect higher resolution, more complete time series of ecological data. This is likely to support more insightful research and precise modelling during the period of unprecedented rapid ecological change that we are currently experiencing. Monitoring of marine resources across all seasons would allow greater insight into the sustainability of fisheries.

An expanded research program at Davis station would improve satellite validation capabilities at high latitudes. Increased access to Antarctica would offer a viable location to test, fine-tune and improve new Australian smart-sensing technology. Satellite technology also contributes greatly to aircraft safety.

Increased access to the continent would allow students and post doctorate researchers to visit Antarctica and to be trained on-site in polar field and research techniques.

Reliable, flexible and rapid access to the continent for people and equipment would enable scientists to respond quickly to important observational events, and improve emergency response capability. Winter access would support studies into how human physiological performance and vehicle operations and tracking performance can be optimised under extreme winter conditions, enabling future expeditions to run more safely and efficiently.

Construction of the aerodrome offers a unique opportunity to study the impact of human activities in Antarctica, including construction and settlement on a largely untouched region.

COLLABORATION OPPORTUNITIES

Increased access throughout the year would offer greater opportunities for international collaboration, as it would enable researchers from other nations to fly to Antarctica more frequently – both to undertake science at Davis, in the field, or to transit to their own research stations.

More intracontinental flights to other stations would allow the sharing of expensive scientific equipment and the sampling of multiple sites to answer continent-scale ecological, atmospheric, geological and oceanographic questions. Sharing with international collaborators could reduce the environmental impact of research, as researchers could collect data samples and run projects simultaneously.

The greater research capacity enabled by year-round access would allow Australia to take the lead in managing and contributing to large international and interdisciplinary Antarctic research programs. Uploading new data to world data centres would lead to increased availability and quality of scientific data for scientists across the globe.

IMPACT AND OUTCOMES

The impact these research activities would have on science, and on Australian and international society's planning, management and decision-making, would be far-reaching. They would increase our understanding of the Antarctic environment, and improve environmental management. Year-round observations may enable discoveries that significantly improve policy- and decision-making.

An increased capacity to visit Antarctica would mean that Australian engineering and technology in the polar expedition domain would develop, potentially opening up international business opportunities. There would be opportunities for academic development, improving Australia's standing as a research nation on a global stage. Regular, year-round opportunities to transport people and equipment would enable Australia to be the provider of logistical and operational support that makes new scientific research possible.

Improved understanding of ice sheet, weather, climate and ecosystems processes and trends would improve confidence in climate and weather modelling. This would provide knowledge to enable more informed decisions and advice informing policies relating to greenhouse gases, carbon sequestration in the Southern Ocean, aerosol pollutants, ocean management, ocean health and use of resources, and planning for a warmer climate. Increased data and improved numerical weather prediction are also essential for safe operations in Antarctica.

More accurate and higher resolution datasets, and enhanced ecological models, plankton forecasts, and disease models would improve knowledge of species movements, including invasive species, and enable identification of threats to species survival. There would be increased information for policy makers and the International Association of Antarctica Tour Operators regarding human impacts via invasive species. Improved biological data enabled by year-round monitoring would contribute to understanding population dynamics, providing improved knowledge of how to sustainably manage fisheries populations.

Increased access would allow more data from different regions to be collected, leading to better understanding about Antarctic-related chemical processes (both contaminated and natural) to enable more efficient and effective clean up strategies.

INFRASTRUCTURE, EQUIPMENT AND OTHER REQUIREMENTS

Transport, including helicopters and light fixed-wing aircraft, ice-traversing vehicles and boats, would be required to make full use of the Davis upgrades, support intracontinental research, and to access field sites. Transport vehicles could be fitted with observational equipment to augment the coverage of the remote in-situ instrument network.

The increase in sampling is likely to require more storage capacity, consumables, larger wet laboratories and laboratory access, and increased cargo capacity for transport of samples back to Australia. There would also need to be an increased number of available beds.

Technological improvements would need to be made to maintain data accuracy. Computing resources and high-speed internet access would be required for communication and data analysis. Technical support would be required throughout the year.

Increased research funding for observation collection and model development would be necessary to ensure that new data yield the most information and value.

PROJECT BACKGROUND

> Antarctica is a critical element of our Earth system, yet it remains largely unexplored and the least understood. Changes to the icy continent and Southern Ocean will have profound ecological and economic impacts on Australia and the rest of the world, which is why ongoing Antarctic research is imperative.

Year-round access to the continent – via an aerodrome at Davis research station – is being considered to facilitate future Antarctic research and build on Australia's role as a leader in Antarctica. If approved and constructed, the Davis aerodrome would become operational around 2040, providing year-round access via a six-hour flight from Hobart, Tasmania. Between October and May, three intercontinental flights per month are anticipated, carrying 30 to 50 expeditioners, and up to 80 expeditioners on early season flights. A modern Davis research station would offer approximately 150 beds.

Davis research station is situated in one of the largest coastal ice-free areas of Antarctica, on the edge of East Antarctica's Vestfold Hills. Australian Antarctic Program (AAP) aviation access to East Antarctica is currently via Wilkins Aerodrome, a summer-only ice runway near Casey research station. Flights depart Hobart for Wilkins between late October and March, with a shutdown of approximately six weeks around December and January when higher temperatures soften the ice runway surface. Intercontinental flights land at Wilkins Aerodrome, with connecting flights to Davis research station and on to Mawson station and other field sites.

A paved runway at Davis research station would increase efficiency and adaptability for deployment of scientific and support personnel and equipment. It would also significantly extend the operating and science season. This would enable more research to occur in winter and shoulder seasons, as well as allowing more flexible field deployments.

More frequent flights would increase the flexibility of the AAP, and other national Antarctic programs would be able to access the continent as part of the AAP. Scientists and specialised personnel who may not be available for lengthy seasonal deployments could make short visits to undertake research work. Science support staff, technical experts, and logisticians could prepare technical equipment and logistics prior to scientists arriving. More frequent flights could support field-based familiarisation opportunities, which are especially important for students and early-career researchers.

David Barringhaus

Four workshops were held in March 2020, in Hobart, Melbourne, Sydney and Canberra. These sessions were structured to provide researchers with an interest in Antarctic science the chance to identify, discuss and further develop the future science opportunities that could be enabled by improved access via a year-round intercontinental air link and a modernised Davis research station. The workshops also provided an opportunity for the Australian Antarctic Division (AAD) to share information about the Davis Aerodrome Project, plans for modernising Australia's Antarctic research stations, and the science associated with the proposed aerodrome.

The COVID-19 pandemic in early 2020 led to the workshops being undertaken as webinars. The webinars were attended by a total of 56 participants. Each webinar session was attended by researchers who had planned to participate in a physical workshop in a capital city. The Hobart session was attended by 20 participants, Melbourne had 19, Sydney 7, and Canberra 10. Seven other staff from AAD and Scientell also attended the webinars.

Workshop participants identified research activities that would be enabled by the access provided by a Davis aerodrome. Incorporating future research needs and science opportunities is integral to future AAD planning processes. Participants' input will be considered in the planning phase for both the station modernisation master planning process and the Davis Aerodrome Project.

KEY DATES INCLUDE:

May 2018	The Australian Government announced its intention to construct a paved runway near Davis research station, subject to environmental approvals
December 2019	The Australian Government announced further funding and reiterated its commitment to a proposed aerodrome
January 2020	Proposal for new aerodrome opened for public comment under the Environment Protection and Biodiversity Conservation Act
March 2020	Workshops held to further understand science opportunities
Late 2020/early 2021	National and international public consultation on environmental impact assessments
Mid-2021	Environmental assessment discussed at the Antarctic Treaty Consultative Meeting in Paris, France
Late 2021/early 2022	Environmental decision point
TBC	Final decision by Australian Government

CHALLENGES OF WORKING IN ANTARCTICA

The Council of Managers of National Antarctic Programs (COMNAP) recognises in the Antarctic Roadmap Challenges (2016) report[2] that '**Antarctic logistic requirements are complex and challenging**'.

The **limited number of research projects** that are possible in Antarctica would increase if there were easier and more frequent access. Upgrades to Davis station, including an increase in the number of beds available for researchers, would also help.

Scaling up of important long-term research and monitoring could be achieved by facilitating **larger multidisciplinary teams**. Such teams would then have the opportunity to visit Antarctica as the Davis station upgrades would allow for more researchers to be posted for one to two months, or even shorter periods. Antarctic science has the potential to become more comprehensive and to have a greater international impact. The opportunity for global experts to fly in for short periods throughout the year to undertake research could facilitate broader outcomes.

The **lack of flexibility** across seasons would be improved as timing and duration of field seasons could be changed depending on weather conditions and researcher availability. This is particularly important for fieldwork that requires ice-free zones.

Due to Antarctica's isolated location and limited seasonal access it can be a challenge to provide a variety of researchers access to the continent. Presently, **lengthy time commitments** restrict some researchers from ever visiting. Increased access and schedule flexibility would allow academics with family and other commitments, and PhD students on shorter tenures, greater access to the continent, with the ability to undertake multiple shorter trips year-round, instead of one long expedition. This would make access to Antarctica **more equitable for scientists** and would be especially pertinent for **early-career scientists**, providing increased access early in their research careers.

In Australia's Antarctic Territory, there are many components of the Earth system that are **too scarcely or inaccurately observed** to adequately support ice sheet, weather, climate and ecosystems research. For example, observational gaps in ice and atmosphere temperatures; sea level; ice-sheet movement and crevassing; atmospheric chemistry; winds, humidity, clouds, precipitation and pressure limit our confidence in predictive modelling and trend monitoring across all time scales. Our lower confidence in Earth system processes, trends and future scenarios stemming from these observational gaps translates directly into higher societal, economic and environmental risks. Addressing observational gaps in the Australian Antarctic Territory is therefore a critical step for Australian and global disaster mitigation and climate change adaptation.

The **remote and hostile nature** of Australia's Antarctic Territory presents a formidable hurdle for the effective deployment and sustained maintenance of observational equipment. For us to improve the breadth, reliability and longevity of a comprehensive Antarctic Territory-wide observational system requires enhanced and timely access to the region. An intercontinental year-round air connection into Davis and enhanced land and air connections into more remote parts of the continent increases opportunities to deploy and maintain science underpinning ice and atmosphere monitoring equipment.

Another limitation is **lack of data from certain areas**, such as the Indian Ocean sector and restricted access to **species across their breeding season**. Year-round access would improve time series data and allow for sampling regimes to become more regular. Long-term projects that previously were not viable could also be conducted, with the ability to monitor data quality and accuracy throughout the year. Improved access would allow for seasonal transitions to be monitored, enabling new questions to be addressed and knowledge gaps filled.

Delays in transporting equipment between Australia and Antarctica would be overcome with a regular, heavy-lift capacity. This would provide scientists with more access to their equipment and the ability to do further research throughout the year. Access to the continent during winter or before the start of summer would enable teams to set up for their summer research, **maximising the light availability** that is another limitation of conducting research in Antarctica. Maximising research throughout the entire summer would enable project funding to be used more efficiently and more research to be conducted per expedition.

Calibration and repair of in-situ monitoring equipment throughout the inaccessible winter months presents a challenge. Year-round access would enable maintenance of equipment and improved collection of new samples. Similarly, the **lack of data throughout inaccessible months** would decrease with the ability for dedicated technical and research infrastructure support teams to access remote locations regularly. The lack of winter access has meant that if monitoring instruments fail during the off-season, they cannot always be repaired, potentially reducing data quality and accuracy. Year-round access would overcome this issue, contributing to more viable and complete data sets.

It would be easier to facilitate **medical attention** with year-round access. Conducting medical evacuations would be easier and possible more often throughout the year, making expeditions to Antarctica and research activities on the continent safer. Reducing this risk-factor may enable a wider range of scientists to visit Antarctica.

An overall challenge for Antarctic research is the **uncertainties, limitations, and lack of continuity of funding**, particularly for early-career researchers. Funding limitations restrict the number of scientists who can work on Antarctic research and the number of projects. All-year access would enable shorter trips, potentially requiring less funding and possibly make funding applications more enticing to a broader range of institutions and funding agencies. Shorter and more frequent expeditions could be more cost-effective, therefore spreading funding across more projects and supporting a larger variety of research.

SCIENCE OPPORTUNITIES

NEW AND ENHANCED RESEARCH

When identifying the high priority scientific questions for the next two decades and beyond, a cohort of the international Antarctic research community note that, '**future research in Antarctica will require expanded, year-round access to the continent and the Southern Ocean**.'[1]

Increased innovation

An aerodrome would support a range of **new research initiatives**. The opportunity to visit Antarctica during previously inaccessible months would allow scientists to test **more ambitious and novel hypotheses**. As a result of research questions not being constrained by seasons, broader thinking would be encouraged. The benefit of an increased scope for developing research questions and discoveries is well illustrated by the identification of depletion of the ozone layer, which was enabled only by long-term monitoring made possible by the British Antarctic Survey's routine observations at Halley Bay in Antarctica.

Increasing access for larger teams of researchers would promote international collaboration, to enable more **coordinated, large-scale projects** that link research disciplines and address multiple regions of Antarctica (for example, ice-sheet modelling, which requires global distributed research teams). There would be greater opportunities to incorporate multidisciplinary collaborations from the outset of projects and fieldwork, with team members travelling to Antarctica at different times, as occurs with the International Thwaites Glacier Collaboration run by the British and United States Antarctic programs.

Collaboration may spark **enhanced creativity**, resulting in more **innovative research**, as the knowledge pool of contributing researchers is greater. The increase in the variety of researchers and the size of research teams may subsequently result in enhanced research and problem-solving creativity, as collaboration can inspire more in-depth and critical examination of issues. Seasonal and multi-year studies that have not previously been possible may then further prompt new questions. Expanded access could enable research in previously inaccessible areas, which could lead to discoveries that significantly impact scientists' careers.

Sharing year-round access and improved infrastructure with international collaborators could also **reduce the environmental impact** of research, as different researchers could collect data samples and run projects simultaneously with greater station access. Creativity and innovation enabling sustainable living, energy and water would be necessary to develop solutions that mitigate the increased environmental footprint associated with increased Antarctic access.

Equality of access

More frequent flights would allow more scientists to access Antarctica, both from a capacity perspective (more beds available) and an equality perspective (shorter trips to accommodate; reducing the impact on other commitments). Regular opportunities to deploy and retrieve personnel between Australia and the deep field are likely to provide improvements in **efficiency of summer fieldwork** with an increased ability to target favourable weather windows.

Increased access to the continent is likely to be particularly useful for **early-career scientists**, who may have the opportunity to take part in projects that they wouldn't otherwise have been able to; this would help accelerate careers that potentially influence Antarctic science for years to come.

Research across seasons

Year-round access to Antarctica would **reduce seasonal biases** in data via collection and consideration of observations from all seasons, not just predominantly summer. It would also enable observations of the **transitions between seasons**. This is important for long-term atmospheric data (especially monitoring greenhouse gases and aerosols) biological data (such as monitoring moss growth phases, microbial activity, micro and macroalgae blooms) and ice/ocean data (such as ice shelf melt rates, seasonal patterns in ice acceleration/deceleration and thickening/thinning).

Increased access could enable improved data collection across **breeding and non-breeding cycles of Antarctic species**, particularly pre-breeding and wintering states that are rarely observed. Seabirds, including penguins, and seals breed and forage in the Vestfold Hills. Toothfish spend most of their lives under sea ice near the continent and are the basis for a valuable commercial fishery. Krill are a keystone species of the Antarctic ecosystem, but there is limited information about their behaviour and dynamics in the wild in winter. Targeted access to the region could facilitate research on these and other species across their life or breeding cycles.

Year-round operations would provide access to previously **inaccessible areas over winter**. This would provide new opportunities for projects that break new ground and make important new contributions to polar research. Access to winter measurements would enable an improved understanding of marine species' seasonal succession patterns. There would also be greater opportunity to instrument seabirds and seals with oceanographic sampling devices to capture winter oceanographic data. Plankton research could include examination of seasonal changes in abundance and biomass of coastal and oceanic zooplankton, and of overwintering behaviour in zooplankton, such as feeding and reproduction. Carbon flux and nutrient cycling understanding could be improved with seasonal data.

Wilkins Aerodrome, Australia's summer-only link between Hobart and Antarctica (Photo: Greg Greg Barras)

Improved biological understanding

It is difficult to make predictions given the rapidly changing state of Antarctica, but year-round access would paint a **more detailed picture of ecosystem dynamics**, which could contribute to new research questions in the future, and enhance current projects. Winter access has significant **benefits for biological studies**, particularly if the ice edge can be accessed. Learning about the roles of Antarctica's many endemic species of flora and fauna in the ecosystem as a whole can improve management strategies. Certain taxa, such as some moss species, can be used as biological indicators for measuring climate change. Access to **new and remote sites** would enable researchers to collect new data on more species and better understand ecosystem processes.

An **increased ability to survey species** that breed over winter would enhance vertebrate animal research. Increased access could also facilitate the **discovery of new species and habitats** in the nearshore environment during winter. Benefits for benthic research include monitoring through winter, including for invasive species and enhanced disease surveillance, and tracking growth rates and seasonal changes during ice retreat and change.

Having year-round access to Antarctica offers the opportunity to **collect higher resolution, more complete time series of ecological data**. We are in a period of unprecedented rapid ecological change; year-round access is likely to support more insightful research and precise modelling.

High resolution **marine surveys** might include regular marine and freshwater sampling of phyto- and zooplankton, alongside measurements of ocean temperature, salinity and pH throughout the transitions of the seasons. This would allow changes to be monitored, and an understanding of the movement of contaminants throughout the year to be developed.

Long-term monitoring would provide **more detailed baselines** of ocean microbial communities and benthic zones. Monitoring of marine resources across all seasons would allow greater insight into the **sustainability of fisheries** through collecting and modelling data on how microbes, krill and nutrients cycle throughout winter.

Improved data

Long-term monitoring would provide baselines for sea-ice melt and sea-level rise research, which is important considering Antarctica holds close to 60 metres of potential sea-level rise. Winter access provided by the aerodrome would provide the capacity to monitor processes of formation and decay of ice over the winter months. Winter records of snow and ice cores would contribute to improved climate models and understanding of atmospheric teleconnections.

Year-round access to the Antarctic continent would enable short-term, winter, or full-year deployments of specialised instruments or techniques to benefit multidisciplinary research into the atmosphere, ocean and cryosphere. Aircraft at Davis would enable the collection of **new observations** from low-level atmosphere clouds, which hasn't previously been possible beyond 65°S.

The development of infrastructure at Davis station associated with year-round access could provide new opportunities for a sophisticated data network with significant bandwidth and storage capability, increasing the scope and scale of data collection.

An expanded research program at Davis station would **improve satellite validation capabilities at high latitudes**. Validated satellite products, such as advanced and higher resolution images of the polar region, are important for scientific objectives on a regional scale, and could improve weather forecasts, climate projections, and understanding of the southern hemisphere's climate. Increased access to Antarctica would offer a viable location to test, fine-tune and **improve new Australian smart-sensing technology**.

Improving the global coordinate reference frame (the frame that dictates the accuracy of positioning objects on the Earth) will have potential benefits, including improved modelling of the impacts of climate change. Antarctica has little geodetic infrastructure, which is a gap in our observational and analysis capabilities. Geodetic infrastructure could be installed in Antarctica, including satellite laser ranging stations and very long baseline interferometry stations.

Satellite technology contributes greatly to **aircraft safety**. There would be potential to partner with other research agencies to develop more **accurate navigation systems** by installing and managing satellite laser stations. Satellite technology would also contribute to higher resolution geophysical surveys.

There would be **operational infrastructure opportunities** such as access to next generation autonomous underwater vehicles and gliders, extension of the animal tracking facility, and sampling of near-shore and coastal essential ocean variables, including microbes and larval fish. Increased access would afford many opportunities to make better use of existing technology, and support development and testing of new technologies and scientific equipment, such as autonomous vehicles, remote sensing tools, remote field camps, and campaign-type science projects.

There could be extensive oceanographic sampling throughout the shoulders of the summer season and during winter; for example, taking sea-ice measurements using **drones and helicopters**, sampling of polynyas and nearshore oceanography using **autonomous underwater vehicles, seal-borne conductivity-temperature-depth sensors and future technology**, and calibration of satellite-derived oceanographic data during winter around the sea-ice edge. There could also be biological studies including of carbon exchange during early ice break-up.

There is a need for more **access to deep-field sites** during summer. Increased access to such sites would allow collection of data from important locations such as West Iceshelf, Gaussberg, Mt Brown, Prince Charles Mountains and Amery. Having suitable aviation facilities near Davis would also provide **more efficient use of helicopters**.

Increased safety and efficiency

More time **in the deep field** could be enabled by increasing staffing to allow longer working hours when suitable weather arises, or providing more transport to field sites. Deep-field expeditions, such as traversing to the edge of the sea ice, would be supported by better transportation and larger teams, making such projects more feasible. These larger teams would be possible with regular flights to the continent.

Increased access would allow students and post doctorate researchers to visit and be **trained on-site** in polar field and research techniques. A science training course could be held in Antarctica for post-graduate students and early-career researchers, enabling them to become accredited Antarctic researchers. Such experience would be invaluable during early stages of scientific careers, with the potential to generate quality ongoing research.

Reliable, flexible and rapid access to the continent for people and equipment would enable scientists to respond quickly to natural and other events, and improve emergency response capability. There would be new opportunities for ambitious and logistically complex research projects that today are not possible. The proposed Davis aerodrome would enable more samples (particularly biological) to be freighted back to Australia, potentially expanding research conducted at both the AAD and universities. An **increased freighting capacity** would make transferring instruments and technical support from Australia to Antarctica possible during winter.

Winter access would support research on how **human physiological performance** and **vehicle operations and tracking performance** can be optimised under extreme winter conditions. This information could enable expeditions to be run more safely and efficiently for longer periods of the year.

Flexible access would enable **maintenance and calibration** of scientific instruments to occur as needed. This regular monitoring would also mean that more complex instrumentation could be used, and data accuracy improved. Long-term access would allow for research infrastructure to be monitored.

Construction of the aerodrome offers a unique opportunity to study **the impact of human activities** in Antarctica including **construction and settlement** on a largely untouched region.

Observations (such as soil characteristics, type and composition) could be taken year-round, and contribute to more comprehensive **glacial geomorphology** and **geological mapping**, and geotechnical studies, in the Vestfold Hills and throughout East Antarctica.

COLLABORATION

> In a collaborative paper identifying priority scientific questions over the timescale of the proposed aerodrome, the international Antarctic community says, '**a co-ordinated portfolio of cross-disciplinary science, based on new models of international collaboration, will be essential as no scientist, program or nation can realise these aspirations alone**.'[1]

More intracontinental flights to other stations would allow the **sharing of expensive scientific equipment and the sampling of multiple sites** within and between seasons to answer continent-scale ecological, atmospheric, geological and oceanographic questions. There would be the potential to collaborate with any long-term terrestrial or marine monitoring programs and increased **information exchange between researchers** locally would help to build collaborations of interdisciplinary science.

Increased access throughout the year would offer a unique opportunity for **greater international collaboration** among academics with varying project timeframes, as it would also enable researchers from other nations to fly in more frequently – both to undertake science at Davis and transit to their own research stations. Researchers could exchange ideas and offer strategic support, which contributes to developing creativity at the station. Collaboration between scientists in both the northern and southern hemispheres would be more likely, as there would be greater flexibility to allow researchers' schedules to coincide. The increased on-site time enabled by the aerodrome would support closer connections with other nations, such as China and Russia, which have research stations close to Davis.

Increased flights into Davis would invigorate the so-called 'East Antarctic Transport network', that sees **international collaboration and asset sharing** for expeditioner and equipment transport across the region. There is an opportunity to collaboratively design a fit-for-purpose observation system with our International East Antarctic neighbours. Australia can lead this effort in alignment with Australian strategic priorities.

Earth system modelling is interdisciplinary by nature and already an international effort. Australia again can show leadership in East Antarctica via the **design and maintenance of an enhanced Earth system science underpinning monitoring system**. CSIRO, Bureau of Meteorology and the AAD will be key collaborators in this proposed effort, further enhancing Hobart's status as a world class Antarctic city.

It is expected that **intracontinental flying would increase by 2040**. This, along with the capacity for the aerodrome to support intracontinental aircraft from other nations and projects not yet conceived, may need to be considered in the future planning of the aerodrome and station, so that collaboration and research are not constrained due to lack of envisaging future possibilities. Intracontinental connections would enable exploration of links between research fields previously temporally separated, allowing for more comprehensive studies of the Antarctic ecosystem.

The greater research capacity enabled by year-round access would allow Australia to take the **lead in managing and contributing to large international and interdisciplinary Antarctic research** programs.

Year-round and collaborative monitoring of the atmosphere is imperative for Antarctic research. With increased access, Australia would have a **greater opportunity to contribute to international atmospheric monitoring and research programs** (e.g. MOSAiC and SOCRATES), expeditions and trans-continental traverses, and validation of new satellite missions (e.g. upcoming European Space Agency EarthCARE mission) from Davis station. Ice-sheet models require international collaboration, because they need to consider melt factors on a global scale. With increased access to Antarctica, Australia could take a lead in developing ice-sheet modelling and this would put us in a position to regularly work with international teams.

Uploading new data to world data centres would lead to **increased quality of scientific data** becoming available, not only to scientists directly working in the Vestfold Hills, but across the globe. This would generate more interest in Antarctic data, increasing research and funding potential. High-precision data are necessary for developing modelling and international observation networks, such as the Antarctic Near-shore and Terrestrial Observation System (ANTOS). Year-round monitoring of equipment enabling higher quality data would promote international collaboration between countries contributing to these networks.

One of the benefits for research partners being able to access more infrastructure at Davis station is the ability to **further identify additional observational equipment** and opportunities required for future research.

Mt Brown South ice core camp (Photo: Peter (Bloo) Campbell)

IMPACT AND OUTCOMES

The impact these research activities would have on science, and on Australian and international planning, management and decision-making, would be far-reaching. They would increase our understanding of the Antarctic environment, and improve environmental management.

Leadership and decision-making

An increased capacity to visit Antarctica would mean that Australian engineering and technology in the polar expedition domain would develop, potentially opening up **international business opportunities**.

There would be opportunities for academic development, as Australian universities would be provided with state-of-the-art observations and data, which could **improve Australia's standing as a research nation** on a global stage. There also would be more **training opportunities for students**.

Regular, year-round opportunities to transport people and equipment would enable Australia to be the **provider of logistical and operational support** that makes new scientific research possible. The project would develop the capacity of Australian researchers to continue to be **leaders of international research collaborations and programs**. The ability to visit Antarctica for shorter times would provide the opportunity to develop more collaborative and coordinated research projects both on a national and international scale, as scientists from across the globe would have more opportunities to fit Antarctic expeditions into their schedules. As a result, there would be more holistic and interdisciplinary projects.

Collaboration could potentially **reduce the environmental impact of research** by coordinated sample collection and data sharing.

Year round observations may enable **new discoveries that significantly change policy- and decision-making**, just as long-term monitoring has informed international policies and decisions relating to stratospheric ozone depletion. Increasing baseline data would identify knowledge gaps, and lead to better and more accurate models that can more effectively inform future decision making. The ability to conduct long-term monitoring would enable the development of comprehensive data sets, important for informing policies and actions. **Evidence-based decisions** underpinned by science, data and observations have more credibility.

Climate and weather knowledge

There are many parts of the East Antarctic Earth system that remain unchartered. This dearth in observations comes with a cost to the believability of our science. Improved understanding of ice sheet, weather, climate and ecosystems processes and trends would improve confidence in our predictive skill.

There is an opportunity to undertake more comprehensive long-term atmospheric monitoring, boundary layer, cloud aerosol and oceanographic studies which would inform climate change science and improve weather forecasting. Increased spatial and temporal data resolution, and improved understanding of global atmospheric teleconnections, would reduce future climate change projection uncertainties. This would enable more informed decisions and advice informing **policies relating to greenhouse gases, carbon sequestration in the Southern Ocean, aerosol pollutants, ocean management, ocean health and use of resources, and planning for a warmer climate**. These would contribute to Australia's obligations and commitments to sustainable development and climate change mitigation.

Increased Antarctic atmospheric data would improve forecasts and models, including through the Australian Community Climate and Earth System Simulator (ACCESS). Improved forecasts and projections across the Southern Ocean, and for Antarctic weather systems in general, could provide **insight into Australian weather patterns**. This would enable governments to make more informed decisions about environmental, human and infrastructure impacts.

At year to century timescales, better climate modelling will have **wide ranging socio-economic benefits** via more targeted and appropriate policy for disaster mitigation and climate change adaptation.

At seasonal timescales, better representation of the atmospheric polar vortex, for example, will result in **improvements to seasonal outlooks** for the Australian mainland, thereby enhancing our preparedness for drought, flood, heatwaves and bushfire. There would also be better information about likely weather and ice conditions, which would help Antarctic seasonal planning.

At sub-seasonal timescales, an enhanced monitoring network will **support real time decision making** and enhance numerical weather prediction skill for trip planning (boating, aviation, station activities and remote field traverses). For example, during the 2018-19 summer, the World Meteorological Organization led an intensive observational campaign over Antarctica. Researchers demonstrated that enhanced observations over the icy continent improved forecasts of intensity and location of Australian East coast lows. Such systems are responsible for billions of dollars of damages and threats to Australian lives and livelihoods along the eastern Australian seaboard.

Accurate weather forecasts are essential for **safe operations in Antarctica**, particularly for aviation. More accurate forecasts would make Antarctic expeditions safer. Safer and more regular aircraft travel would increase the number of researchers visiting, and potentially increase the diversity of research activities.

In addition to the direct inputs into weather and climate monitoring and modelling, an improved in-situ observational network would support the **calibration and validation of satellite remote sensing** platforms that are inadequately calibrated for many Antarctic applications (e.g. sea-ice thickness, infrared atmospheric sounders).

Increased **satellite data** collection would improve the way in which Antarctic boundary layer parameters are represented in models. More in-situ measurements, currently biased towards the northern-hemisphere mid-latitude zones, would improve validation of satellite data. In-situ measurements in Antarctica also would contribute to a **better understanding of the southern hemisphere's climate**, and contribute to higher resolution models for weather forecasts and climate projections.

Improved access to deep-field sites would facilitate more effective and targeted deployments of GPS-loggers, seismometers, and other geophysical instruments, and enable geological sampling and mapping. Data that span across all seasons are needed for better ice-sheet modelling (formation and decay), improved ecosystem models, more accurate modelling of global climate, surface mass balance, ocean melt rates and **understanding the Antarctic contribution to global sea level**.

More flights would make it easier to maintain a remote surface automatic weather station network. Baseline data would be especially important for insights into precipitation, aerosols, the atmospheric boundary layer, and short- and long-wave radiation. Microclimate data from automatic weather station arrays in the Vestfold Hills and surrounds would help reveal **changes to ice-free areas under climate change**.

Increased intracontinental flying from Davis will demand an enhanced remote surface automatic weather station network. This would support decision making and improve weather predictions for flight planning. Such a monitoring system would also support climate monitoring and modelling at global climate timescales.

Monitoring species and fisheries

Year-round access to Antarctica would enable establishment of **self-monitoring, analysis and reporting technology (SMART) monitoring**. When linked with biological and physical systems, this monitoring can use species (such as moss) as **biological indicators** and contribute to understanding the impacts of climate change.

More accurate and higher resolution datasets, and enhanced ecological models, plankton forecasts, and disease models, would **improve knowledge of species movements, including invasive species**. Year-round access would provide important data for international collaborations on species health and movements, population status and policy. It would also enable identification of threats to species survival, and improved plankton comparative analyses. There would be increased information for policy makers and the International Association of Antarctica Tour Operators (IAATO) regarding human impacts via invasive species. Improved population dynamics observations could provide more insight into protecting Antarctic species during **future infrastructure development**.

Finer temporal resolution in biological data enabled by year-round monitoring would contribute to understanding population dynamics, providing improved knowledge of how to **manage fisheries populations sustainably**, notably krill populations.

Increased access would allow more data, from different regions, to be collected, leading to better understanding of Antarctic-related chemical processes (both contaminated and natural). This would enable more efficient and effective **clean up strategies** to be established.

Lidar beam at Davis research station (Photo: Simon Alexander)

INFRASTRUCTURE, EQUIPMENT AND OTHER REQUIREMENTS

> A COMNAP report in 2016 outlined the multiple benefits of expanded, year-round access to the continent. It notes that, '**expanded continent and ocean wide access year-round is essential, including to areas of high scientific interest, and 'super sites' should be established for collaborative, interdisciplinary research**.'[2]

Transport, including **helicopters and light fixed-wing aircraft**, ice-traversing vehicles and boats, would be required to make full use of the Davis upgrades, support intracontinental research, and to access field sites.

To enable full use of such an aerodrome and cater for the increased number of scientists visiting, there would need to be an **increased number of beds available**.

The many biological samples collected would need to be transported back to Australia to be studied, so increased **cargo capacity** adequate for larger sample sizes would be necessary.

The increase in sampling is likely to require **more storage capacity** (e.g. labs, freezers and fridges), consumables (including a dedicated consumable and chemical supply store), and **larger wet laboratories and laboratory access** to process samples and run experiments.

Laboratory facilities could include traditional microbiology (culture organisms); DNA extractions (reducing the need to transport live organisms); and sequencing facilities (PCR, MinION, MiSeq). Laboratories would need **upgraded instruments** such as autoclaves, flow cytometer, qPCR machines, fluorescence microscopes and spectrophotometers.

Ice sheet research requires accommodation for staff on station, equipment storage facilities, technical staff, and sufficient support staff to allow flexible deep-field operations (including communications, meteorology, aviation, and logistics).

Benthic research would need laboratories with aquarium facilities, remotely operated vehicles, and smaller vessels for deploying equipment.

Plankton research requires laboratories (including bench space, consumables and storage), freezer storage support for creating a closed system to conduct experiments measuring future climate conditions (e.g. pH and temperature), including microcosms, and plankton sampling nets for offshore sampling.

Atmospheric research would need a laboratory located upwind of pollution sources such as the airstrip or the station itself. It would be necessary to construct infrastructure to support high-quality monitoring, such as a temperature-controlled shelter with a 10-metre inlet. Monitoring downwind of the aerodrome should commence before construction begins (preferably at least 12 months before). Automated weather stations and remote sensing over a great area would be beneficial.

Equipment necessary to support increased data collection at Davis and surrounds would include **ice coring** and **atmospheric monitoring devices, water collectors, nets**, and a conductivity, temperature, and depth (CTD) rosette. Deep water moors (like those run by the Integrated Marine Observing System) track currents and chemical cycling and could be installed around the Davis station. This would allow for in situ monitoring and, with more frequent access, could be regularly maintained.

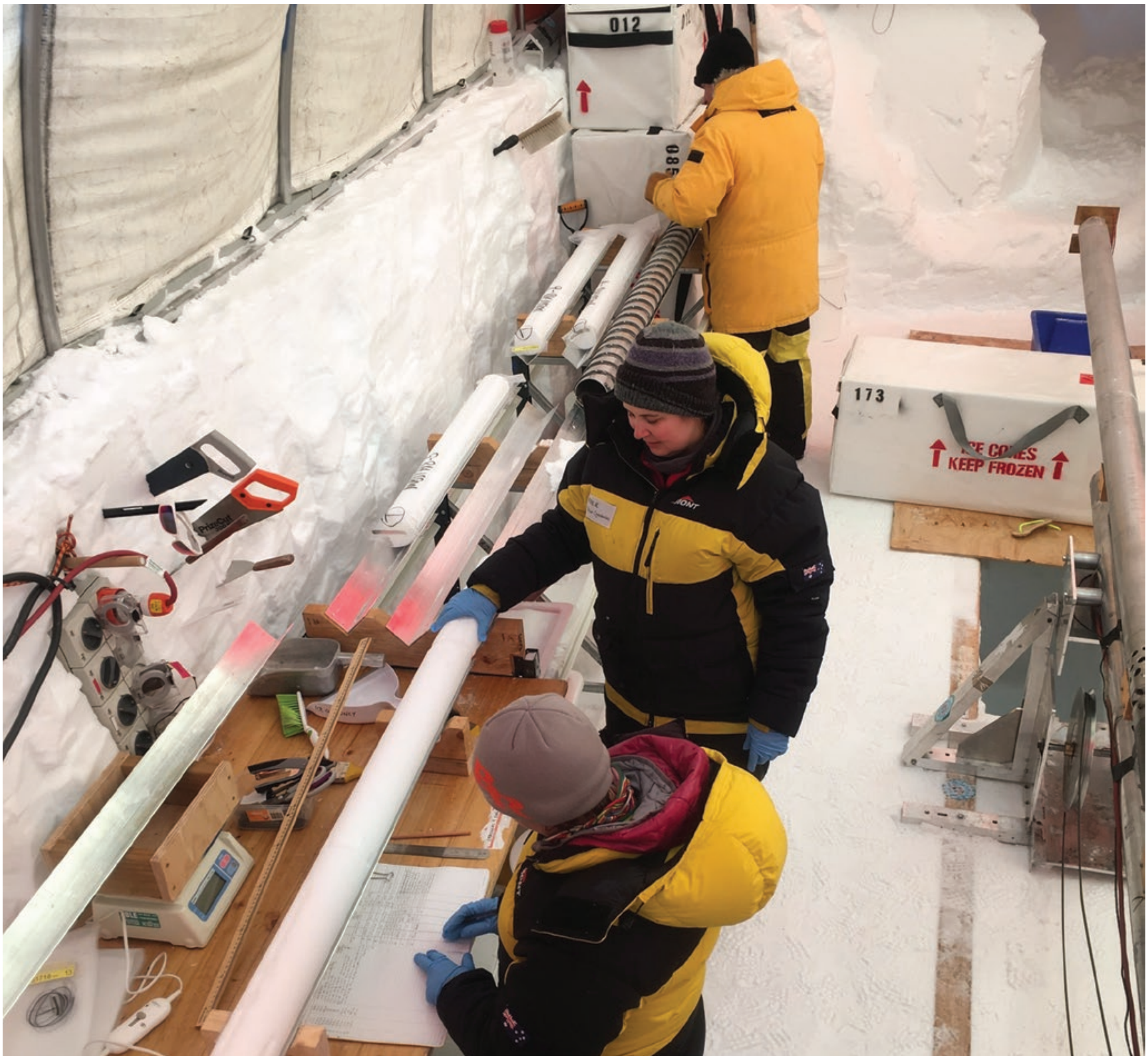
In addition to sustained remote in-situ instruments, transport vehicles could be fitted with observational equipment to augment the coverage of the network. For example, inter- and intra-continental aircraft could be fitted with a suite of meteorological instruments suitable for atmospheric, boundary layer and cloud/aerosol studies, including aviation meteorological data and relay (AMDAR) system at a minimum. Ground station relays are required to allow timely relay of data into the World Meteorological Organization's global telecommunication system. Cameras and sophisticated instrumentation and probes for turbulence and a cloud, aerosol, precipitation spectrometer (CAPS) such as those fitted on British Antarctic Survey aircraft should also be considered. Downward scanning lidars should be fitted to remote traverse vehicles to improve crevasse detection and mapping.

Technological improvements would need to be made to maintain data accuracy, including using **advanced radar, remote sensing** and more **complex, permanent, *in-situ*** monitoring equipment.

New geodetic infrastructure would need continuous power and communications and, while they could be run remotely, maintenance and servicing would be required.

Computing resources and high-speed internet access would be required for communication and data analysis. An upgrade in communication technology would also be needed to ensure that scientists going to **deep-field locations are safe and supported**.

The Australian Antarctic Data Centre would need to increase its **capacity to store new data**. It would also need to put systems in place to distribute these data to the wider scientific community. High-performance computing in Australia would be required to manage data.



Field camp, Mount Brown South (Photo: Sharon Labudda)

Technical support would be required throughout the year to provide repairs and upgrades for new technology and in-field monitoring instruments, as well as transport equipment and machinery. To accompany the use of more technology (such as ice drilling and more complex monitoring instruments) and the increased number of participants, field training for Antarctic sampling (both remote and on site) would need to increase. More extensive training of scientific staff could reduce the ratio of scientific staff to support staff on stations.

In order to support the scientific community while the aerodrome is being developed, it would be beneficial to **share previously recorded regional baseline data** (e.g. biological and geological) surrounding the Vestfold Hills. This would complement existing data by putting localised studies into a more regional context.

Increased research funding dedicated to observation collection and to model development would be necessary to ensure that the most information is gleaned from any new data. A Special Research Initiative bid may be an appropriate mechanism to facilitate this.

There are opportunities to use **new infrastructure** to support the Scientific Committee on Antarctic Research (SCAR) Fellowship Program, which helps build capacity for Australia, early-career researchers, and their home nations.

APPENDIX A: PARTICIPATING ORGANISATIONS

AECOM	RMIT University
Australian Antarctic Division	SERCO Asia Pacific
Australian Antarctic Program Partnership	Sydney Institute of Marine Science
Bureau of Meteorology	University of Adelaide
CSIRO	University of Melbourne
Department of Industry, Science, Energy and Resources	University of New South Wales
Federation University	University of Queensland
Geoscience Australia	University of the Sunshine Coast
Institute for Marine and Antarctic Studies	University of Tasmania
Integrated Marine Observing System	University of Technology Sydney
Monash University	University of Wollongong

Adélie penguins (Photo: Justin Chambers)

[1] Kennicutt, M.C., Chown, S.L., Cassano, J.J., Liggett, D., Peck, L.S., Massom, R., Rintoul, S.R., Storey, J., Vaughan, D.G., Wilson, T.J. and Allison, I., 2015. A roadmap for Antarctic and Southern Ocean science for the next two decades and beyond. Antarctic Science, 27(1), pp.3-18. https://www.cambridge.org/core/journals/antarctic-science/article/roadmap-for-antarctic-and-southern-ocean-science-for-the-next-two-decades-and-beyond/0AC6CADDCCD84DD4394015D13DB8F576

[2] Kennicutt, M.C., Kim, Y. and Rogan-Finnemore, M., 2016. Antarctic roadmap challenges. Council of Managers of National Antarctic Programs. https://www.comnap.aq/wp-content/uploads/2019/12/Antarctic_Roadmap_Challenges_Book_2016.pdf

APPENDIX B: BACKGROUND PRESENTATION

Australian Antarctic Strategy and 20 Year Action Plan

In 2016, the Government released the Australian Antarctic Strategy and 20 Year Action Plan. This committed to a range of activities that support Australia's national Antarctic interests and enhance Australia's Antarctic science capability.

A key component of the plan is the delivery of Australia's state of the art icebreaker, RSV *Nuyina*. The ship will be the main lifeline to Australia's three Antarctic research stations and sub-Antarctic station on Macquarie Island and also offer scientists unprecedented and extended access to the Southern Ocean and Antarctica.

The action plan committed to the delivery of a modern, deep-field traverse capability that will offer scientists the opportunity to access the entire Australian Antarctic Territory. The Government also committed to scope options for a year-round aviation capability between Hobart and Antarctica.

Aviation is a key component of operations on Antarctica. Australia's aviation system consists of a summer-only link from Hobart to the Wilkins Aerodrome ice runway, approximately 70 kilometres inland of Casey research station. Flights to the ice runway take place when ice temperatures are below the threshold temperature of minus 5 degrees Celsius. Because of this, Wilkins usually closes for four to six weeks at the height of summer. In the 2019-20 season, warmer temperatures meant it closed a week earlier than normal and remained shut for 10 weeks with significant flow on effects for expeditioners travelling to and from the continent.

Intracontinental flights to other stations and field sites also form part of Australia's Antarctic aviation network, with fixed wing aircraft landing on specially prepared ski ways.

Year-round access to Antarctica

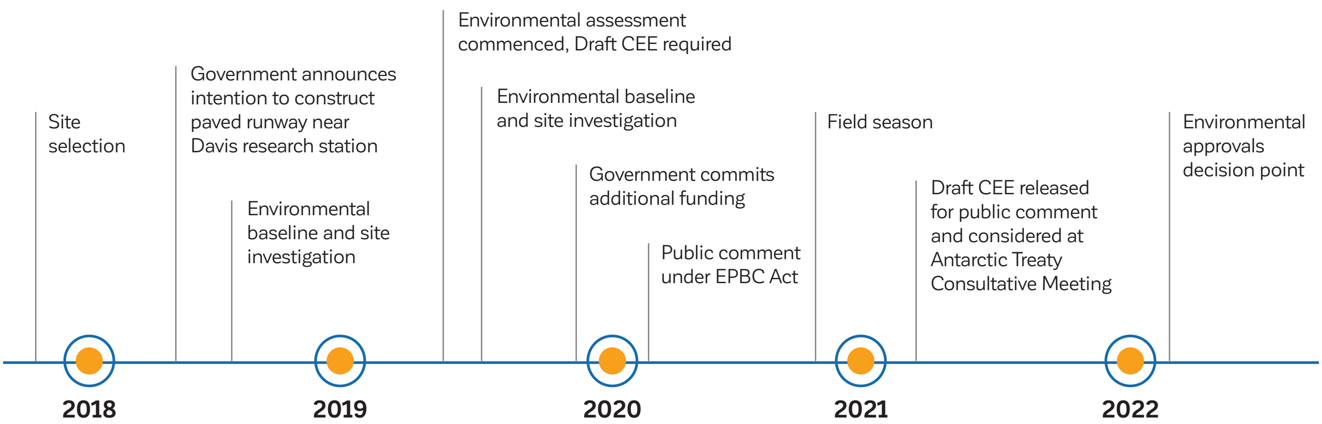
Year-round access to Antarctica is important. Australia claims 42 per cent of the continent and has rights to 2.9 million square kilometres of the Southern Ocean. We are an active and well-respected member of the Antarctic Treaty System, and we are committed to ensuring its continued effectiveness and promoting the principles of the Treaty. The operation of a year-round aerodrome at Davis research station would contribute to both our presence and influence.

The AAD is building a sophisticated Antarctic program. We're modernising our shipping capability and station infrastructure. We've partnered with the Royal Australian Air Force to develop heavy-lift cargo capabilities, including air drops, and we're building a traverse capability.

The proposed aerodrome would provide a rapid and reliable means of accessing the continent. It would enhance Australia's emergency response capability for both the continent and surrounding ocean, and it would also improve resupply logistics, and our ability to transport people and cargo to and from Antarctica at any time of the year.

The capability would further enhance Hobart's status as a premier global Antarctic Gateway. Flights to Davis aerodrome would be on Australian operated planes, departing from Hobart, which would provide an economic boost to Tasmania.

Importantly, year-round access offers benefits for science. The proposed Davis Aerodrome would deliver an aviation capability that would regularly and efficiently transport scientists and research equipment to Antarctica. It would offer new opportunities to monitor and understand changes, and improve the accuracy of forecast models, sea-level rise predictions and climate



Project timeline

change impacts – to name a few. Access to the continent across all seasons would also allow scientists to directly investigate processes through the full cycle of changes including during the cold and dark winter months.

In 2016, the Government committed to scoping options for year-round aviation access to Antarctica. After three field seasons of geotechnical and environmental investigations, the AAD identified a suitable site for a paved runway near Davis research station.

In May 2018, the Australian Government announced its intention to construct a paved runway near Davis research station, subject to environmental and other Government approvals. In December 2019, the Australian Government committed additional funding to advance the design and environmental assessments required for the Davis Aerodrome Project.

The Project is now focused on delivering the environmental assessments, and refining the design of the aerodrome and associated infrastructure and preparing a final business case for Government to consider.

Environmental approvals

The Davis Aerodrome Project is subject to two key pieces of environmental legislation.

The *Antarctic Treaty (Environment Protection) Act (1980)* (ATEP Act) implements the Protocol on Environmental Protection to the Antarctic Treaty which provides for comprehensive protection of the Antarctic environment and dependent and associated ecosystems. AAD is preparing Australia's first ever Comprehensive Environmental Evaluation for assessment under the ATEP Act.

The *Environment Protection and Biodiversity Conservation Act (1999)* (EPBC Act) provides a legal framework for activities that have significant impact on the environment and any carried out by a Commonwealth agency.

The Project's EPBC Act Referral was made available for public comment in early 2020. In March 2020, the EPBC Regulator decided the proposal is a 'controlled action', which means it requires further assessment and approvals before it can proceed.

Modernisation of Davis research station

In April 2019, the Government announced it will invest more than $450 million over the next 10 years to upgrade Australia's Antarctic research stations and supporting infrastructure. We have now commenced a master planning process for Davis research station.

The master plan for Davis research station will help ensure that the station redevelopment supports future activities of the Australian Antarctic Program (AAP). The conversations we have here today will feed into this process and help the team make informed decisions.

The modernisation of Davis research station will occur regardless of whether the aerodrome is approved or not, and a similar master planning approach will be adopted for Casey and Mawson research stations in the future. If the Davis aerodrome is approved to go ahead, the path to a modern station is longer – as we'll need to first build a station that can support the workforce required for the construction of the aerodrome.

The Davis aerodrome

The ridge site in the Vestfold Hills was selected as the preferred option in 2018. It offers more favourable topographical, environmental and geological conditions and we were able to design the alignment of the runway to suit the prevailing winds and topography of the site. The location and alignment also allows us to minimise disturbance to wildlife populations in the region.

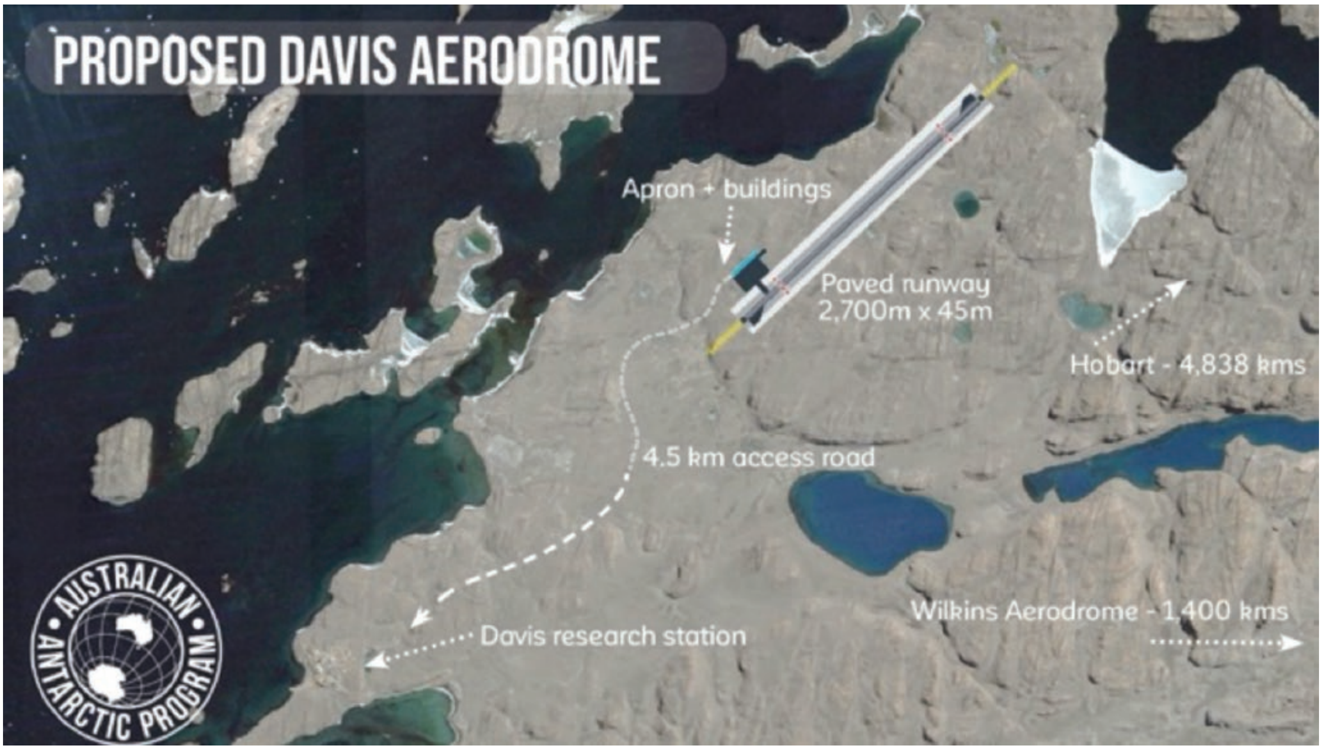
The runway would be constructed from pre-cast concrete panels manufactured in Australia and shipped to Antarctica, where they would be assembled on site. These would measure approximately 5 m by 3 m and 220 mm thick. Each paver would weigh up to 10 tonne, and 11,500 pavers would be required for construction of the runway, taxiway and apron.

A 4.5 km two-lane unsealed access road would provide access from Davis research station to the Davis aerodrome during construction and throughout the operational life of the aerodrome.

It is anticipated the aerodrome would be operational around 2040.

To meet the forecast demand for expedition transport, between October and May there would be three intercontinental flights per month to Davis, carrying 30 to 50 expeditioners and up to 80 expeditioners on early season flights. We envisage monthly flights in winter and up to 10 C-17A flights undertaken by the Royal Australian Air Force.

There would be approximately 150 beds available at Davis.



The site of the proposed aerodrome

Science and future opportunities

The priorities for science are set out by the government in strategic documents:

- Australian Antarctic Strategy and 20 Year Action Plan
- Australian Antarctic Science Strategic Plan

A wide range of scientific activities are undertaken across the physical, natural and social sciences. Outputs have informed our understanding of the Antarctic environment, its importance in the global system, and the threats that Antarctica faces.

Australian Antarctic Science Program research has been integral in informing and improving international policy- and decision-making in the Antarctic Treaty System.

Science has been undertaken in the Vestfold Hills for many years. Investigations to support contemporary year-round access began in 2012-13 and continued through several field seasons, including major work from 2017 to now. The primary objectives of these investigations were to inform both the feasibility of building an aerodrome in the Vestfold Hills and a comprehensive and detailed environmental assessment process.

As the site of the intended runway is now known, recent research has been more targeted. This research has included a focus on lake ecology, the marine benthic environment (including commissioning a new remotely operated underwater vehicle), broadscale vegetation surveys, seal and seabird surveys, invertebrate studies and soil microbiology.

Should the aerodrome project proceed, there would be a planning and construction phase that would include science to informing baselines, develop monitoring programs, and support research to clarify potential impacts.

A paved runway at Davis research station would increase the flexibility for deployment of scientific and support personnel and equipment and extend the operating season, enabling research to occur in winter and shoulder seasons, and allow more flexible field deployments. The AAP would be able to pre-position science support staff, technical experts, and logisticians to undertake preparation of technical equipment and logistics prior to scientists arriving. The aerodrome would increase collaborative opportunities and engender an extensive range of research opportunities.

Australian Government
Department of Agriculture, Water and the Environment
Australian Antarctic Division

AUSTRALIAN ANTARCTIC PROGRAM

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science, in other words

For more information about the proposed Davis aerodrome, email **DavisAerodromeProject@awe.gov.au** or visit **www.antarctica.gov.au**