

FUTURE SCIENCE OPPORTUNITIES

FROM A YEAR-ROUND, INTERCONTINENTAL AIR LINK TO A MODERNISED DAVIS RESEARCH STATION

Benefits for Australia's leadership, operations and research capability

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

The Australian Government is committed to delivering a modern Antarctic program that enables us to continue to lead a world-class science program and maintains our position as a leading Antarctic nation well into the future. In 2018, the Government announced its intention to construct an aerodrome near Davis research station, subject to environmental approvals.

The proposed Davis aerodrome will support year-round access and represents a major capability enhancement for the Australian Antarctic Program. If approved to proceed, it will create new opportunities for ambitious and logistically complex research projects.

The Council of Managers of National Antarctic Programs (COMNAP) Antarctic Roadmap Challenges report in 2016 described the many 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 scientists to answer critical questions of global significance for the generations to come.

Kim Ellis, Australian Antarctic Division Director



Photo: Nathan Bourke

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



Australian Government

Department of Agriculture, Water and the Environment
Australian Antarctic Division



AUSTRALIAN
ANTARCTIC
PROGRAM

DAVIS AERODROME PROJECT BACKGROUND



Davis research station

Antarctica is a critical element of our Earth system, yet it remains the least understood. Changes to the icy continent and Southern Ocean will have profound impacts on Australia and the rest of the world.

An aerodrome at Davis research station is being considered to enhance 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. It would provide year-round access from Hobart, Tasmania, and increase 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.

Researchers with an interest in Antarctic science have identified the science opportunities that could be enabled by improved access via a year-round intercontinental air link and a modernised Davis research station. Their contributions, summarised in this brochure, will contribute to planning for both the station modernisation and the Davis Aerodrome Project.

CHALLENGES OF WORKING IN ANTARCTICA



Law Dome field camp (Photo: Tony Fleming)

Year-round access would potentially alleviate many of the challenges researchers face working in Antarctica.

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 travelling south. Increased reliability and flexibility would make access to Antarctica more equitable and would provide increased access for scientists early in their research careers. A wider range of research projects would be possible in Antarctica if there were easier and more frequent access.

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 monitoring equipment in the field throughout the inaccessible winter months are a challenge. The lack of winter access means that if monitoring instruments break during the off-season, they cannot always be repaired, potentially affecting data quality and accuracy and precluding some equipment from being deployed at all.

In Antarctica there are many components of the Earth system that are too scarcely or inaccurately observed to adequately support research and understand trends. These deficiencies mean greater societal, economic and environmental risks.

NEW AND ENHANCED RESEARCH

Innovation across seasons

An aerodrome would increase innovation by supporting research 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 prompt important new research questions. The proposed increased aviation capability within the continent using fixed wing planes and helicopters 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 use seabirds and seals with oceanographic sampling devices to capture winter oceanographic data.

Improved biological understanding

Winter access has significant benefits for biological studies, as learning about the roles of Antarctica's many endemic plants and animals can improve their management and conservation. Access to new and remote sites would enable researchers to collect data on more species and better understand their habitats. This increased ability to survey flora and fauna could help discover new species, and better understand the ways organisms have adapted to Antarctic conditions.

Higher resolution, more complete time series of ecological data would support insightful research and predictions of the outcomes of the unprecedented rapid ecological change that we are experiencing. This enhanced data would also provide insights into how we can ensure Antarctic ecosystems can be most effectively protected and conserved. Monitoring of marine resources across all seasons would help ensure the long-term ecological sustainability of fisheries and of other human activities.



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



Tiburon Junior drones deployed to Wilkins Aerodrome in 2016 as part of an international scientific collaboration (Photo: Jamin Greenbaum)

Increased safety and efficiency

The proposed aerodrome would provide opportunities to better use existing technology, and support the development and testing of new Australian smart-sensing technology and scientific equipment, such as autonomous vehicles, remote sensing tools, remote field camps, and campaign-type science projects.

Drones and autonomous underwater vehicles (AUVs) can be large and require dedicated teams to operate. Year-round access provides the possibility of using long-range autonomous drone and AUV technology (ideally in tandem) that are equipped with sophisticated sensors to conduct short, targeted campaigns.

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

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.

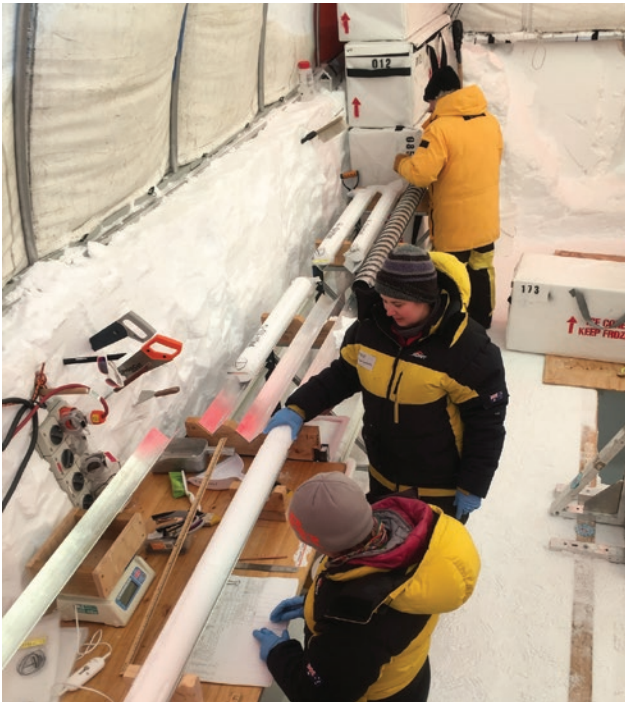
Collaboration opportunities

Increased access throughout the year would offer greater opportunities for international collaboration, as researchers from other nations could take advantage of more frequent flights from Australia – 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 increase the availability and quality of scientific data for scientists across the globe.

IMPACT OF NEW RESEARCH



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

Leadership and decision-making

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

An increased capacity to visit Antarctica would mean that Australian engineering and technology could advance, potentially creating 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 research possible.



MORE INFORMATION | This brochure summarises *Davis Aerodrome Project: Future Science Opportunities*, a 2020 report on webinar workshops with the Antarctic science community, organised by the Australian Antarctic Division in collaboration with Scientell.

Ecosystems and human impacts

Seabirds, including penguins, and seals breed and forage in the Vestfold Hills, the coastal ice-free area of East Antarctica where Davis research station is situated. Toothfish spend most of their lives under sea ice near the continent and are the basis for a valuable fishery. Krill are a keystone species of the Antarctic ecosystem, but there is limited information about them in the wild in winter.

More accurate and higher resolution datasets, and enhanced year-round ecological understanding, plankton forecasts, and disease models would improve knowledge of species movements, including invasive species, and enable identification of threats. There would be increased information to manage human impacts and invasive species. Improved biological data enabled by year-round monitoring would contribute to the sustainable management of fisheries.

Increased access would allow more data, from different regions, to be collected, leading to better understanding of Antarctic-related chemical processes, enabling more efficient and effective clean up of contaminants.

Climate and weather knowledge

Antarctica is the world's driest, coldest and windiest continent. It holds close to 60 metres of potential sea-level rise. The surrounding Southern Ocean is responsible for around 40 per cent of the total global ocean uptake of carbon dioxide emissions.

Improved understanding of ice sheet, weather, climate and environmental processes and trends would improve climate and weather modelling. This knowledge would enable more informed decisions and advice about 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.

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