ANNUAL REPORT

2023 / 2024

SMARTSAT
COOPERATIVE RESEARCH CENTRE

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EXECUTIVE SUMMARY

This year SmartSat celebrates its fifth year of achievements thanks to the support of our partners and the Cooperative Research Program; In this Annual Report we take the opportunity to look back on our achievements during the 2023/2024 operational year.

This financial year started with a bang, with the launch of SCARLET-α, a $7 million project to develop new autonomous spacecraft using artificial intelligence. This project, a collaboration between SmartSat and eight of our key partners with support from the Federal Government's CRC Program, was the flagship of a suite or projects under the SCARLET Laboratory, which we also officially launched this year.

We continued to strengthen our collaborative relationships with international partners, starting with an agreement with European Space Agency's Φ-lab to collaborate on Earth Observation research, enabling us to further showcase our nation's expertise on a global scale. The agreement opened the door for us to fund two of our PhD candidates, Nermine Hendy and Brandon Victor, to complete a three-month internship at Φ-lab. On the other side of the world, PhD candidates Emily Ahern and Anne Bettens were working under the mentorship of the team at NASA's Jet Propulsion Laboratory. Our PhD students represent the next generation of Australian space scientists and engineers, and by offering them opportunities such as these to launch their space careers, SmartSat is preparing the next generation to transform Australia into a high-tech space nation.

We started the calendar year off strong with the signing of a Memorandum of Understanding with the New Zealand Space Agency to accelerate the growth of Australian and New Zealand space industries. This agreement has since resulted in joint-funding for four space research projects, as well as an open call for feasibility studies with up to AUD $100,000 available for Australia-based research activities, or up to NZD $100,000 for New Zealand-based research activities.

Back home, we were proud to support the Australian Capital Territory's new space strategy through a suite of R&D projects and university appointments, bringing our total investment in the state to over $7 million. We also increased our support in New South Wales through the NSW Space+ Program, offering grants up to $500,000 to local businesses looking to commercialise their innovative capabilities. This funding call followed SmartSat backing the $2.3 million In-Orbit Servicing, Assembly and Manufacturing (ISAM) project, led by University of Sydney and supported by NSW-based industry partners Abyss Solutions, ANT61, Space Machines Company, Sperospace and Spiral Blue.

SmartSat's second Defence & National Security Showcase was held in Canberra in August, welcoming key stakeholders from defence, the broader national security community and industry to receive an update on our relevant research projects and strategic direction. The event included a research project highlight session, followed by a showcase event that provided a more strategic view of Defence interests in space technology and innovation and how SmartSat supports the national enterprise.

We were grateful to be able to bring our broader community together once again for the SmartSat CRC Annual Conference 2023, hosted at the magnificent Australian National Wine Centre. This year's theme was 'Delivering Value for our partners and impact for our nation' and through the more than 50 presentations delivered by our researchers, industry partners and PhD students, SmartSat demonstrated that it is well and truly delivering on this theme. I was very proud to witness some amazing technologies showcased by our industry and research providers and was truly inspired by our doctoral student presentations, which were a testament to the hard work and passion that drives this sector.

This year we saw Kanyini take its final steps towards launch, with the satellite passing its final regime of testing before being packaged up for delivery to the Launch Service Provider. Although the launch of Kanyini took place after the end of this reporting year, I am delighted to report that it was successfully launched onboard the Space X Transporter 11 from the Vandenburg Air Force Base in California, US. It is now being commissioned and all systems are thus far working outstandingly well. A program of research projects has been initiated aimed at developing applications for a number of South Australian Government departments.

This year also saw some significant changes to the SmartSat team. In April, we farewelled our Principal Earth Observation Scientist, Dr Jasmine Muir, who has since taken on a new role at Landgate as the Spatial Architect in the Western Australian Digital Twin project. Jasmine made a great contribution to SmartSat during her time here, not only as an expert in Earth Observation but also as a valuable team member. We also welcomed on board out new Commercial Director, Cameron Stephenson. Responsible for SmartSat's finance and business development activities, Cameron is an internationally experienced finance and commercial executive, having held senior roles across Asia, Europe and Australia in the IT sector.

Finally, we welcomed our new Strategic Advisor, Lieutenant General (USAF Ret'd) Larry James to the team. Larry will also be employed by Monash University as a Distinguished Professor of Space Research and Innovation. This appointment will build on our existing relationships with our counterparts in the US, providing strong opportunities in the US for SmartSat and the broader Australian Space ecosystem.

Through our partners, SmartSat continues to contribute to the growth of the space industry, and we will continue to seek opportunities for collaboration with our key stakeholders, including Defence, the Australian Space Agency, the CSIRO and Geoscience Australia as well as many other key contributors to other sectors of the economy, such as the research and development corporations. Our focus remains on delivering impact and value for our partners and stakeholders, and we are grateful to our partners for your support as we continue to deliver value to our nation through our great R&D projects and technology maturation initiatives.

Professor Andy Koronios
SmartSat CEO & Managing Director

CHAIR'S FOREWORD

What a productive and successful year we have had at SmartSat as we continue to work together to build and strengthen the Australian space ecosystem.

Following the devastating loss of Dr Peter Woodgate at the end of 2022, we were honoured to ensure the continuation of his legacy by introducing the Dr Peter Woodgate Scholarships for Earth Observation, in collaboration with the Andy Thomas Space Foundation. In December, we were incredibly pleased to award two scholarships under the initiative. Donna Fitzgerald from the University of South Australia, and Oliver Hatswell from Flinders University, each received scholarships for their respective research projects into Earth Observation technology.

This year we have been focusing on identifying project outputs with high potential for commercialisation. To this end, we have established a commercialisation group of experts to assist us in this very important activity. Future plans will focus efforts on identifying the steps necessary to make SmartSat intellectual property (IP) more investible.

We have also been concentrating our involvement on water quality R&D projects that support the Maya Nula Agricultural Intelligence Research Program.

We are establishing a number of strong relationships and these promise to yield more co-funded research project opportunities. These include relationships and partnerships with Grains Research and Development Corporation, Elders, the South Australian Government (Department of Primary Industries and Regions South Australia, the Department of Environment and Water, SA Water), Ag Innovation Australia, Food & Wood Products Australia, Wine Australia and Charles Sturt University (Gulbali Agri Park).

In March, the Board approved the new Diversity, Equity and Inclusion (DEI) Action Plan. SmartSat is, as always, committed to DEI not just within the immediate organisation, but within our broader ecosystem. This year saw the first DEI Survey distributed to SmartSat staff, facilitated through newly acquired employee engagement tool, Culture Amp. We saw an encouraging 79% participation rate from the team. The survey revealed that SmartSat has an overall inclusion score of 85%, which is to be acknowledged and applauded.

In April, we said farewell to director Dr Rosalind Dubs, who announced she would be departing the Board to pursue other work. We wish to thank Ros for her contribution to the Board over the years, wish her all the best in her future endeavours, and invite her to remain a part of the SmartSat family.

On behalf of the SmartSat Board, I wish to recognise Professor Andy Koronios and his dedicated team for their incredible work over the past 12 months. Without their hard work and commitment, the organisation would not be where it is today. The past year has seen the Australian space sector face a number of challenges, underpinned by a high degree of uncertainty surrounding the uncertain future Defence environment. Despite this, SmartSat continues to achieve real-world results through its research and development activities.

As we move into the next financial year, we have been devoting significant effort into ensuring that SmartSat will become an enduring organisation at the end of the Cooperative Research Program funding in mid-2026. It is my hope that we can continue to operate as Australia's premier space research center and continue our important work ensuring enduring value for our partners and impact and prosperity for our nation.

Dr Michele Allan AO
Chair

2023 — 2024 HIGHLIGHTS AT A GLANCE

AGRICULTURE & THE ENVIRONMENT

Created an IoT-based visualisation tool to enhance Australia's environmental monitoring of water quality in the **AquaWatch Coastal Water Quality Pilot.**

Enhancing mapping, biodiversity detection, and marine ecosystem management with the **Monitoring live coral cover and seagrass species from space** project.

Addressing bushfire challenges with **Fusion of earth observation data for wildfire reconstruction,** to help land and fire managers understand fire behavior; and **On-board for Early Fire Smoke Detection Phase 2,** advancing AI processing capabilities to improve early fire detection and response times.

Improving mangrove management by developing a method to fuse satellite and LiDAR data in the **SmartCoast** project

Developing an AI tool under **RiskSmart** to analyse Earth Observation data, estimating and mapping soil moisture for improved sorghum crop health and yield.

Created a tool to support agricultural and land management decisions by assessing vegetation condition using Synthetic Aperture Radar data.

DEFENCE AND NATIONAL SECURITY

The **ASCEND2LEO** project successfully demonstrated 'Push-to-Talk' capabilities for mobile military communications onboard Fleet Space Technologies' Centauri-4 satellite, and continues collaboration with NASA for astronaut and lunar vehicle emergency messaging.

Presented potential air, maritime, and land-based applications of **Coherent Free-Space Optical Communications** technology to Defence's Navy Capability Division, highlighting high-rate data transfer of 100+ Gbps to moving platforms.

Demonstrated the groundbreaking **Compact Hybrid Optical-RF User Segment** prototype terminal during Exercise Talisman Sabre, advancing its manufacturability and performance evaluations.

ARTIFICIAL INTELLIGENCE AND SPACECRAFT AUTONOMY

SCARLET LABORATORY
A SMARTSAT INITIATIVE

Launched **SCARLET Lab** to develop innovative technologies in spacecraft autonomy, on-board AI and data analytics with two flagship projects:

- **SCARLET- α:** innovating onboard AI capability enabling small spacecraft to operate independently and quickly
- **SCARLET-β:** demonstrating spacecraft autonomy capabilities onboard DSTG's Buccaneer Main Mission.

Inter-Satellite Links using Millimetre Waves advanced a novel satellite-to-satellite communication system for use in formation flying scenarios.

Developed intelligent, robotic servicing technology through the **Technology Development for In-orbit Servicing, Assembly, and Manufacturing** project, extending satellite in orbit lifespans.

Progressed real-time data processing and coordination for intelligence, surveillance and reconnaissance (ISR) with **Space analytics engine for on-board machine learning and multimodal data fusion** project

Improved satellite manoeuvre tracking using deep-learning systems paired with a visualisation tool in the **Trusted AI Frameworks for Change and Anomaly Detection in Observed ISR** project

READY FOR LAUNCH

Completed Kanyini's manufacture, payload integration and final testing, before shipping to California in readiness for launch on SpaceX's Transporter-11 in August 2024.

SMARTSAT BOARD & GOVERNANCE

Dr Michele Allan AO	Chair
Professor Andy Koronios	Chief Executive Officer & Managing Director
Dr Jacqueline Craig AM FTSE	Director
Dr Rosalind Dubs FTSE FAICD	Director (Resigned May 2024)
Emeritus Professor Roy Green AM	Director
Professor Margaret Harding	Director
Mikaela Jade FTSE	Director
Dr Danielle Wuchenich	Director
Catherine Cooper FAICD	Company Secretary

PEOPLE & OPERATIONS

- Completed staff engagement survey through Culture Amp
- Finalised DEI Action Plan 2024
- Established and fit out the Scarlet Laboratory facility
- **Key Staff Appointments:**

Cameron Stephenson | Commercial Director
Lt Gen Larry James (Ret'd) | Strategic Advisor

EDUCATION & TRAINING

71 PhD Scholarships funded

10 Doctoral candidates graduated

4 PhD webinars were held

5 International scholarships

2 PhD Awards 2023
Best Presentation: Anne Bettens
Best Poster: Skevos Karpathakis

2 Peter Woodgate Scholarships for Earth Observation

COMMUNICATIONS, EVENTS AND AWARDS

11 Media releases issued

300+ Media articles published

89M+ Media audience

13 Events (workshops, webinars & annual conference)

600+ Combined event attendance

AWARD

RMIT's Real Time Fire Analytics project team successfully progressed into the next phase of the **XPRIZE Wildfire** competition, which may lead to further utilisation of the project's outputs. The team is also in discussions with the forest fire services team at DEECA (Victoria) to co-design a next generation fire analytics product.

INTERNATIONAL PARTNERSHIPS

Established a collaboration with the European Space Agency on Earth Observation research

Formed the Australia New Zealand Collaborative Space Program launching four initial projects

Providing mission design and advice for the Australia/UK AquaWatch initiative.

RESEARCH HIGHLIGHTS

KANYINI SMALL SATELLITE MISSION

The Kanyini small satellite mission, a partnership with the South Australian government, completed final checks and was shipped to California in readiness for launch on SpaceX's Transporter-11 in August 2024. Kanyini underwent rigorous testing, including thermal and vibration tests, following the integration of Myriota's Internet of Things (IoT) sensor and a hyperspectral imager on the satellite 'bus' built by Inovor Technologies. The mission will facilitate demonstrator projects focused on Onboard Artificial Intelligence (AI) and hyperspectral imagery, aimed at improving decision-making for environmental monitoring and disaster response.

See full update on Kanyini on pages 12-13

SmartSat Kanyini mission team members (L-R) Dr Sarah Cannard, Nadia Sarunic, Peter Nikoloff and Nick Manser performing final inspections of Kanyini

IN-ORBIT SERVICING, ASSEMBLY & MANUFACTURING

The University of Sydney's Technology Development for **In-orbit Servicing, Assembly, and Manufacturing (ISAM)** project, in collaboration with several NSW robotics start-ups, aims to strengthen Australia's sovereign capabilities in the competitive ISAM sector. The project focuses on developing an advanced robotic satellite system featuring onboard automation, AI, precision sensing, and robust control technologies. The research will culminate in a ground-based demonstration of the system's ability to conduct proximity operations, docking and maintenance tasks. ISAM technology is critical for extending the life of valuable satellite assets by enabling precise in-orbit servicing, including safe close approaches and docking to prevent damage or collision.

See full case study on page 25

Visualisation of ISAM Technology in operation

SATELLITE TRACKING TOOL DEVELOPMENT

A new visual tool to detect and display satellite manoeuvres has been developed as part of the **Trusted AI Frameworks for Change and Anomaly Detection in Observed ISR project.** The system uses publicly available data and allows users to interact through a natural-language interface. Three detection methods were tested using satellite orbit data (Two-Line Elements, or TLE), with accuracy confirmed against known manoeuvre timestamps of over 5,000 Starlink satellites, demonstrating its capability to monitor a wide range of space objects. This technology is crucial for tracking of valuable sovereign satellite assets as well as monitoring unfamiliar satellite movements.

Visualisation of Starlink constellation over Australia

INTEGRATED TACTICAL COMMUNICATIONS

The **Integrated Tactical Communications (ITC)** project focuses on improving tactical waveform designs for secure, low-latency voice and data communications using low earth orbit (LEO) satellites. Targeting highly mobile users across land, sea, and air environments, it employs X-band frequency and software-defined radio to provide reliable connectivity, particularly in contested areas. This system enhances Defence communications by supporting small mobile terminals and overcoming the limitations of high-latency geostationary systems. By the project's conclusion, a Matlab-based software package was developed to investigate LEO satellite constellations, coverage, beam management, and inter-satellite networking. Waveforms for data transmission in high-mobility tactical scenarios were also studied and simulated.

THE SCARLET LABORATORY

The SCARLET Laboratory is focused on developing innovative technologies across spacecraft autonomy, on-board AI and data analytics. Spacecraft autonomy is key to next-generation space systems by improving responsiveness, reduce communication and data latencies, and lowering costs for both space and ground operations.

- **The SCARLET-α** (Spacecraft Autonomy and Onboard AI for Next Generation Space Systems) project aims to develop autonomous algorithms for small and distributed spacecraft, that will allow spacecraft to make independent decisions, optimise resources, adapt to changing conditions and handle critical situations without Earth-based intervention.
- **The SCARLET-β** project addresses the need for enhanced autonomous capabilities in satellite self-inspection and Earth Observation operations, which are critical for the Defence Science and Technology Group's Buccaneer Main Mission. Researchers studied the relationship between on-board and off-board autonomy and considered integrated scheduling of data acquisition and down-link, combined with energy aware planning.

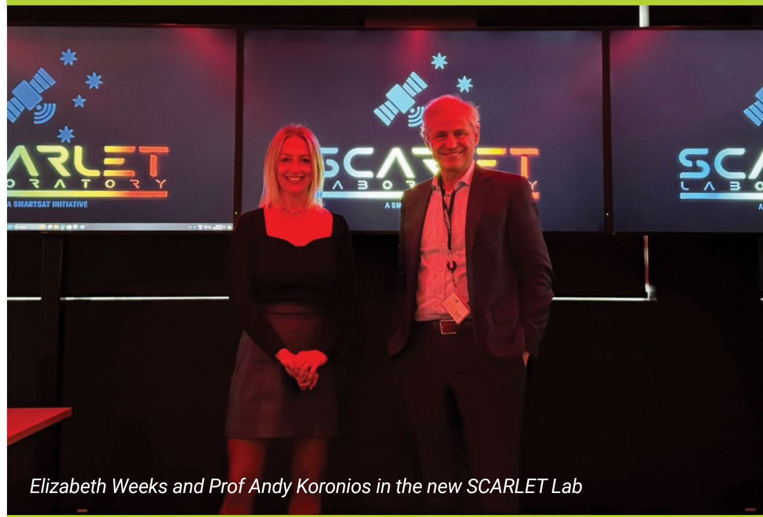
See full case study on page 24

AQUAWATCH COASTAL WATER QUALITY PILOT PROJECT

The **AquaWatch Coastal Water Quality Pilot** project developed a new visualisation tool to enhance environmental monitoring, following two key studies in Moreton Bay (Queensland) and Cockburn Sound (Western Australia). In Moreton Bay, the team integrated various data sources to map the distribution of white spot disease in prawns, while in Cockburn Sound, they used in-situ and satellite data to assess the impact of port development on water quality. This tool sets a new standard for monitoring, offering insights into seagrass changes, sediment dynamics, dredging activities, and aquaculture health. The pilots establish a framework for water quality tracking through IoT, with broad implications for aquaculture, environmental regulation, and sustainable industry practices in Australia.

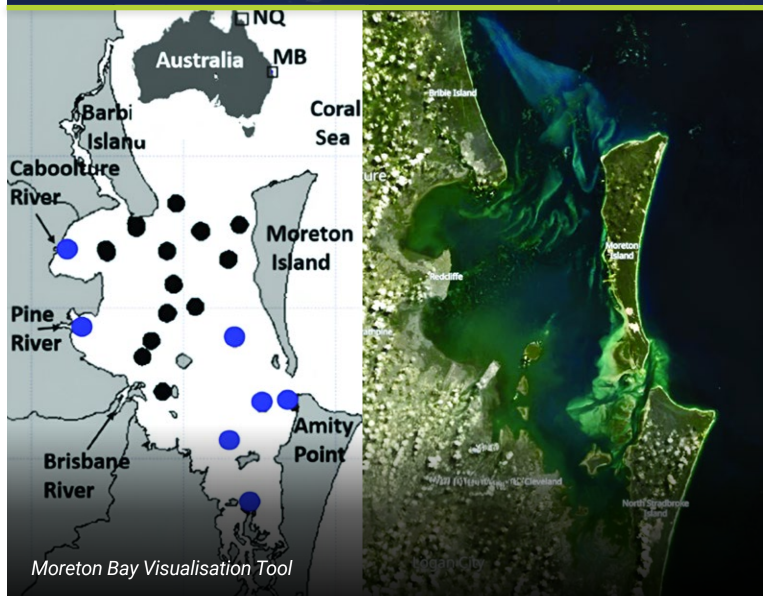
See full case study on pages 26 -27

Mobile tactical communications device



Elizabeth Weeks and Prof Andy Koronios in the new SCARLET Lab

Visualisation of DSTG's Buccaneer Main Mission



Moreton Bay Visualisation Tool

RESEARCH HIGHLIGHTS
DEMONSTRATIONS TO DEFENCE

ASCEND2LEO

The **ASCEND2LEO** project conducted its first demonstration to Defence's Joint Capabilities Group, with the Fleet Space Technology's Centauri-4 satellite transmitting low-rate voice and data using the Beagle waveform. This successful demonstration showed the Centauri satellites can be reprogrammed to deliver high quality, fit-for-purpose voice 'Push-to-Talk' (PTT) capabilities while in orbit. The Beagle waveform is also being applied to NASA's Search and Rescue (SAR) system for future human exploration on the Moon in the LunaSAR project. It is intended to provide miniature low-power radio beacons mounted on spacesuits and lunar rover vehicles to support SOS and two-way messaging over a lunar orbiting satellite constellation during NASA's Artemis mission.

Connecting defence assets and personnel from low earth orbit (Image courtesy of Fleet Space Technologies)

COHERENT FREE-SPACE OPTICAL COMMUNICATIONS

The **Coherent Free-Space Optical Communications** technology was demonstrated to Defence stakeholders in the Navy Capability Division, showcasing its capacity for high data rate links (100+ Gbps) to moving platforms (air, maritime, and land) through an optical retro-reflector that simulates a space-to-Earth atmospheric path. Additionally, the project team has initiated further research with TeraNet, a $6.5 million project funded by the Australian Space Agency and the Western Australian Government.

CHORUS

The **CHORUS (Compact Hybrid Optical-RF User Segment)** project was demonstrated at Exercise Talisman Sabre, the largest military exercise conducted in Australia. This bilateral joint military exercise between Australia and the United States aims to strengthen interoperability among key allies and enhance collective capabilities to respond to a wide array of potential security concerns. Notably, the Australian Navy showed interest in the project's potential for advancing naval capability. Phase Two of CHORUS is focusing on evaluating manufacturability and the performance of the physical terminal system.

Coherent Free-Space Optical Communications technology demonstration at University of Western Australia

The CHORUS Terminal on display at a trade show

PATHWAY TO IMPACT
TECHNOLOGY READINESS

SmartSat focuses our research efforts on advancing innovations through the **Technology Readiness Levels,** driving them toward operational implementation and commercial viability.

TRL1 | TRL2 | TRL3 | TRL4 | TRL5 | TRL6 | TRL7

BASIC RESEARCH (TRL1) — SMARTSAT INNOVATION & TECHNOLOGY MATURATION (TRL2–TRL5) — PARTNER OR EXTERNAL OPERATIONALISATION/ COMMERCIALISATION (TRL6–TRL7)

QUANTUM TECHNOLOGIES: COMPACT CLOCK FOR SMALL SATELLITE APPLICATIONS

QUANTX FUNDING $390K AUSTRALIAN RESEARCH COUNCIL → SMARTSAT INVESTMENT AND R&D SUPPORT $2.9 MILLION TOTAL INVESTMENT → DEFENCE SCIENCE & TECHNOLOGY GROUP / AUSTRALIAN SPACE AGENCY $3.7M MOON2MARS GRANT

PROJECT FOCUS:

Development of a high-precision, small form-factor, clock technology.

The intellectual property (IP) for a high precision clock was developed at the University of Adelaide, resulting in the spin-off company, QuantX, leveraging the technology for defence applications. Recognising the space capability opportunities for the technology, SmartSat invested in a significant project that applied the IP to small satellites and developed expertise for the space marketplace. This novel small clock technology, which provides PNT capabilities in a GPS denied environment, has successfully received further maturation funding for demonstration in space.

ADVANCED NARROWBAND WAVEFORMS: RESILIENT EMERGENCY AND SEARCH & RESCUE COMMUNICATIONS (RESARC), LUNASAR AND ASCEND2LEO

SAFETY FROM SPACE ≈$100K (VARIOUS SOURCES) → SMARTSAT INVESTMENT AND R&D SUPPORT $1.3 MILLION TOTAL INVESTMENT → DEPARTMENT OF DEFENCE $6.5M DEFENCE GRANT (FLEET SPACE TECHNOLOGIES)

PROJECT FOCUS:

Advanced narrowband waveforms that enable users in the Defence and emergency services to access new and emerging software defined radio solutions.

The initial project, RESARC, addressed the challenges with existing search & rescue systems, with a demonstration of a low-power, two-way emergency messaging via satellite. This technology has expanded to emergency communications for astronauts on the Moon through the LunaSAR project, in development with NASA to support the Artemis program. Additionally, the challenges with existing search & rescue systems, with a demonstration of a low-power, two-way emergency messaging via satellite. This technology has expanded to emergency communications for astronauts on the Moon through the LunaSAR project, in development with NASA to support the Artemis program. Additionally, the ASCEND2LEO project, funded by Defence Space Command, has modified and successfully demonstrated the waveform for tactical voice communications (Push-to-Talk technology) on Fleet Space Technology's LEO Centauri satellite.

COHERENT FREE-SPACE OPTICAL COMMUNICATIONS

UNIVERSITY OF WA $50K AUSTRALIAN RESEARCH COUNCIL → SMARTSAT INVESTMENT AND R&D SUPPORT $5.95 MILLION TOTAL INVESTMENT → AUSTRALIAN SPACE AGENCY $4.4M MOON2MARS GRANT

PROJECT FOCUS:

Deliver fiber-like connectivity over free-space to spacecraft in orbit.

SmartSat has worked with a group of partners, led by the University of Western Australia, to develop a high-throughput optical communication capability with adaptive optics for atmospheric corrections. The optical ground station has been successfully demonstrated across multiple sites before moving to aerial vehicles. Follow-on funding has matured this research for demonstration with spacecraft and development of a three-node optical ground station network in Western Australia.

KANYINI

"Until now, images of our state have been sourced from foreign satellites, limiting our access to up-to-date, detailed images of areas of interest. With the Kanyini mission, we are demonstrating the capability to capture images of specific locations tailored to applications. By leveraging advanced data analytics, we have the ability to transform these images into actionable intelligence for state government departments for the benefit of all South Australians."

- SmartSat CEO, Professor Andy Koronios

Image (right): Kanyini Lead Engineer Nick Manser inspecting the Kanyini FlatSat

The Kanyini satellite - developed in collaboration with the South Australian Government (through the South Australian Space Industry Centre), Inovor Technologies and Myriota – completed its final round of tests before being packaged up for shipping to the Launch Service Provider. It is the first satellite commissioned by a state government in Australia to collect data to inform a State Department, in areas such as environment, water, energy, agriculture and emergency services.

Over the last twelve months, the six-unit cube satellite has been in its final development with satellite builder Inovor Technologies, while SmartSat's system engineers have been finalising the next generation technologies and on-board processing capabilities, including the integration of cosine's HyperScout 2 Flight Model hyperspectral imager.

The imager, which is a three-in-one instrument combining hyperspectral and thermal imaging with high-level data processing and Artificial Intelligence (AI) capabilities, will support the monitoring of crops, vegetation, soil moisture and water. As Australia's first 'smart' satellite, equipped with an onboard computer and advanced AI algorithms for real-time image processing, Kanyini will be able to send insights directly to the ground, reducing the need for transmitting large amounts of raw data for post-analysis.

In November 2023, the mission team accompanied Kanyini to the National Space Test Facility at the Australian National University in Canberra, where it successfully completed its Environmental Stress Screening. The robust testing verified the satellite's ability to withstand the rigours of space by exposing it to the harsh physical and environmental conditions it is expected to encounter while in orbit. Following the successful screening process, the satellite was formally handed over to Myriota as the telecommunications service provider for final testing of the Internet of Things (IoT) space services.

The final stage saw the Australian Space Agency issuing the Australian Launch Permit in April, as the physical satellite underwent its final checks and was packaged for transport to the Launch Service Provider to be launched onboard the Space X Transporter 11 rideshare mission from Vandenberg Space Force Base, California in August 2024.

Achieving launch readiness status for the Kanyini mission has been an invaluable experience for all involved. This mission has already increased South Australia's space capabilities, developed our space heritage and proven the benefits of industry and government collaboration.

THE SATELLITE

HYPERSCOUT 2 EARTH OBSERVATION PAYLOAD

The HyperScout 2 Flight Model hyperspectral imager is a three-in-one instrument that combines hyperspectral and thermal imaging with high-level data processing and AI capabilities, developed by Dutch company, cosine. This compact imaging payload will provide extremely detailed Earth Observation imagery to support research into crop health, forestry, inland and coastal water management and more.

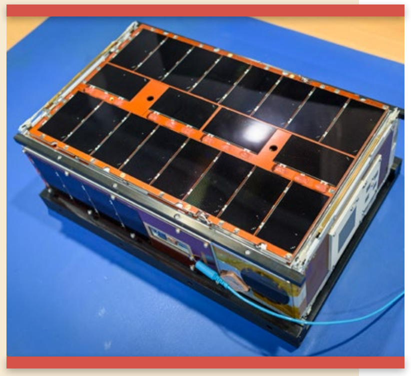
MYRIOTA IOT PAYLOAD

The Myriota IoT payload will relay data from IoT devices and sensors on Earth's surface to the ground from space. The data will be returned to Earth and securely transferred directly to the cloud so it can be used to improve delivery of emergency services, environmental monitoring and more.

INOVOR TECHNOLOGIES' 'APOGEE BUS'

The Apogee Bus provides the shell, power system, pointing system, mission control and telemetry systems for Kanyini, all integrated into a lightweight, modular structure. As the only spacecraft designed and built in Australia using a sovereign supply chain, the Apogee Bus offers the team complete control of all hardware and software with unprecedented flexibility, security, and mission assurance.

Hyperscout 2 Earth Observation Payload



Inovor Technologies' Apogee Bus

RESEARCH

Vital to the true impact of the Kanyini mission is the portfolio of research and development projects, managed by SmartSat, in artificial intelligence, onboard processing and machine learning that are utilising the satellite and its data. These projects aim to develop innovative applications that address challenges in agriculture, water management and the environment.

ONBOARD HYPERSPECTRAL AI: CAL, PANOPTIC SEGMENTATION, ESTIMATION

PROJECT PARTIES: Queensland University of Technology (QUT), Airbus Defence & Space, Nova Systems

This project's goal is to develop capabilities for onboard AI processing and analysis of hyperspectral imagery on smart satellite platforms. In particular, the project will tackle the key modules of calibration, segmentation, fine-grained analysis and joint space-ground inference of onboard AI processing of hyperspectral data. This gives ability to process onboard the rich and multidimensional spectral modalities in an end-to-end manner, creating new opportunities to enable accurate, efficient, and reliable automated detection and classification of natural phenomena and human activities over a wide area on Earth.

SMALL SAT ENERGY-EFFICIENT ONBOARD AI PROCESSING OF HYPERSPECTRAL IMAGERY FOR EARLY FIRE-SMOKE DETECTION

PROJECT PARTIES: University of South Australia (UniSA), Swinburne University of Technology, Geoscience Australia

This research aims to provide a solution for energy-efficient AI-based on-board processing of hyperspectral imagery supporting automated early detection of fire smoke, providing a solution that meets on-board processing limitations and up/downlink data transfer restrictions of Kanyini. Expected outputs of this project include on-board and ground AI algorithms for fire smoke detection, applicable for various multispectral and hyperspectral imagery datasets.

DEVELOPING CAPABILITY TO ASSESS LIVE CORAL COVER AND SEAGRASS SPECIES USING SATELLITE BASED HYPERSPECTRAL IMAGERY

PROJECT PARTIES: The University of Queensland, The University of Adelaide, CSIRO, SA Water, South Australian Department of Environment and Water

This project aims to leverage high-quality archived hyperspectral data and field observations to evaluate the potential of these satellites for detailed mapping of coral and seagrass habitats. The research will help develop remote sensing frameworks capable of identifying specific coral and seagrass characteristics, setting the stage for future large-scale mapping efforts, to provide valuable insights for scientists and reef managers worldwide.

ROBUST PREDICTIVE AI: ADVANCED SAT HS BAND REGISTRATION AND RELIABLE EVENT PREDICTION

PROJECT PARTIES: Queensland University of Technology (QUT), Swinburne University of Technology

This project aims to develop a novel deep learning pipeline for achieving robust and reliable prediction of events such as landslides, flooding and bushfires with hyperspectral satellite imagery. The output of the project is robust and trustworthy predictive AI capabilities that can accurately predict events further in advance using better aligned hyperspectral data cubes. This project is a collaboration with the European Space Agency's ϕ-Lab (Phi-Lab) and builds on their algorithmic strengths and onboard processing experience with Φ-Sat 1. While the primary use will be in disaster management applications, it has other end-use applications such as predicting the impact of urban growth on vegetation and road infrastructure, as well as security and defence-related event predictions.

SPACE ANALYTICS ENGINE FOR ON-BOARD MACHINE LEARNING AND MULTIMODAL DATA FUSION

PROJECT PARTIES: The University of Adelaide, University of New South Wales (UNSW), BAE Systems

This project aims to develop advanced algorithms and workflows for on-board machine learning on nanosatellites, utilising multi-modal sensors for Intelligence, Surveillance and Reconnaissance (ISR) satellites. It addresses challenges such as the limited computing power on satellites compared to ground hardware, the need for model optimisation, and the difficulties in updating models in space. The current approach to ISR satellite operations, where data collection is passive and processing occurs on the ground, leads to significant delays and hinders real-time coordination between satellites and end-users. The project's goal is to produce a novel space analytics engine that is reconfigurable after launch, significantly increasing the value proposition of on-board processing.

EM VERIFICATION OF ONBOARD SMOKE DETECTION MODEL AND ALGORITHMS

PROJECT PARTIES: University of South Australia, Swinburne University of Technology

This project builds on an earlier project, which used simulated imagery and a low-cost emulation system to replicate the HyperScout 2 AI onboard processing for fire smoke detection. Specifically, it addresses methods to reduce raw data volumes by using AI processing to automatically detect smoke locations by identifying and separating out clouds or landscape imagery before downlink transfer. This greatly enhances downlink transfer efficiency, which is crucial for early fire detection. This second phase of the project aims to adjust and test all onboard imagery processing tasks and verify them for their error-proof deployment on the Kanyini/HyperScout 2 system.

ENGAGEMENT WITH THE GLOBAL SPACE SECTOR

BUILDING INTERNATIONAL RELATIONSHIPS

SmartSat's engagement with the international space sector included meetings with space agency representatives from Saudi Arabia, Poland, Italy, Korea, France, Germany, and Greece, and leading researchers from Japan, USA and the United Kingdom.

A formal agreement was signed with the European Space Agency to collaborate on Earth Observation research, leading to two SmartSat PhD students undertaking a 12-week exchange program with the ESA's ESRIN research centre and an ESRIN-based PhD student hosted at SmartSat in reciprocation.

The relationship with NASA Search and Rescue continues with the progression of the LunaSAR project, supporting astronaut safety on the Moon for NASA's Artemis program.

AUSTRALIA NEW ZEALAND COLLABORATIVE SPACE PROGRAM

A joint research program was established in early 2024 between the Ministry of Business Innovation & Employment (New Zealand Space Agency) and Australian partners to boost the space industries of both nations. Four initial projects were launched, focusing on methane emissions monitoring, real-time greenhouse gas tracking, managing free space optical communication nodes, enhancing space object tracking and a joint Australia-New Zealand concept for maritime domain awareness. Further projects, starting in late 2024, will target agricultural monitoring for improved farming, support for Indigenous communities through Earth Observation, and advanced pasture condition and biomass mapping.

AQUAWATCH UK

SmartSat is collaborating with CSIRO and Surrey Satellite Technology Ltd to provide mission design and spacecraft pointing advice for the Australia/UK AquaWatch initiative, supported by the UK Space Agency and Australian Space Agency. Australia's AquaWatch mission aims to create a 'weather service' for water quality and this partnership will expand the mission into the UK. SmartSat's initial role in the bilateral initiative involves supporting the design of this system to monitor water quality in the UK.


NEW ZEALAND SPACE AGENCY


EUROPEAN SPACE AGENCY


GERMAN AEROSPACE CENTER (DLR) DELEGATION


HOKKAIDO UNIVERSITY, JAPAN


FRENCH AMBASSADOR


FORMER US AMBASSADOR

NASA JET PROPULSION LABORATORY


KATE KITAGAWA, JAXA


NEW ZEALAND SPACE MINISTER


HEAD OF NEW ZEALAND SPACE AGENCY


AquaWatch UK, Plymouth Bridge

ENGAGEMENT IN AUSTRALIA EVENTS

SmartSat hosted **13 events** in the year with **600 attendees,** including an Annual Conference, providing valuable knowledge-sharing opportunities for the space research sector. SmartSat also sponsored and participated in multiple space sector events and hosted many visitors at the SmartSat Offices.

Events included Australian Space Forum, Indo-Pacific Space & Earth Conference, Australian Space Summit, Australian Space Research Conference, IEEE Radar Conference, Industry Reception for the Parliamentary Friends of Space Group, Cooperative Research Australia's National Innovation and Policy Forum at Parliament House, Canberra.

600
Event attendance

13
Events


AUSTRALIAN SPACE FORUM


IEEE RADAR CONFERENCE


AUSTRALIAN SPACE SUMMIT


AUSTRALIAN SPACE RESEARCH CONFERENCE


GLOBAL MIILSAT CONFERENCE


COOPERATIVE RESEARCH AUSTRALIA'S NATIONAL INNOVATION AND POLICY FORUM

ENGAGEMENT IN AUSTRALIA
SMARTSAT NODES

The portfolio of SmartSat Node projects now includes **over 50 projects.** Node highlights include:

NSW Node launched the Space+ $500,000 funding Program to aid NSW businesses to commercialise and showcase their capabilities to a global audience at the 76th International Astronautical Congress in Sydney in 2025.

The Victoria Node launched another round of small grants for demonstrator projects that enhance research partner IP and investment readiness.

QUEENSLAND EARTH OBSERVATION HUB

The Queensland Earth Observation (EO) Hub, incorporating the SmartSat Queensland Node, is a joint initiative by SmartSat and the Queensland Government. The EO Hub supports the growth of Queensland's Earth Observation industry through research commercialisation and EO product development, benefiting data analytics businesses and downstream industries. The EO Hub's funding programs focus on industry-led research partnerships in various sectors, including agriculture and mining. The EO Hub also promotes and connects Queensland's EO sector with industry end users through collaborative projects, workshops and events.

QUEENSLAND EO HUB ACTIVITIES 2023-2024

- A co-design workshop on applying EO technologies to agriculture, focusing on challenges like weed management, land use, and water utilisation.
- A workshop on using EO technologies for Australia's critical minerals sector, exploring EO's role in pre-mining exploration and post-mining rehabilitation.
- A market engagement study highlighting opportunities for collaboration, commercialisation, capacity building, and workforce development in Queensland's EO sector, with findings informing the Hub's strategy.
- A symposium on hyperspectral data analysis that also provided hands-on training for real-world EO applications.

RISKSMART: DIGITAL TOOL FOR DE-RISKING SORGHUM PRODUCTION DECISIONS

PARTNERS: Pacific Seeds, University of Queensland

Will utilise high-temporal- spatial-spectral resolution satellite data to derive sensing metrics and models for estimating and optimising sorghum production at field scales before sowing.

CALIBRATING AND VALIDATING SATELLITE DATA FROM DRONE IMAGERY

PARTNERS: GeoNadir, James Cook University

Addresses field calibration across diverse geographies being costly and time consuming. The partners used the vast coverage of drone data available on GeoNadir to build a comprehensive library of data labels suitable for calibrating and validating satellite data products, with applications in land cover and coral reef mapping.

THE COASTAL CHANGE OBSERVATION AND ANALYTICS (MULTI-) SCALE (MULTI-) TECHNOLOGY SYSTEM (COASTS)

PARTNERS: EOMap, University of Sunshine Coast, Noosa Council, University of Queensland

Leverages satellite imagery, drones, numerical modelling and AI based analytics to fill the gaps in our understanding of coastal change and response to storm events. COASTS supports coastal management planning and decision making for government and industry.

VALIDATION OF SATELLITE-DERIVED IN-LAND WATER TOPOGRAPHY MAPS

PARTNERS: Kurloo, CSIRO

Using Kurloo mass deployable global navigation satellite system (GNSS) precise positioning technology. Leveraging the CSIRO Googong calibration facility, Kurloo data was collected over eight months, with the output supporting the national AusCalVal facility and improving the reliability and accuracy of location analytics and spatial analysis.

QUANTIFICATION OF CLIMATE RISK ON THE CROP PRODUCTIVITY OF THE QUEENSLAND SOIL TYPES

PARTNERS: NGIS, University of Southern Queensland

Developed a pipeline to evaluate risks to productivity performance of different cropping soils under climate change in Queensland. The point scale climate-change-scenario modelling differs from existing decision support tools by spatially explicit understanding of climate change impacts on agricultural systems.

PHD PROFILES

VIBHOR THAPLIYAL

LA TROBE UNIVERSITY

Fabrication of 3-D, Wavelength-Tuneable Photonic Crystals for Space-Based Mm-Wave, Terahertz, and Infrared Communications

Vibhor Thapliyal is a PhD student in the Eemc2 lab under the Department of Engineering at La Trobe University in Bendigo, Australia. His PhD research aims to fabricate 3-D tunable photonic crystals for space-based mm-Wave, Terahertz, and Infrared communications, a collaborative project between SmartSat and La Trobe University to enhance major satellite systems and solve advanced communications challenges. Thapliyal completed his Master of Engineering in manufacturing engineering from La Trobe University in 2021 and has coordinated the High-Altitude Advanced-Materials & Engineering Research (HAAMER) project during his degree.

DONNA FITZGERALD

UNIVERSITY OF SOUTH AUSTRALIA

Quantifying Dieback of Eucalypt Forests using Remote Sensing

Donna Fitzgerald holds a Bachelor of Environment Science from the University of South Australia (Uni SA) with First-Class Honours. In her Honours research, Fitzgerald assessed the dieback of the red stringybark (Eucalyptus macrorhyncha) using remote sensing techniques in a small, remote population in Spring Gully Conservation Park (SGCP). Satellite imagery was used to look at vegetation changes over time, and airborne multispectral and LiDAR imagery was collected to determine the extent of dieback. The outcomes of this integrated approach were highly successful, confirming declining population health over the last five years and providing a reliable estimate of the extent of the dieback of up to 37%. Recently, Fitzgerald was awarded the Peter Woodgate Scholarship for Earth Observation. During her PhD, Fitzgerald will further develop methods for reviewing the dieback of eucalypt forests using various remote sensing methods.

SKEVOS KARPATHAKIS

UNIVERSITY OF WESTERN AUSTRALIA

Communications engineering, phase- and spatial-stabilisation system development

Skevos Karpathakis is an engineer and PhD graduate of the University of Western Australia (UWA). His project contributes to the future of optical ground station networks in Australia by integrating optical communications systems into phase-and-amplitude-stabilised free-space laser ranges. Karpathakis' work is conducted with the Astrophotonics group at the International Centre for Radio Astronomy Research (ICRAR), where he was employed as an electronic engineer prior to commencing his PhD. Before joining ICRAR, Karpathakis worked in product development in the smart city space. He previously completed a Master of Professional Engineering at UWA and led a team of students to participate in the Society of Automotive Engineers Australasia's Formula SAE-A competition.

VINICIUS GUEDES GONCALVES DE OLIVEIRA

SWINBURNE UNIVERSITY OF TECHNOLOGY

The cybersecurity of the Australian Space Infrastructure – A legal and policy analysis

Vinicius Guedes Goncalves de Oliveira is a lawyer specialising in International Law, graduated from the Federal University of Espírito Santo in Brazil. He is currently a PhD candidate and scholarship holder co-funded by SmartSat and Flinders University, developing a doctoral project assessing the Cybersecurity of the Australian space infrastructure and its interaction with the current legal and policy international framework. He also works as a Research Associate at Flinders University on projects mainly involving Defence, Cyber, Politics and Law, and teaches classes on these themes.

PHD INTERNSHIPS

NERMINE HENDY

esa

Nermine Hendy was one of two SmartSat PhD students selected to work on pioneering satellite research during a three-month internship at the European Space Agency's Φ-Lab in January 2024. During her time in Italy, Nermine worked with internationally renowned researchers on her research into interference modelling, detection, and mitigation for improving spaceborne SAR performance.

What did it mean to you to be selected for this internship at the European Space Agency's Φ-Lab?

Being selected for the internship at the European Space Agency's Φ-Lab was a significant milestone in my academic and professional journey, representing recognition of my hard work and potential, as well as a unique opportunity to immerse myself in a world-renowned research environment. This experience also validated that my research was heading in the right direction and gave me the confidence to push the boundaries of what I thought was possible in the field of SAR.

What was the best thing about your time at ESA's Φ-Lab?

The best part of my internship was the motivating and encouraging work environment. The structured routine and strict deadlines motivated me to maximise productivity, significantly enhancing both my professional and personal growth. This internship not only enriched my technical expertise but also inspired me to contribute more meaningfully to the space industry and the Australian space sector.

What do you think Australia's burgeoning space industry could learn from the European space sector?

Australia could learn a great deal from the established European space sector, in particular the importance of collaborative frameworks, advanced research and development, and supportive regulatory policies. Europe's emphasis on sustainable space practices and public engagement can also guide Australia in building a robust space industry.

CHANG LIU

MIT

Chang Liu, who has since graduated with her PhD from the University of New South Wales (UNSW) Sydney, was accepted as a visiting student at the internationally renowned Massachusetts Institute of Technology (MIT) Senseable City Lab. The opportunity provided invaluable insight and experience, allowing her to continue her work developing a deep learning classification model to assess building damage following natural disasters.

What study and/or career opportunities did you see for yourself upon taking the opportunity at MIT's Senseable City Lab?

The cutting-edge research environment at Senseable City Lab allowed me to delve deep into those more advanced topics in my field, while the extensive network of renowned faculty at MIT opened the door to collaboration. MIT provided several in-person workshops during my study, so I had a chance to gain valuable knowledge from presenters. This experience not only enriched my academic journey but also positioned me well for career advancement in the technology sector.

What was the best thing about your time at the Senseable City Lab?

I learnt so much related to my research, such as emerging AI-based methods, Geographic Information System (GIS) analysis methods and LiDAR operations. The best thing about my time was the collaborative and innovative environment that fostered my creativity and pushed the boundaries of my research. The open culture of knowledge sharing, and interdisciplinary collaboration was instrumental in broadening my perspective and enhancing the quality of my work.

What do you think Australia's burgeoning space industry could learn from the US's more established space sector?

Many US-based space companies and government departments offer internships or part-time positions to local students, helping them gain insights into the industry beyond their university coursework. I think it's worth discussing the feasibility of implementing similar initiatives in Australia's space industry.

BRANDON VICTOR

esa

Brandon Victor was one of two SmartSat PhD students selected for a three-month internship at the European Space Agency's Φ-Lab, where he was able to work on his research into using satellite data to locate and phenotype plants from space.

What did it mean to you to be selected for this internship at European Space Agency's Φ-Lab?

I didn't study overseas at all during my undergraduate, and I had always felt like I missed out. This opportunity helped fill in a perceived gap in my personal experiences and I felt very privileged to be able to work with such a prestigious organisation.

What was the best thing about your time at ESA's Φ-lab?

For me, it was that it was the atmosphere of the other Φ-Labbers. They have many visiting researchers, and it felt like there was a little bit of frantic energy to get stuff done before the visits were over but there also wasn't a lot of structure. While I was there, I could work how I wanted and to give the work all my brain space as it was only for a few months.

What do you think Australia's burgeoning space industry could learn from the European space sector?

From my interactions with staff around the European Space Agency, it sounds like there's a lot of money being spent by the organisation to encourage private organisations to participate in the space economy. I can also say with experience that having a physical lab with many rotating visiting researchers was much more effective at motivating me than any amount of working from home.

JORDAN SHIPARD

Shield AI

As part of his SmartSat PhD, Jordan Shipard completed a five-week internship with Shield AI (formerly Sentient Vision Systems) in Melbourne, Victoria. His research is focused on efficient subnets for scalable onboard AI in Space.

What did it mean to you to complete an internship with a company like Shield AI?

Interning at Shield AI was a valuable opportunity to gain real-world experience. It gave me a fresh perspective on the purpose of academic research and its broader role within the engineering ecosystem, as well as being a great chance to collaborate with others and be part of a team, contributing to meaningful projects at Shield AI.

What did you learn during your time at Shield AI?

I was reminded of the value of essential skills I had overlooked, such as maintaining weekly notes and staying organised in all aspects of my work. Working in a team again highlighted how critical these skills are for effectively communicating progress and collaborating with others. It reinforced the importance of structure and clear communication within a team setting.

Do you think the Australian space sector could benefit from working closer with academia through internships?

I believe the Australian space sector would benefit from closer collaboration with academia overall, and internships provide an excellent opportunity for students to bridge the gap between research and industry.

Images (left to right): ESA Interns Nermine & Brandon, Students at ESA Phi-Labs, MIT Intern Chang Liu

CASE STUDIES

Ongoing and/or completed SmartSat research projects from 2023-24.

CASE STUDY

SCARLET-β

THE INDUSTRY PROBLEM

The SCARLET-β project aimed to address the challenge of increasing spacecraft autonomy for satellite missions. The specific problem was the need for enhanced autonomous capabilities in satellite self-inspection and Earth observation operations, which are critical for the Defence Science & Technology Group (DSTG)'s Buccaneer Main Mission (BMM). End-users faced limitations due to the reliance on human interaction for these operations, which hindered efficiency and optimal use of small spacecraft and their payloads.

THE SOLUTION / OUTCOME

This initial phase aimed to successfully develop intelligent algorithms, progressing the advancement of spacecraft autonomy and enabling more capability and optimality from small spacecraft and their payloads with less human interaction.

BMM features the MANTIS (Manoeuvrable Antenna and Terrestrial Imaging System) payload with a controllable, deployable arm for self-inspection imaging. The algorithm developed will allow the payload to take an optimal image of itself against a backdrop of Australia from orbit in near-real time.

This will allow a greater opportunity for researchers to study the relationship between on-board and off-board autonomy. Additionally, the work allows for integrated scheduling of data acquisition and down-link, combined with energy aware planning.

The testing and development of these groundbreaking algorithms were conducted using a simulation, ready for integration and interfacing with the Hardware-in-the-Loop (HWIL) tests in the next phase of the project.

THE IMPACT

Australia is building space skills, hardware, and capabilities, and this must include autonomous algorithms to remain innovative in space system development and implementation. This project is a flagship of the SmartSat initiative SCARLET Laboratory (Spacecraft Autonomy Research Laboratory) to bring together researchers and industry to focus and coalesce efforts to advance spacecraft autonomy for tangible outcomes.

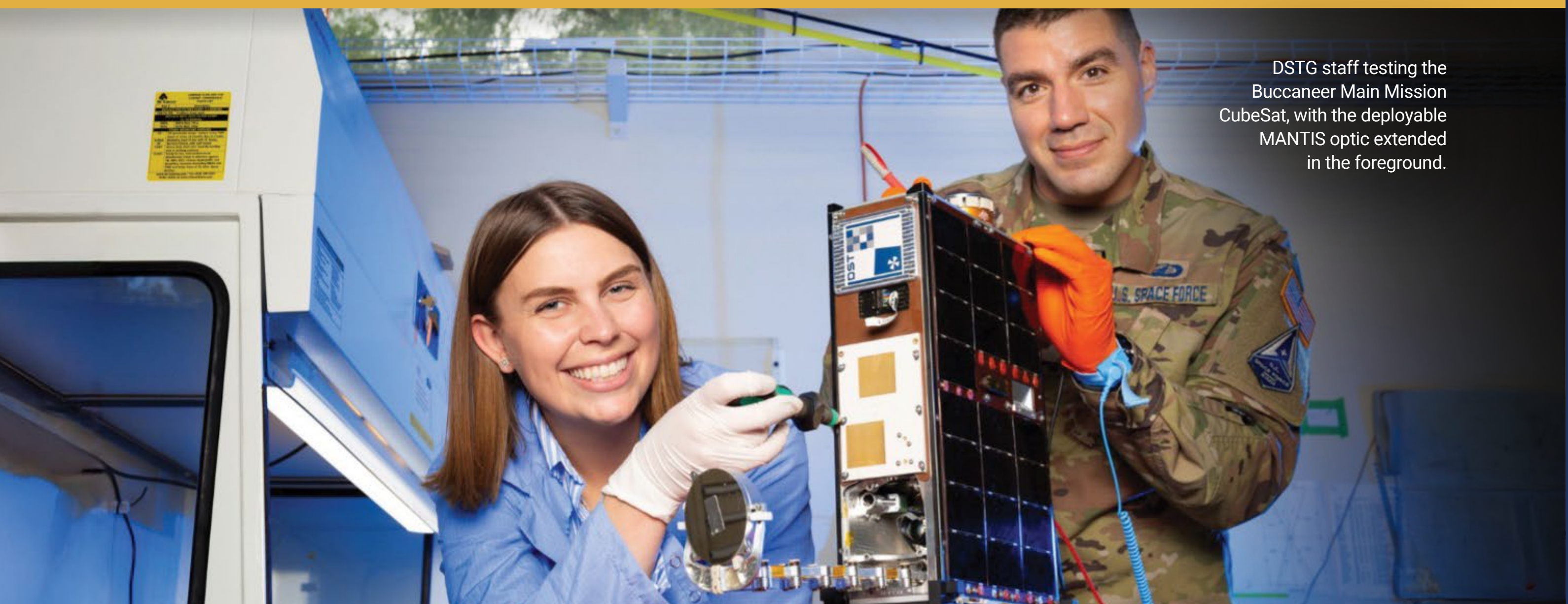
This autonomy project is an experiment to advance the use of autonomy in space and a precursor to future autonomy needs of the space hybrid architecture using smaller and smarter constellations of spacecraft. Its main near-term impact is to practically demonstrate to Defence the use of autonomy. The longer-term impact is that system-level and goal oriented autonomy becomes the foundation for future smarter spacecraft that rely less on human interaction in their operations.

"The National Defence Strategy identifies the importance of trusted autonomy for future Defence capabilities. This project is a step toward to realising that vision for the Space Domain".

— Dr David Lingard, Group Leader Space Autonomy, DSTG.

What's Next

The next phase involves integrating wide-area imaging capabilities with the self-inspection camera into the Earth imaging algorithm. This project is part of a broader plan under the SmartSat initiative to continuously advance spacecraft autonomy. Future plans include experimental testing using the BMM spacecraft and exploring additional commercial applications of these autonomous technologies.



DSTG staff testing the Buccaneer Main Mission CubeSat, with the deployable MANTIS optic extended in the foreground.

CASE STUDY

TECHNOLOGY DEVELOPMENT FOR IN-ORBIT SERVICING, ASSEMBLY AND MANUFACTURING (ISAM)

THE INDUSTRY PROBLEM

Maintaining satellites in orbit is challenging due to the harsh conditions of space and the risk of damaging expensive assets. The overarching challenge of this project is to enhance the reliability, sustainability, and functionality of the in-orbit servicing technologies to be developed and integrated into robotic spacecraft. Key challenges include:

- Ensuring real-time performance of the servicing system in a disruptive environment;
- Developing an autonomy strategy that seamlessly works all the way from the far-field orbital rendezvous with the target satellite through until the first mechanical contact;
- Capturing high dynamic range images of the target satellite in highly variable lighting conditions, with a textureless background and small relative size of objects in space;
- Designing imaging sensors for constrained volume, processing power and communication;
- Accurately detecting and tracking objects with a limited computational budget;
- Stabilising the servicing satellite while the robotic manipulator is in operations; and,
- Ensuring the overall safety and reliability of autonomous robotic operations in orbit.

THE SOLUTION / OUTCOME

To anchor the research in a realistic end-user application, the project is based on a reference mission to release a stuck mechanism on the exterior of a client spacecraft. This task is representative of freeing a deployable solar array or antenna on a malfunctioning satellite.

The project focuses on four core areas that will be required for future ISAM missions: Autonomy, Sensing, Perception and Control. These four workstreams will be complemented by ground-based demonstrations using mock robotic satellite hardware, thus making an integrated demonstration of the project's innovative ISAM capabilities.

The University of Sydney research team is developing an end-to-end software simulation covering all the technology areas in the study, including high-fidelity orbit propagation and visual effects. The team will conduct hardware-in-loop tests with the mock satellite hardware, including dynamics of the vehicles and robotic arms.

The industry partners participating in the project- Space Machines, Sperospace, ANT61, Abyss Solutions and Spiral Blue- are guiding the research team to capture commercially relevant specifications for the robotic system and the most appropriate use case scenarios to demonstrate the technologies.

The project outputs will include a thorough study of the technical requirements of the reference mission, equipping future Australian space mission developers with a detailed template for setting up future space robotic space missions incorporating autonomy and other advanced functionality.

THE IMPACT

This project addresses the gaps between autonomous robotic systems and the requirements of real-time and reliable close proximity operations. This will advance technologies for extending the lifespan of Australia's space assets and position Australian companies as leaders in the ISAM industry.

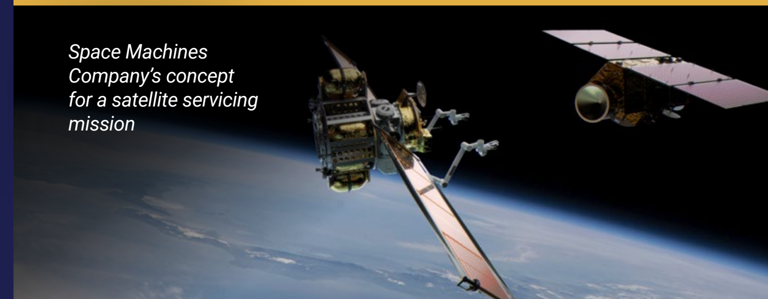
This foundational Australian capability in ISAM will help to position Australian companies with unique technologies, giving competitive advantages for selling into the international ISAM industry. The project outputs will be of high interest to Australian Space Agency and Defence.

"In the future, all spacecraft will be serviced. Participating in the ISAM project is giving Space Machines Company the chance to work in partnership with top Australian robotics and space researchers to tackle some of the crucial technical capabilities to deliver in-orbit satellite servicing solutions both in Australia and globally."

— Mark Ramsey, Chief Commercial Officer, Space Machines

WHAT'S NEXT

SmartSat and the research team aim to demonstrate this technology on a future space mission.



Space Machines Company's concept for a satellite servicing mission

CASE STUDY

AQUAWATCH COASTAL WATER QUALITY PILOT: INTEGRATION OF SATELLITE AND IN SITU OBSERVATIONS WITH ECOSYSTEM MODELLING DATA STREAMS FOR WATER QUALITY UNDERSTANDING IN TWO AUSTRALIAN COASTAL ECOSYSTEMS

THE INDUSTRY PROBLEM

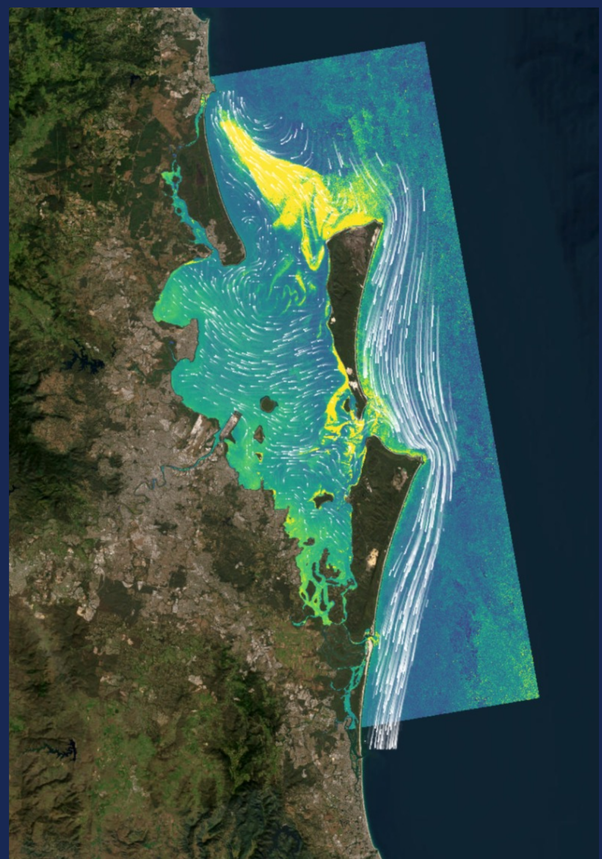
Australian coastal water bodies face significant environmental challenges due to aquaculture activities and development projects. In Moreton Bay, Queensland, concerns about the spread of white spot disease in aquaculture, and in Cockburn Sound, Western Australia, worries about the environmental impact of proposed port development, highlight the need for advanced water quality monitoring systems. Traditional methods are often insufficient for timely, comprehensive data collection and analysis, leaving regional water managers without the critical information needed for effective decision-making.

THE SOLUTION / OUTCOME

To address these challenges, the project team launched a pilot project to demonstrate the AquaWatch system's capabilities in monitoring coastal water quality. The project established collaborations with the Queensland Department of Agriculture and Fisheries (QLD DAF) and the Western Australia Department of Water and Environmental Regulation (WA DWER). The initiative integrated space-based satellite data with ground-based sensors, creating a comprehensive ground-to-space water quality monitoring and data visualization system.

In Moreton Bay, the project focused on using satellite water quality products and hydrodynamic modelling to understand the spatial patterns of white spot disease. In Cockburn Sound, new sensors were deployed to enhance existing measurements, and satellite technologies were used to map water quality parameters over time. The data integration and visualization were facilitated through the enhanced EASI/AquaWatch ADIAS platform, with prototypes developed using Python Jupyter Notebooks, co-designed with project partners.

A prawn infected with white spot disease.



The prototype Moreton Bay visualisation portal showing the full spatial domain. Animated vector. Fields of mean current magnitude and direction for the summer season are displayed overlayed on an underlying image of the mean distribution of tss in the bay derived from the landsat algorithm.

THE IMPACT

The AquaWatch Coastal Water Quality Pilot Project has significantly advanced the field of coastal water quality monitoring. By combining in-water sensor data, satellite remote sensing information, and outputs from hydrodynamic models, the AquaWatch system provided a comprehensive, real-time view of water quality across the targeted regions at a level of detail unattainable using traditional methods.

The project utilised satellite water quality products to create detailed hydrodynamic models, significantly enhancing the understanding of environmental factors influencing aquaculture health, such as white spot disease. The project's innovative use of HydraSpectra sensors, tailored specifically to the bio-optical characteristics of Australian coastal waters, combined with satellite validation, created a highly efficient monitoring network that could detect subtle changes in water quality with high precision.

The project also developed and implemented machine learning algorithms designed to process and analyze water quality data. These algorithms were specifically tuned to the unique bio-optical properties of Australian coastal waters, making them particularly effective. By automating the analysis of vast amounts of data, these machine learning tools provided real-time insights and predictive capabilities.

The integration of these algorithms into the ADIAS platform allowed for the seamless visualization and exploration of complex data sets and enabled stakeholders to interactively explore water quality data, facilitating more informed decision-making. Stakeholders were actively involved in co-designing the project's components, particularly the visualization and data integration tools, ensuring the final products met the specific needs and preferences of end-users.

The project's impact extends beyond immediate technical achievements, fostering a sense of ownership and investment among regional stakeholders, and is expected is expected to drive continued innovation and adoption of advanced water quality monitoring systems in other coastal regions.

WHAT'S NEXT

The lessons learned and successes achieved during the pilot phase have provided critical insights that will inform future expansions of the program. The optical characterisation of Cockburn Sound and the extended monitoring periods planned for future phases will build on the current achievements, enhancing the system's accuracy and reliability. In Moreton Bay, further validation of water quality algorithms and the exploration of additional data sources will continue to refine the system's capabilities. These efforts are aimed at creating a robust forecasting tool that can predict and mitigate the impacts of environmental stressors on aquaculture and other coastal activities.

By demonstrating the feasibility and value of a ground-to-space water quality monitoring system, this project has set a new standard for environmental monitoring across multiple sectors. These achievements underscore the transformative potential of technology in addressing complex environmental challenges and pave the way for future innovations in the field.

CSIRO's HydraSpectra sensor

CASE STUDY

CORAL AND SEAGRASS MAPPING

THE INDUSTRY PROBLEM

Live coral cover and seagrass species composition are key indicators for scientists and managers to assess the health of coral reef habitats. Despite the critical need for accurate mapping of these features, current methods using multispectral sensors are insufficient. There have been no successful attempts to map seagrass species composition on a regional to global scale, nor live coral cover, with only a few examples at local scales. The challenge is to develop a reliable method to detect and differentiate live coral cover and seagrass species using hyperspectral imagery, which is recognised as necessary for this level of detail.

With increasing numbers of hyperspectral satellites being launched since 2021 and more launches planned in the coming years - many capable of global coverage - there is now an opportunity to investigate these challenges. Additionally, there is a growing need to develop remote sensing frameworks to assess their capability for live coral and seagrass cover mapping.

THE SOLUTION / OUTCOME

The project aims to utilise newly launched hyperspectral satellites to address this challenge. The strategy involves:

1. Researching the capabilities of hyperspectral sensors to map live coral and seagrass properties.
2. Designing experiments to determine the optimal spatial, spectral, and radiometric resolutions.
3. Developing AI and machine learning models to support the differentiation of these habitats.
4. Implementing a processing workflow that combines satellite data with physical attributes and field data.

The project leverages existing hyperspectral datasets and newly acquired data from recently launched cubesats (including the soon to be launched Kanyini), to test and refine these methods. The expected outcome includes the development of state-of-the-art artificial intelligence models and image processing algorithms, providing a roadmap for future mapping initiatives.

THE IMPACT

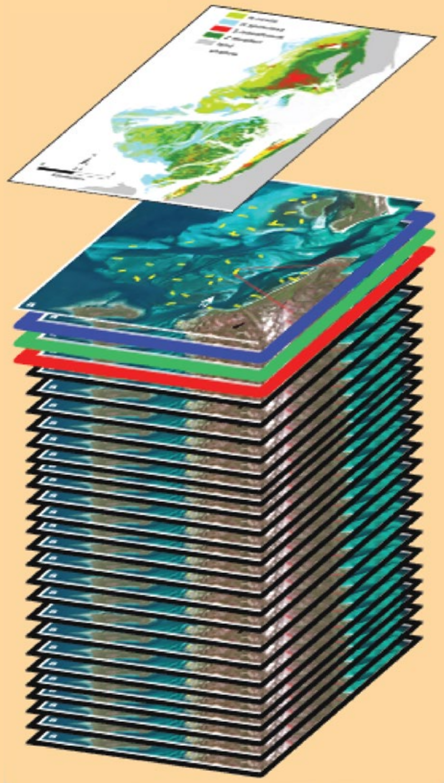
This research aims to significantly improve the ability to map and monitor coral and seagrass habitats, enhancing the competitiveness and sustainability of Australia's marine industries. This advancement supports better management and conservation of marine ecosystems, providing valuable information to scientists and managers.

"Utilising the combination of quality in-situ data, high spectral resolution hyperspectral imagery, and machine learning models, we are aiming to provide comprehensive tools and workflows for mapping and monitoring key shallow marine ecosystems. We are excited to identify the capabilities of existing and planned hyperspectral satellites in providing essential large scale ecosystem monitoring services for both live coral and seagrass habitats, empowering both scientists and decision makers with the resources and knowledge needed to help preserve these critically important environments.

— Dr Dylan Cowley, The University of Queensland

HABITAT MAPPING

- Regional scale
- Differentiate between live/dead coral
- Identify seagrass species and other crucial bethnic features
- Machine learning and object based classification



FIELD SPECTRA

- Field measurements
- Spectral characterisation
- Ecological characteristics of live coral and seagrass

SPATIAL / TEMPORAL VARIABILITY

- Spatial extent and temporal changes
- Species abundance and status
- Remote sensing characteristics of live coral and seagrass.

HYPERSPECTRAL SATELLITES

- EnMAP, PRISMA, Kanyini, etc
- Key spectral bands
- Comparison with field spectra
- Atmospheric and water column corrections

WHAT'S NEXT

A subsequent phase would be implementing the developed methods using Australian-developed technologies and satellite sensors to assess live coral and seagrass species in Australian waters. This project lays the groundwork for future large-scale mapping initiatives and potential commercial applications in marine habitat monitoring.

Images: Example coral photographs from Heron Reef

APPENDIX

SmartSat PhD Students
Consolidated Financial Report 2023-24.

🎓 Graduated

✈ Participated in international PhD internship or placement

SMARTSAT PHD STUDENTS

	Student	Commencement — Completion	Research Program	University	Country	Project Title
🎓	Benjamin Dix- Mathews	2020 — 2022	RP 1	University of Western Australia	Australia	Phase- and spatial- stabilisation system development
🎓	Skevos Karpathakis	2021— 2024	RP 1	University of Western Australia	Australia	Phase- and spatial- stabilisation system development / Coherent Free-Space Optical Communications
	Duaa Fatima	2020 — 2025	RP 1	La Trobe University	Pakistan	Physical Layer Security for Satellite based IoT Edge Services with Deep Reinforcement Learning for Energy Efficiency
	Zachary Aul	2020 — 2024	RP 1	La Trobe University	Australia	Anomaly Detection in IoT for Satellite Security Using Blockchain
🎓	Mohamed Shehata	2021— 2024	RP 1	University of Adelaide	Egypt	Potentials and Limitations of the IEEE 802.15.3d Standard for Terahertz Satellite Communications
🎓	Ahsan Waqas	2021— 2024	RP 1	University of South Australia	Pakistan	Distributed Beamforming for Satellite Applications
	Kou Tian	2021— 2024	RP 1	University of Sydney	China	Deep Learning for Advanced Physical Layer Communications
	Vibhor Thapliyal	2022 —2025	RP 1	La Trobe University	India	Fabrication of 3-D, Wavelength-Tuneable Photonic Crystals for Space-based mm-Wave, Terahertz, and Infrared Communications
	Ziwei Wang	2021— 2024	RP 2	Australian National University	China	Event-based attitude estimation for space applications
🎓 ✈	Anne Bettens	2020 — 2023	RP 2	University of Sydney	Australia	Autonomous navigation of satellites for space exploration
	Sam Hilton	2020 — 2024	RP 2	Royal Melbourne Institute of Technology	Australia	Human-Autonomy teaming for intelligent Distributed Satellite Operations
🎓	Jordan Plotnek	2020 — 2023	RP 2	University of South Australia	Australia	Measuring Control System Resilience to Cyber-Physical Threat in a Satellite Context
	Thomas Graham	2021 — 2024	RP 2	Swinburne University of Technology	Australia	Responsible AI in Space
	Sabrina Slimani	2021 — 2024	RP 2	University of Adelaide	Australia	Using quantum entanglement to remotely synchronise clocks
✈	Emily Ahern	2021 — 2024	RP 2	University of Adelaide	Australia	Compact Clock for Small Satellite Applications: Protocol Development for Increased Stability
🎓	Kathiravan Thangavel	2021 — 2023	RP 2	Royal Melbourne Institute of Technology	India	AI for Distributed Satellite Systems Autonomous Operations: An Integrated Approach to Space and Control Segments Co-Evolution
	Sai Vallapureddy	2021 — 2024	RP 2	Royal Melbourne Institute of Technology	India	A machine learning based solution for Space Situational Awareness and Space sustainability
🎓	Artur Medon	2021 — 2023	RP 2	University of South Australia	Australia	Small satellite thermal management with 3D printed metal heat sinks containing phase change material thermal storage
✈	Brandon Victor	2021 — 2024	RP 2	La Trobe University	Australia	Using Satellite Data to Locate and Phenotype Plants from Space
	Harikesh Singh	2021 — 2024	RP 2	University of Sunshine Coast	India	An empirical and dynamic tool for prediction of forest fire spread using remote sensing and machine learning techniques
🎓 ✈	Chang Liu	2021 — 2024	RP 2	University of New South Wales	China	Building damage estimation after natural disaster using multi satellite source data based on machine learning
	Jordan Shippard	2022 — 2025	RP 2	Queensland University of Technology	Australia	Efficient Subnets for Scalable Onboard AI in Space
✈	Nermine Handy	2021 — 2024	RP 2	Royal Melbourne Institute of Technology	Australia	Interference modelling, detection, and mitigation for improving spaceborne SAR performance
	Trung Dung Nguyen	2022 — 2025	RP 2	La Trobe University	Vietnam	Advances in Long-term Water Quality Monitoring through Data Fusion
	Joshua Davis	2022 — 2025	RP 2	La Trobe University	Australia	Attack-resilient CubeSat constellations
	Nur Fajar Trihantoro	2021 — 2024	RP 3	Royal Melbourne Institute of Technology	Indonesia	Real Time Fire Analytics
🎓	Konstantinos Chatzopoulos Vouzoglanis	2021 — 2024	RP 3	Royal Melbourne Institute of Technology	Greece	Real Time Fire Analytics
	Simon Ramsay	2021 — 2024	RP 3	Royal Melbourne Institute of Technology	Australia	Real Time Fire Analytics
	Jason Dail	2022 — 2025	RP 3	University of Queensland	USA	Towards effective adaptive monitoring of UN SDG #15 Protect and Sustain Terrestrial Ecosystems using EO Data, Products and Services
	Liang Zhao	2021 — 2024	RP 3	University of South Australia	China	Satellite image-based smoke detection for bush fire detection

SMARTSAT PHD STUDENTS

🎓 Graduated

✈️ Participated in international PhD internship or placement

	Student	Commencement — Completion	Research Program	University	Country	Project Title
	Yanli Yu	2021 — 2022	RP 3	Australian National University	China	Monitoring changes in water quality in response to landcover disturbance with Earth Observations in Australia
🎓	Alvaro Valenzuela Quinteros	2021— 2024	RP 3	University of Western Australia	Chile	Innovations in spatial response assessment for satellite images
	Robert Andriambololonaharisoamalala	2021 — 2024	RP 4	Curtin University	Madagascar	Integration of Earth Observation data and ground-based measurements to accurately map the effect of Urban Heat Islands
✈️	Vinícius Guedes	2022 — 2025	RP 2	Flinders University	Brazil	How to preserve national aspirations and promote cyber defence policies
	Lucas Tutsui da Silva	2023 — 2026	RP 3	University of New South Wales	Brazil	Semi-Supervised Learning for Automatic Improvement of Onboard Object Detection Models on Small Satellites
	Uakomba Uhongora	2022 — 2025	RP 1	University of South Australia	Namibia	Deep Learning Intrusion Detection System for Smart Satellite Networks Based on Software Defined Networking
	Xiongren Chen	2022 — 2025	RP 1	University of South Australia	China	Interpretable Machine Learning for the Early Smoke Wild-fire Detection
	William Meakin	2022 — 2025	RP 1	University of Adelaide	Australia	Onboard Machine Learning for Intelligent Satellites
	Yue Cai	2022 — 2025	RP 2	University of Sydney	China	Deep learning-based Low earth orbit (LEO) satellites task offloading and massive MIMO implementation
	Michael Aygur	2023 — 2026	RP 1	Royal Melbourne Institute of Technology	Australia	Cognitive Satellite Radios
	Kithmini Weththasinghe	2022 — 2025	RP 1	University of Technology Sydney	Sri Lanka	Cognitive Satellite Radios
	Hira Saleem	2023 — 2026	RP 3	University of New South Wales	Pakistan	Natural hazard prediction and damage assessment using multimodal satellite and geospatial data in self-supervised XAI model
	William Damario Lukito	2023 — 2026	RP 1	La Trobe University	Indonesia	Machine Learning Approach for The Enhancement of Transmission Capacity and Latency for IoT Satellite Communications Based on Resource Allocation
	Arun Thekedathu Raveendran	2024 — 2027	RP 1	University of Technology of Sydney	India	High Performance Beam Steering Antenna Systems for Space Applications
	Gillian Rowan	2023 — 2026	RP 3	University of Queensland	Canada	Using space-based Earth Observation to map Australia's kelp forests for a stronger Blue Carbon economy
	Harrison Bennett	2023 — 2026	RP 2	University of Adelaide	Australia	Machine learning-enabled satellites for Agile Space Operations
	Franke Agenbag	2023 — 2026	RP 2	University of South Australia	Australia	An automated method of detecting, characterising, and responding to radiation events in space.
	Francis Kagai	2023 — 2026	RP 1	Swinburne University of Technology	Kenya	Emergency Buddy System
	Than Myint Swe	2023 — 2026	RP 3	University of Queensland	Myanmar	On-ground management of soil health by integrating proximal and remote sensing platforms in northern Australian savannas grazing land
	Raja Ram Aryal	2022 — 2025	RP 3	University of Queensland	Nepal	Solar Induced Chlorophyll Fluorescence (SIF) for plant health/stress and productivity remote sensing applications
	Elliot Hansen	2023 — 2026	RP 2	University of Adelaide	Australia	Advanced Synthetic Aperture Radar-based Surface and Underwater Object Detection and Classification
	Geekiyanage Deepa Rakshitha De Silva	2023 — 2026	RP 1	Deakin University	Sri Lanka	Cognitive Satellite Radios
	Charith Dissanayake	2023 — 2026	RP 1	Royal Melbourne Institute of Technology	Sri Lanka	Cognitive Satellite Radios
	Sithumini Kankanamge	2024 — 2027	RP 3	Macquarie University	Sri Lanka	Cognitive Satellite Radios
	Bazarzagd Lkhagvasuren	2023 — 2026	RP 3	Curtin University	Mongolia	Integration of Digital Earth and IoT for water quality monitoring
	Pretha Sur	2023 — 2026	RP 2	Deakin University	India	SCARLET-α
	Ghaith Suleiman Mustafa El-Dalahmeh	2023 — 2026	RP 2	Swinburne University of Technology	Jordan	SCARLET-α
	Mohamad Abdul Hady	2024 — 2027	RP 2	University of South Australia	Indonesia	SCARLET-α
	Monirul Islam Pavel	2024 — 2027	RP 2	University of South Australia	Bangladesh	SCARLET-α

Graduated

Participated in international PhD internship or placement

SMARTSAT PHD STUDENTS

Student	Commencement — Completion	Research Program	University	Country	Project Title
Hassam Tahir	2024 — 2027	RP 2	Swinburne University of Technology	Pakistan	SCARLET-α
Francesca Devoto	2023 — 2026	RP 3	University of Queensland	Italy	Determining the Effects of A-Biotic Stress on Crop Growth Development, and Yield under Different Nitrogen Applications using Remotely Sensed Data for Cotton and Wheat
Chengxi Luo	2023 — 2026	RP 3	La Trobe University	China	Machine learning based water quality parameters predicting and forecasting
Glen Eaton	2023 — 2026	RP 3	University of Queensland	Australia	Automating individual tree-scale aboveground biomass inventory and monitoring at local to regional scales with drone LiDAR and satellite data
Zhenguyen Chai	2024 — 2027	RP 3	Curtin University	China	Environmental Science with Support for Machine Learning Applications'
Joanna Smart	2024 — 2027	RP 3	University of Queensland	Australia	Developing capability to assess live coral cover and seagrass species using satellite based hyperspectral imagery
Donna Fitzgerald	2023 — 2026	RP 3	University of South Australia	Australia	Quantifying Dieback of Eucalypt Forests using Remote Sensing
Oliver Hatswell	2024 — 2027	RP 3	Flinders University	Australia	Innovative Mapping of Archaeological Landscapes Using Satellite Remote Sensing
Ethan Elms	2024 — 2027	RP 2	University of Adelaide	Australia	Close proximity space domain awareness on board satellite systems
Yu Luo	2024 — 2027	RP 3	University of Sydney	China	Crop mapping based on satellite image time series
Joram Downes	2024 — 2027	RP 6	University of Adelaide	Australia	Developing capability to assess live coral cover and seagrass species using satellite based hyperspectral imagery
Mingjun Fun	2024 — 2027	RP 2	University of South Australia	China	SCARLET-α
Anonnya Ghosh	2024 — 2027	RP 2	Deakin University	Bangladesh	SCARLET-α

SmartSat CRC Ltd and its Controlled Entities

ABN 63 633 923 949

Consolidated Financial Report - 30 June 2024

The Directors present their report on SmartSat CRC Ltd (SmartSat) and its Controlled Entities (the 'Group') for the year ended 30 June 2024.

Directors
The following persons were Directors of SmartSat during the whole of the financial year and up to the date of this report, unless otherwise stated:

Director	Position	Date appointed - resigned
Dr. Michele Allan AO	Chair	20/01/2023
	Acting Chair	06/12/2022 - 19/01/2023
Prof. Andy Koronios	CEO & Managing Director	05/08/2019
Dr. Jacqueline Craig AM	Director	27/11/2019
Dr. Rosalind Dubs	Director	27/11/2019 - 15/05/2024
Prof. Margaret Harding	Director	27/11/2019
Dr. Danielle Wuchenich	Director	31/01/2021
Ms. Mikaela Jade	Director	17/02/2022
Prof. Roy Green	Director	23/05/2023

Principal activities
The principal activities of SmartSat during the financial period were to conduct translational research which creates game-changing technologies, generate know-how that will make Australian industries more competitive, and future-proof jobs for the Australian population.

SmartSat is a consortium of universities and other research organisations, partnered with industry that has been funded by the Australian Government to develop know-how technologies in advanced telecommunications and IoT connectivity, intelligent satellite systems and earth observation next generation data services. The impact of this research will be to develop intellectual property and a specialised space industry expertise that will spawn new businesses, create export economic value and generate new high-tech jobs for all Australians.

Short and long term objectives of the Group
SmartSat was established to tackle three major challenges:

1. Lack of universal digital connectivity; (communication and connectivity)
2. Fragmented space ecosystem; (creation of an integrated space R&D ecosystem)
3. Technology-limited earth observation. (earth observation from space)

The strategic objectives of SmartSat are to:

- Forge space systems research
- Drive innovation and transformation
- Develop a space industry
- Foster a space smart nation
- Position Australia as a global player in the space sector

The Group's strategy for achieving its objectives
SmartSat has developed strategic and operational plans that underpin the achievement of its strategic objectives. These include:

SmartSat CRC Ltd and its Controlled Entities
Directors' report
30 June 2024

- Seeking peer review of SmartSat projects and outcomes from world leaders in space research and development
- Developing a continuous review approach
- Identifying areas of high impact applications in which to develop research programmes relevant to Earth Observation needs
- Developing a technology roadmap to align research projects and technology development to selected applications
- Identifying higher degree research (HDR) topics that suggest and augment the research programme
- Conducting a space industry skill needs analysis
- Collaborating with educational providers in mapping all available relevant training programs
- Development of partnerships to share expertise, capabilities and strategies
- Using media tracking services to track media reporting on SmartSat activities and outputs

Key performance indicators used by the Group
Key performance indicators have been developed for each of the Group's objectives including:

- Partners contributing additional funding to CRC approved research projects
- Recognition of excellence in national and international events and activities
- External bench marking of research projects
- Successful completion of at least 70 HDR students
- A percentage of SmartSat students will be employed by the Australian Space Industry

The Group's key performance measures used are the milestones that are set up in the CRC Commonwealth Agreement and SmartSat is required to report against those milestones on a quarterly basis. SmartSat is also required to submit an annual report to the Commonwealth.

Significant changes
There were no significant changes to the operations of the Group.

Operating result
The operating result of the Group for the year amounted to a deficit of $80,459 (2023: surplus of $2,748,786).

Dividends
The Group is limited by guarantee and has no share capital. No dividends were paid or declared by SmartSat for the period.

Events after the reporting date
No matters or circumstances have arisen since the end of the financial year which significantly affected or may significantly affect the operations of the Group, the results of those operations or the state of affairs of the Group in future financial years.

Future developments and results
As the Group continues its activities, further expenditure will be incurred on research, educational and other activities and projects established by SmartSat.

Environmental issues
The Group's operations are not regulated by any significant environmental regulations under a law of the Commonwealth or of a state or territory of Australia.

Information on Directors
The information on Directors is as follows:

Director	Qualifications
Dr. Michele Allan AO FAICD	B App Sc (Biomedical), DBA, M Mgmt Tech, M Com Law
Prof. Andy Koronios FACS FISEAM GAICD	PhD, MLitt(Comp), GradDip Ed, BE
Dr. Jacqueline Craig AM FTSE	Bsc, MSc, PhD
Dr. Rosalind Dubs FTSE FAICD	BSc, Dr ès SC (Lausanne)
Prof. Margaret Harding FRACI MAICD	BSc (Hons, Chemistry), PhD (Chemistry), DSc (Chemistry)
Dr. Danielle Wuchenich	PhD (Physics), BSc (Physics and Mathematical Studies), BA (Spanish Studies)
Ms. Mikaela Jade	M Applied Cybernetics, BSc (Environmental Biology), Grad Cert Indigenous Land management
Prof. Roy Green FIAM FRSA FCRD FRSNSW	PhD, LLB, BA

Meetings of Directors
The number of meetings of the company's Board of Directors ('the Board') held during the year ended 30 June 2024, and the number of meetings attended by each Director were:

	Full Board	
	Attended	Held
Dr. Michele Allan AO	4	4
Prof. Andy Koronios	4	4
Dr. Jacqueline Craig AM	3	4
Dr. Rosalind Dubs	3	3
Prof. Margaret Harding	4	4
Dr. Danielle Wuchenich	4	4
Ms. Mikaela Jade	4	4
Prof. Roy Green	3	4

Held: represents the number of meetings held during the time the Director held office.

Indemnification and insurance of officers and auditors
The Directors and Officers of the Group are covered by a Directors and Officers insurance policy, paid by the Group.

No other indemnities have been given during or since the end of the year for any person who is or has been an officer or auditor of the Group.

Proceedings on behalf of the Group
No proceedings have been entered into on behalf of the Group.

Member's guarantee
SmartSat is a company limited by guarantee. In the event of, and for the purpose of winding up of the company, the amount capable of being called up from each member and any person or association who ceased to be a member in the year prior to the winding up, is limited to $100 for members that are corporations and for all other members, subject to the provisions of the Group's constitution.

SmartSat CRC Ltd and its Controlled Entities
Directors' report
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At 30 June 2024 the collective liability of members was $1,100 (2023: $1,100).

Auditor's independence declaration
A copy of the auditor's independence declaration in accordance with section 60-40 of the Australian Charities and Not-for-profits Commission (ACNC) Act 2012, for the year ended 30 June 2024, has been received and can be found immediately after this Directors' report.

This report is made in accordance with a resolution of the Board of Directors:

Dr. Michele Allan AO	Prof. Andy Koronios
Chair	CEO & Managing Director

25 September 2024

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Australia

DECLARATION OF INDEPENDENCE
BY JOSH CARVER
TO THE DIRECTORS OF SMARTSAT CRC LTD

As lead auditor of SmartSat CRC Ltd for the year ended 30 June 2024, I declare that, to the best of my knowledge and belief, there have been:

1. No contraventions of the auditor independence requirements of section 60-40 of the *Australian Charities and Not-for-profits Commission Act 2012* in relation to the audit; and
2. No contraventions of any applicable code of professional conduct in relation to the audit.

This declaration is in respect of SmartSat CRC Ltd and the entities it controlled during the period.

JDCarver

Josh Carver
Director

BDO Audit Pty Ltd

Adelaide, 25 September 2024

SmartSat CRC Ltd and its Controlled Entities
Consolidated statement of profit or loss and other comprehensive income
For the year ended 30 June 2024

	Note	Consolidated 2024 $	Consolidated 2023 $
Revenue	4	16,417,524	17,156,611
Other income	5	2,353,625	2,439,222
Total revenue and other income		18,771,149	19,595,833
Programme Costs	6	15,385,136	13,364,373
Business development		250,877	341,950
Conference & seminars		157,940	176,436
Administration fees	7	1,736,086	1,721,447
Governance		442,883	467,050
Information technology		245,754	201,910
Marketing & promotions		227,627	323,456
Office operations		138,205	95,428
Other expenses		267,100	154,997
Total expenses		18,851,608	16,847,047
Surplus/(deficit) for the year attributable to the members of SmartSat CRC Ltd and its Controlled Entities		(80,459)	2,748,786
Other comprehensive income for the year		-	-
Total comprehensive income for the year attributable to the members of SmartSat CRC Ltd and its Controlled Entities		(80,459)	2,748,786

The above consolidated statement of profit or loss and other comprehensive income should be read in conjunction with the accompanying notes

SmartSat CRC Ltd and its Controlled Entities
Consolidated statement of changes in equity
For the year ended 30 June 2024

	Note	Consolidated 2024 $	2023 $
Assets			
Current assets			
Cash and cash equivalents	8	18,320,237	25,082,360
Trade and other receivables	9	1,028,729	1,027,283
Financial assets	12	7,168,643	-
Other assets		629	41,817
Total current assets		26,518,238	26,151,460
Non-current assets			
Property, plant and equipment	10	130,506	188,503
Right-of-use assets	11	385,214	545,962
Total non-current assets		515,720	734,465
Total assets		27,033,958	26,885,925
Liabilities			
Current liabilities			
Trade and other payables	13	6,008,555	5,710,837
Lease liabilities	14	165,069	150,298
Employee benefits	15	288,101	240,634
Total current liabilities		6,461,725	6,101,769
Non-current liabilities			
Lease liabilities	14	248,431	413,499
Employee benefits	15	99,389	65,785
Total non-current liabilities		347,820	479,284
Total liabilities		6,809,545	6,581,053
Net assets		20,224,413	20,304,872
Equity			
Retained earnings	17	20,224,413	20,304,872
Equity attributable to the members of SmartSat CRC Ltd and its Controlled Entities		20,224,413	20,304,872
Total equity		20,224,413	20,304,872

The above consolidated statement of financial position should be read in conjunction with the accompanying notes

SmartSat CRC Ltd and its Controlled Entities
Consolidated statement of changes in equity
For the year ended 30 June 2024

Consolidated	Research chairs Reserve $	Scholarships reserve $	Node reserve $	Retained earnings $	Total equity $
Balance at 1 July 2022	5,223,077	3,652,058	600,000	8,080,951	17,556,086
Surplus for the year	-	-	-	2,748,786	2,748,786
Other comprehensive income for the year	-	-	-	-	-
Total comprehensive income for the year	-	-	-	2,748,786	2,748,786
Transfer from reserves	(5,223,077)	(3,652,058)	(600,000)	9,475,135	-
Balance at 30 June 2023	-	-	-	20,304,872	20,304,872

Consolidated	Research chairs Reserve $	Scholarships reserve $	Node reserve $	Retained earnings $	Total equity $
Balance at 1 July 2023	-	-	-	20,304,872	20,304,872
Deficit for the year	-	-	-	(80,459)	(80,459)
Other comprehensive income for the year	-	-	-	-	-
Total comprehensive income for the year	-	-	-	(80,459)	(80,459)
Balance at 30 June 2024	-	-	-	20,224,413	20,224,413

The above consolidated statement of financial position should be read in conjunction with the accompanying notes

SmartSat CRC Ltd and its Controlled Entities
Consolidated statement of cash flows
For the year ended 30 June 2024

	Note	Consolidated 2024 $	Consolidated 2023 $
Cash flows from operating activities			
Receipts from grants (incl. GST)		8,339,940	8,479,114
Receipts from participants (incl. GST)		6,709,658	7,706,688
Receipts from other operating income (incl. GST)		2,662,725	2,657,429
Payments to suppliers and employees (incl. GST)		(18,117,776)	(17,270,184)
Interest income		990,773	722,469
Interest expense		(28,505)	(29,900)
Net cash provided by operating activities		556,815	2,265,616
Cash flows from investing activities			
Payments for property, plant and equipment		-	(79,864)
Net cash used in investing activities		-	(79,864)
Cash flows from financing activities			
Repayment of lease liabilities (principal)		(150,295)	(157,033)
Net cash used in financing activities		(150,295)	(157,033)
Net increase in cash and cash equivalents		406,520	2,028,719
Cash and cash equivalents at the beginning of the financial year		25,082,360	23,053,641
Cash and cash equivalents at the end of the financial year	8	25,488,880	25,082,360

The above consolidated statement of financial position should be read in conjunction with the accompanying notes

SmartSat CRC Ltd and its Controlled Entities
Notes to the Consolidated Financial Statements
30 June 2024

Note 1. General introduction

The consolidated financial statements and notes represent those of SmartSat CRC Ltd (SmartSat) and its Controlled Entities (the 'Group'). SmartSat is a not-for-profit unlisted public company limited by guarantee, incorporated and domiciled in Australia. SmartSat is also a registered charity with the *Australian Charities and Not-for-profits Commission Act 2012*. Aurora Space Cluster Pty Ltd is a wholly owned subsidiary of SmartSat.

The consolidated financial report is measured using the currency of the primary economic environment in which the Group operates in (the 'financial currency'). The financial report is presented in Australian dollars which is the Group's functional and presentation currency.

The financial report was authorised for issue by the Directors on 25 September 2024. The Directors have the power to amend and reissue the financial statements.

Principles of Consolidation

This consolidated financial report has been prepared in accordance with the Australian Accounting Standards - Simplified Disclosures issued by the Australian Accounting Standards Board ('AASB') and the *Australian Charities and Not-for-profits Commission Act 2012*, as appropriate for not-for-profit oriented entities. This includes compliance with the recognition and measurement requirements of all Australian Accounting Standards, Interpretations and other authoritative pronouncements of the Australian Accounting Standards Board and the disclosure requirements of *AASB 1060 General Purpose Financial Statements - Simplified Disclosures for For-profit and Not-for-profit Tier 2 Entities*.

Historical cost convention

The consolidated financial report has been prepared on an accrual basis and under the historical cost convention, unless otherwise stated.

Rounding of amounts

The Group is of a kind referred to in Corporations Instrument 2016/191, issued by the Australian Securities and Investments Commission, relating to 'rounding-off'. Amounts in this report have been rounded off in accordance with that Corporations Instrument to the nearest dollar.

Critical accounting estimates

The preparation of the consolidated financial report requires the use of certain critical accounting estimates. It also requires management to exercise its judgement in the process of applying the Group's accounting policies. The areas involving a higher degree of judgement or complexity, or areas where assumptions and estimates are significant to the financial statements, are disclosed in note 3.

Note 2. Material Accounting Policy Information

The principal accounting policies adopted in the preparation of the consolidated financial report are set out below. These policies have been consistently applied to all the years presented, unless otherwise stated.

(a) New or amended Accounting Standards and Interpretations adopted

The Group has adopted all of the new or amended Accounting Standards and Interpretations issued by the Australian Accounting Standards Board ('AASB') that are mandatory for the current reporting period.

Any new or amended Accounting Standards or Interpretations that are not yet mandatory have not been early adopted.

Note 2. Material Accounting Policy Information (continued)

(b) Principles of Consolidation

This consolidated financial report incorporates the assets and liabilities of all subsidiaries of SmartSat as at 30 June 2024 and the results of all subsidiaries for the year then ended. SmartSat and its subsidiaries together are referred to in this consolidated financial report as the 'Group'.

Subsidiaries are all those entities over which the Group has control. The Group controls an entity when the Group is exposed to, or has rights to, variable returns from its involvement with the entity and has the ability to affect those returns through its power to direct the activities of the entity. Subsidiaries are fully consolidated from the date on which control is transferred to the Group. They are de-consolidated from the date that control ceases.

(c) Revenue Recognition

Income for Not-for-profit Entities

The consolidated entity considers the applicability of AASB 15 *Revenue from contracts with customers* to each significant income stream.

Where AASB 15 is determined to apply to an income stream, the consolidated entity recognises revenue at an amount that reflects the consideration to which the company is expected to be entitled in exchange for transferring goods or services to a customer. For each contract with a customer, the company: identifies the contract with a customer; identifies the performance obligations in the contract; determines the transaction price which takes into account estimates of variable consideration and the time value of money; allocates the transaction price to the separate performance obligations on the basis of the relative stand-alone selling price of each distinct good or service to be delivered; and recognises revenue when or as each performance obligation is satisfied in a manner that depicts the transfer to the customer of the goods or services promised, which may involve the recognition of contract assets and / or liabilities.

Contract assets are recognised when the company has transferred goods or services to the customer but where the company is yet to establish an unconditional right to consideration. Contract liabilities represent an obligation to transfer goods or services to a customer and are recognised when a customer pays consideration, or when the company recognises a receivable to reflect its unconditional right to consideration (whichever is earlier) before the company has transferred the goods or services to the customer.

AASB 15 *Revenue from contracts with customers* is only applicable to agreements with customers that contain:
1. 'Enforceable' rights and obligations; and
2. 'Sufficiently specific' performance obligations.

An agreement is typically enforceable by another party through legal or equivalent means if the agreement is in writing and includes sufficiently specific requirements of the parties.

Judgement is exercised in assessing whether promises within an agreement are 'sufficiently specific', taking into account any conditions specified in the arrangement (whether explicit or implicit) regarding the promised goods or services, including conditions regarding:
- the nature or type of the goods or services;
- the cost or value of the goods or services;
- the quantity of the goods or services; and
- the period over which the goods or services must be transferred.

Where the consolidated entity determines agreements with customers do not contain "enforceable" rights and obligations, or "sufficiently specific" performance obligations, the consolidated entity applies AASB 1058 *Income of Not-for-Profit Entities* and recognises income in full, either upon receipt, or when the unconditional right to receive payment is established (whichever comes earlier), and it is probable that the economic benefits comprising the contribution will flow to the consolidated entity.

Note 2. Material Accounting Policy Information (continued)

For the below listed revenue streams, the Group recognises revenue as follows:

Contributions from Participants

Contributions from Participants are recognised as revenue in the Statement of Profit or Loss and Other Comprehensive Income as they are received, or when the Group has an unconditional right to receive payment.

Government Grants

Government grants (including monetary grants at fair value) are recognised as revenue in the Statement of Profit or Loss and Other Comprehensive Income as they are received, or when the Group has a conditional right to receive payment. If conditions are attached to the grant which must be satisfied before the Group is eligible to retain the contributions, the grant will be recognised in the Statement of Financial Position as a liability until those conditions are satisfied.

Third Party Contributions

Contributions from other third parties are assessed on a case-by-case basis, with the Group evaluating whether sufficiently specific performance obligations are attached to the funding. Where sufficiently specific performance obligations are determined to exist, revenue is recognised in profit or loss when the Group satisfies the performance obligations. When the Group determines there are no sufficiently specific performance obligations, contributions are recognised as revenue in the Statement of Profit or Loss and Other Comprehensive Income as they are received, or when the Group has an unconditional right to receive payment.

Interest

Interest revenue is recognised as interest accrues using the effective interest method. This is a method of calculating the amortised cost of a financial asset and allocating the interest income over the relevant period using the effective interest rate, which is the rate that exactly discounts estimated future cash receipts through the expected life of the financial asset to the net carrying amount of the financial asset.

Volunteer services and other in-kind contributions

The Group has elected not to recognise volunteer services as either revenue or other form of contribution received in line with AASB 1058. As such any related consumption or capitalisation of such resources received is also not recognised.

Other revenue

Other revenue is recognised when it is received or when the right to receive payment is established.

(d) Financial Instruments

Financial instruments are recognised initially on the date that the Group becomes party to the contractual provisions of the instrument.

On initial recognition, all financial instruments are measured at fair value plus transaction costs (except for instruments measured at fair value through profit or loss where transaction costs are expensed as incurred).

Note 2. Material Accounting Policy Information (continued)

(e) Financial Assets

All recognised financial assets are subsequently measured in their entirety at either amortised cost or fair value, depending on the classification of the financial assets.

Classification

On initial recognition, the Group classifies its financial assets into the following categories, those measured at:

- amortised cost
- fair value through profit or loss - FVTPL
- fair value through other comprehensive income - equity instrument (FVOCI - equity)
- fair value through other comprehensive income - debt investments (FVOCI - debt)

Financial assets are not reclassified subsequent to their initial recognition unless the Group changes its business model for managing financial assets.

Amortised Cost

Assets measured at amortised cost are financial assets where:

- the business model is to hold assets to collect contractual cash flows; and
- the contractual terms give rise on specified dates to cash flows that are solely payments of principal and interest on the principal amount outstanding.

The Group's financial assets measured at amortised cost comprise trade and other receivables and cash and cash equivalents in the Statement of Financial Position.

Subsequent to initial recognition, these assets are carried at amortised cost using the effective interest rate method less provision for impairment.

Interest income, foreign exchange gains or losses and impairment are recognised in the Statement of Profit or Loss and Other Comprehensive Income. Gain or loss on derecognition is recognised in the Statement of Profit or Loss and Other Comprehensive Income.

SmartSat CRC Ltd and its Controlled Entities
Notes to the Consolidated Financial Statements
30 June 2024

Note 2. Material Accounting Policy Information (continued)

(f) Impairment of Financial Assets

Impairment of financial assets measured at amortised cost is calculated using an expected credit loss (ECL) approach which requires lifetime expected credit losses to be recognised from initial recognition of the financial assets.

When determining whether the credit risk of a financial asset has increased significantly since initial recognition and when estimating ECL, the Group considers reasonable and supportable information that is relevant and available without undue cost or effort. This includes both quantitative and qualitative information and analysis based on the Group's historical experience and informed credit assessment and including forward looking information.

The Group uses the presumption that an asset which is more than 90 days past due has seen a significant increase in credit risk.

The Group uses the presumption that a financial asset is in default when:

- the other party is unlikely to pay its credit obligations to the Group in full, without recourse to the Group to actions such as realising security (if any is held); or
- the financial assets is more than 120 days past due date.

Credit losses are measured as the present value of the difference between the cash flows due to the Group in accordance with the contract and the cash flows expected to be received. This is applied using a probability weighted approach.

(g) Income Tax

The Group's subsidiary, Aurora Space Cluster Pty Ltd is a for-profit unlisted company, limited by shares and is liable for income tax.

As SmartSat is a charitable institution in terms of subsection 50-5 of the *Income Tax Assessment Act 1997*, as amended, it is exempt from paying income tax.

(h) Current and Non-current Classification

Assets and liabilities are presented in the consolidated Statement of Financial Position based on current and non-current classification.

An asset is classified as current when: it is either expected to be realised or intended to be sold or consumed in the Group's normal operating cycle; it is held primarily for the purpose of trading; it is expected to be realised within 12 months after the reporting period; or the asset is cash or cash equivalent unless restricted from being exchanged or used to settle a liability for at least 12 months after the reporting period. All other assets are classified as non-current.

A liability is classified as current when: it is either expected to be settled in the Group's normal operating cycle; it is held primarily for the purpose of trading; it is due to be settled within 12 months after the reporting period; or there is no unconditional right to defer the settlement of the liability for at least 12 months after the reporting period. All other liabilities are classified as non-current.

(i) Cash and Cash Equivalents

Cash and cash equivalents includes cash on hand, deposits held at call with financial institutions, other short-term, highly liquid investments with original maturities of three months or less that are readily convertible to known amounts of cash and which are subject to an insignificant risk of changes in value.

Note 2. Material Accounting Policy Information (continued)

(j) Trade and Other Receivables
Trade receivables are initially recognised at fair value and subsequently measured at amortised cost using the effective interest method, less any allowance for expected credit losses. Trade receivables are generally due for settlement within 30 days.

The Group has applied the simplified approach in AASB 9 to measure expected credit losses, which uses a lifetime expected loss allowance. The Group has determined the probability of non-payment of the receivables and multiplied this by the amount of the expected loss arising from default.

The amount of the impairment is recorded in a separate allowance account with the loss being recognised in other expenses. Once the receivable is determined to be uncollectable then the gross carrying amount is written off against the associated allowance.

Where the Group renegotiates the terms of trade receivables due from certain customers, the new expected cash flows are discounted at the original effective interest rate and any resulting difference to the carrying value is recognised in the Statement of Profit or Loss and Other Comprehensive Income.

(k) Other Financial Assets Measured at Amortised Cost
Impairment of other financial assets measured at amortised cost are determined using the expected credit loss model in AASB 9. On initial recognition of the asset, an estimate of the expected credit losses for the next 12 months is recognised. Where the asset has experienced a significant increase in credit risk then the lifetime losses are estimated and recognised.

(l) Financial Liabilities
The Group measures all financial liabilities initially at fair value less transaction costs, subsequently financial liabilities are measured at amortised cost using the effective interest rate (EIR) method. Gains and losses are recognised in the Statement of Profit or Loss and Other Comprehensive Income when the liabilities are derecognised as well as through the effective interest rate amortisation process.

Amortised cost is calculated by taking into account any discount or premium on acquisition and fees or costs that are an integral part of the EIR. The EIR amortisation is included as finance costs in the Statement of Profit or Loss and Other Comprehensive Income.

The financial liabilities of the Group comprise trade and other payables.

(m) Property, Plant and Equipment
Property, plant and equipment is stated at historical cost less accumulated depreciation and impairment. Historical cost includes expenditure that is directly attributable to the acquisition of the items.

Depreciation is calculated on a straight-line basis to write off the net cost of each item of property, plant and equipment over their expected useful lives as follows:

Leasehold improvements are depreciated over the unexpired period of the lease or the estimated useful life of the assets, whichever is shorter.

Asset class	**Depreciation rate**
Leasehold improvements	5 years

The residual values, useful lives and depreciation methods are reviewed, and adjusted if appropriate, at each reporting date.

Note 2. Material Accounting Policy Information (continued)

An item of property, plant and equipment is derecognised upon disposal or when there is no future economic benefit to the Group. Gains and losses between the carrying amount and the disposal proceeds are taken to profit or loss.

Minor asset purchases of less than $3,000 are expensed as incurred.

(n) Right-of-use Assets
A right-of-use asset is recognised at the commencement date of a lease. The right-of-use asset is measured at cost, which comprises the initial amount of the lease liability, adjusted for, as applicable, any lease payments made at or before the commencement date net of any lease incentives received, any initial direct costs incurred, and, except where included in the cost of inventories, an estimate of costs expected to be incurred for dismantling and removing the underlying asset, and restoring the site or asset.

Right-of-use assets are depreciated on a straight-line basis over the unexpired period of the lease or the estimated useful life of the asset, whichever is the shorter. Where the Group expects to obtain ownership of the leased asset at the end of the lease term, the depreciation is over its estimated useful life. Right-of use assets are subject to impairment or adjusted for any remeasurement of lease liabilities.

(o) Impairment of Non-financial Assets
Non-financial assets are reviewed for impairment whenever events or changes in circumstances indicate that the carrying amount may not be recoverable. An impairment loss is recognised for the amount by which the asset's carrying amount exceeds its recoverable amount.

Recoverable amount is the higher of an asset's fair value less costs of disposal and value-in-use. The value-in-use is the present value of the estimated future cash flows relating to the asset using a pre-tax discount rate specific to the asset or cash-generating unit to which the asset belongs. Assets that do not have independent cash flows are grouped together to form a cash-generating unit.

(p) Trade and Other Payables
These amounts represent liabilities for goods and services provided to the Group prior to the end of the financial year and which are unpaid. Due to their short-term nature they are measured at amortised cost and are not discounted. The amounts are unsecured and are usually paid within 30 days of recognition.

(q) Leases
Finance leases are leases of fixed assets where substantially all of the risks and benefits incidental to the ownership of the asset are transferred to the Group, but the legal ownership is not transferred to the Group.

Finance leases are capitalised by recording a right-of-use asset and a corresponding liability at the lower of the amounts equal to the fair value of the leased asset, or the minimum lease payments measured at present value including any residual values.

Leased assets are depreciated on a straight-line basis over the shorter of their estimated useful lives or the lease term.

Short-term leases (remaining lease term of 12 months or less) or low value leases are charged to the Statement of Profit or Loss and Other Comprehensive Income on a straight-line basis over the term of the lease.

The Group has tested the right-of-use asset for impairment on the date of application and has concluded that there is no indication that the right-of-use asset is impaired.

Note 2. Material Accounting Policy Information (continued)

(r) Employee Benefits

Short-term Employee Benefits
Liabilities for wages and salaries, including non-monetary benefits, annual leave and long service leave expected to be settled wholly within 12 months of the reporting date are measured at the amounts expected to be paid when the liabilities are settled.

Other Long-term Employee Benefits
The liability for annual leave and long service leave not expected to be settled within 12 months of the reporting date are measured at the present value of expected future payments to be made in respect of services provided by employees up to the reporting date using the projected unit credit method. Consideration is given to expected future wage and salary levels, experience of employee departures and periods of service. Expected future payments are discounted using market yields at the reporting date on national government bonds with terms to maturity and currency that match, as closely as possible, the estimated future cash outflows.

(s) Provisions
Provisions are recognised when the Group has a legal or constructive obligation resulting from past events, for which it is probable that there will be an outflow of economic benefits and that outflow can be reliably measured. Provisions are measured using the best estimate available of the amounts required to settle the obligation at the end of the reporting period.

(t) Comparatives
Where necessary, comparative information has been reclassified and repositioned for consistency with current year disclosures.

(u) Goods and Services Tax ('GST') and Other Similar Taxes
Revenues, expenses and assets are recognised net of the amount of associated GST, unless the GST incurred is not recoverable from the tax authority. In this case it is recognised as part of the cost of the acquisition of the asset or as part of the expense.

Receivables and payables are stated inclusive of the amount of GST receivable or payable. The net amount of GST recoverable from, or payable to, the tax authority is included in other receivables or other payables in the consolidated Statement of Financial Position.

Cash flows are presented on a gross basis. The GST components of cash flows arising from investing or financing activities which are recoverable from, or payable to the tax authority, are presented as operating cash flows.

(v) Going Concern Assumption
The financial report has been prepared on a going concern basis which contemplates continuity of normal business activities and the realisation of assets and the settlement of liabilities in the ordinary course of business.

The accounting policies that are material to the Group are set out below. The accounting policies adopted are consistent with those of the previous financial year, unless otherwise stated.

Note 3. Critical accounting judgements, estimates and assumptions

The preparation of the financial report requires management to make judgements, estimates and assumptions that affect the reported amounts in the financial statements. Management continually evaluates its judgements and estimates in relation to assets, liabilities, contingent liabilities, revenue and expenses. Management bases its judgements, estimates and assumptions on historical experience and on other various factors, including expectations of future events, management believes to be reasonable under the circumstances. The resulting accounting judgements and estimates will seldom equal the related actual results. The judgements, estimates and assumptions that have a significant risk of causing a material adjustment to the carrying amounts of assets and liabilities (refer to the respective notes) within the next financial year are discussed below.

Revenue recognition
The Group was required to assess whether government grants and contributions from participants fell under the scope of AASB 15 or AASB 1058. Specifically, the Group had to determine whether the Agreements contained performance obligations that meet the 'sufficiently specific' criteria in sections F20-F26 of AASB 15. Judgement is necessary to assess whether a promise is 'sufficiently specific', which takes into account any conditions specified in the Agreements regarding the following aspects:

a) the nature or type of the goods or service;
b) the cost or value of the goods or services;
c) the quantity of the goods and services; and
d) the period over which goods or services must be transferred.

The Directors have determined that the Commonwealth and participant agreements in place do not contain performance obligations that meet the 'sufficiently specific' criteria as per sections F20-F26 of the AASB 15. Therefore, Grant Income has been recognised in accordance with AASB 1058: in full upon receipt or when the Group has the unconditional right to receive the contribution, and it is probable that the economic benefits comprising the contribution will flow to the Group.

Estimation of useful lives of assets
The Group determines the estimated useful lives and related depreciation and amortisation charges for its property, plant and equipment and finite life intangible assets. The useful lives could change significantly as a result of technical innovations or some other event. The depreciation and amortisation charge will increase where the useful lives are less than previously estimated lives, or technically obsolete or non-strategic assets that have been abandoned or sold will be written off or written down.

Employee benefits provision
As discussed in note 2, the liability for employee benefits expected to be settled more than 12 months from the reporting date are recognised and measured at the present value of the estimated future cash flows to be made in respect of all employees at the reporting date. In determining the present value of the liability, estimates of attrition rates and pay increases through promotion and inflation have been taken into account.

Project accrual estimates
Management reviews its estimate of accrued project expenditure at each reporting period. A key assumption in estimating project accruals is that expenditure occurs on a relatively straight-line basis over the life of the project. Management reviews actual cost data and project timelines to validate this assumption. Additionally, management assumes that the budgeted costs will materially equal actual costs upon project completion. This assumption is based on historical data showing immaterial variance between budgeted and actual costs across the Group's portfolio of projects.

These estimates and assumptions are reviewed on an ongoing basis. Changes in circumstances, facts and experience may result in revised estimates and actual results could differ from these estimates.

Note 4. Revenue

	Consolidated 2024 $	2023 $
Contributions	6,777,604	7,736,821
Government grants	8,339,940	8,479,114
Node funding	900,000	242,624
Third party contributions	399,980	698,052
Revenue	16,417,524	17,156,611

Note 5. Other income

	Consolidated 2024 $	2023 $
Interest income	990,880	722,469
Conference income	7,550	-
Consultancy work	458,745	247,991
Office space	-	12,086
Other income - Aurora	-	8,376
Space services mission	896,450	1,448,300
Other income	2,353,625	2,439,222

Note 6. Programme Costs

	Consolidated 2024 $	2023 $
Research expenditure	14,332,332	12,509,337
Education expenditure	1,002,800	825,274
Outreach	50,004	29,762
	15,385,136	13,364,373

SmartSat CRC Ltd and its Controlled Entities
Notes to the Consolidated Financial Statements
30 June 2024

Note 7. Administration expenses

	Consolidated 2024 $	2023 $
Depreciation expenses		
Depreciation expense - Right of use assets	160,746	152,532
Depreciation expense - leasehold improvements	57,997	57,948
	218,743	210,480
Employee benefits expenses		
Wages & salaries	1,163,496	1,099,220
Superannuation	158,007	130,790
Workcover	12,182	7,975
Leave expenses	81,069	111,469
Payroll tax	102,589	161,513
	1,517,343	1,510,967
	1,736,086	1,721,447

Note 8. Cash and cash equivalents

	Note	Consolidated 2024 $	2023 $
Cash at bank			
Aurora Space Cluster Pty Ltd		17,783	25,608
SmartSat CRC Ltd		5,232,354	4,834,531
SmartSat CRC Ltd (NAB TD #10713840)		-	4,151,034
SmartSat CRC Ltd (MyStateBank TD1)		-	4,657,885
SmartSat CRC Ltd (MyStateBank TD2)		-	3,602,435
SmartSat CRC Ltd (NAB TD #10792853)		-	5,168,453
SmartSat CRC Ltd (NAB #1128 - ACT Node)		1,077,228	1,030,962
SmartSat CRC Ltd (NAB #1814 QLD Node)		2,384,127	1,611,452
SmartSat CRC Ltd (NAB TD #511956426)		5,338,398	-
Smartsat CRC Ltd (NAB TD #418519627)		4,270,347	-
Cash at bank		18,320,237	25,082,360
Reconciliation to cash and cash equivalents at the end of the financial year			
The above figures are reconciled to cash and cash equivalents at the end of the financial year as shown in the consolidated statement of cash flows as follows:			
Balances as above		18,320,237	25,082,360
Financial assets (term deposits > 90 days)	12	7,168,643	-
Balance as per consolidated statement of cash flows		25,488,880	25,082,360

Note 9. Trade and other receivables

	Consolidated	
	2024 $	2023 $
Current assets		
Accounts receivable	1,078,729	1,027,283
Less: Allowance for expected credit losses	(50,000)	-
	1,028,729	1,027,283

The carrying value of trade and other receivables is considered a reasonable approximation of fair value due to the short-term nature of the balances. The maximum exposure to credit risk at the reporting date is the fair value of each class of receivable in the financial report.

Note 10. Property, plant and equipment

	Consolidated	
	2024 $	2023 $
Non-current assets		
Leasehold improvements - at cost	269,996	269,996
Less: Accumulated depreciation	(139,490)	(81,493)
	130,506	188,503

Reconciliations
Reconciliations of the written down values at the beginning and end of the prior and current financial years are set out below:

Consolidated	Leasehold improvements $	Total $
Balance at 1 July 2023	188,503	188,503
Depreciation expense	(57,997)	(57,997)
Balance at 30 June 2024	130,506	130,506

SmartSat CRC Ltd and its Controlled Entities
Notes to the Consolidated Financial Statements
30 June 2024

Note 11. Right-of-use assets

	Consolidated	
	2024 $	2023 $
Non-current assets		
Office lease	702,309	702,310
Less: Accumulated amortisation	(317,095)	(156,348)
	385,214	545,962

Reconciliations
Reconciliations of the written down values at the beginning and end of the current financial year are set out below:

Consolidated	$	Total $
Balance at 1 July 2023	545,962	545,962
Depreciation expense	(160,748)	(160,748)
Balance at 30 June 2024	385,214	385,214

Note 12. Financial assets

	Consolidated	
	2024 $	2023 $
Current assets		
Term deposits > 90 days	7,168,643	-

Note 13. Trade and other payables

	Consolidated	
	2024 $	2023 $
Current liabilities		
Accounts payables	411,978	391,115
Accrued expenses	5,335,068	5,188,791
Credit card	20,308	2,314
GST	112,020	33,026
Income tax payable	-	6,396
Fringe benefits tax payable	21,235	(7,340)
PAYG withholdings payable	79,098	70,447
Superannuation payable	28,848	26,088
	6,008,555	5,710,837

Note 13. Trade and other payables (continued)

Trade and other payables are unsecured, non-interest bearing and are normally settled within 30 days. The carrying value of trade and other payables is considered a reasonable approximation of fair value due to the short-term nature of the balances.

Note 14. Lease liabilities

	Consolidated	
	2024 $	2023 $
Current liabilities		
Lease liability - office premises	165,069	150,298
Non-current liabilities		
Lease liability - office premises	248,431	413,499

The Group has entered into a new finance lease during the financial year for office premises located at Level 2, McEwin Building, Lot Fourteen, North Terrace, Adelaide, South Australia, 5000. The lease has a duration of 4 years and is due to end in October 2026 with a right of renewal for a further 5 years with no purchase option or escalation clauses.

The Group has an existing finance lease for office premises located at Level 3, McEwin Building, Lot Fourteen, North Terrace, Adelaide, South Australia, 5000. The lease has a duration of 5 years and is due to end in October 2026 with terms to extend the lease period of use past the end date but no purchase option or escalation clauses.

Reconciliation
Reconciliation of the lease liabilities at the beginning and end of the current financial year are set out below:

Consolidated	Office premises $	Total $
Balance as at 1 July 2023	563,797	563,797
Principal repayments	(178,803)	(178,803)
Interest	28,506	28,506
Balance at 30 June 2024	413,500	413,500

Note 15. Employee benefits

	Consolidated	
	2024 $	2023 $
Current liabilities		
Annual leave	288,101	240,634
Non-current liabilities		
Long service leave	99,389	65,785

SmartSat CRC Ltd and its Controlled Entities
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Note 16. Reserves

Node reserves
The nodes reserve has been setup for the specific purpose of quarantining future commitments for the payment of the specific node during the term of SmartSat.

Research chairs reserve
The research chairs reserve has been setup for the specific purpose of quarantining future commitments for the payment of Research Chairs during the term of SmartSat and ensures that sufficient funds are available to meet these obligations once the positions have been rectified.

Scholarships reserve
The scholarships reserve was setup for the specific purpose of quarantining future commitments for the payment of PhD scholarships during the term of SmartSat. Supporting the PhD programme is considered a high priority and is a commitment in the education and training milestones in the Commonwealth agreement.

The Board resolved to transfer all reserves to retained earnings in the prior period, noting that the forward commitments on the three reserves are now very well understood and committed.

Note 17. Retained earnings

	Consolidated	
	2024 $	2023 $
Retained earnings at the beginning of the financial year	20,304,872	8,080,951
Surplus/(deficit) for the year	(80,459)	2,748,786
Transfer from Research chairs reserve	-	5,223,077
Transfer from Node reserve	-	600,000
Transfer from Scholarships reserve	-	3,652,058
Retained earnings at the end of the financial year	20,224,413	20,304,872

Note 18. Key management personnel disclosures

Compensation
The aggregate compensation made to key management personnel of the Group is set out below. Key management positions included in this value are the Chair, Non-Executive Directors, CEO and COO.

	Consolidated	
	2024 $	2023 $
Aggregate compensation	1,459,329	1,171,026

Note 19. Remuneration of auditors

During the financial year the following fees were paid or payable for services provided by BDO Australia - Adelaide, the auditor of the Group:

	Consolidated	
	2024	**2023**
	$	**$**
Audit services - BDO Australia - Adelaide		
Audit of the financial report	24,270	21,580

Note 20. Contingent liabilities

In the opinion of the Directors, the Group did not have any contingent liabilities as at 30 June 2024 (2023: nil).

Note 21. Related party transactions

Key management personnel
Disclosures relating to key management personnel are set out in note 18.

Other related parties include close family members of key management personnel and entities that are controlled or significantly influenced by those key management personnel or their close family members.

Transactions with related parties
There were no related party transactions during the financial year (2023: nil).

Note 22. Events after the reporting period

No matter or circumstance has arisen since 30 June 2024 that has significantly affected, or may significantly affect the Group's operations, the results of those operations, or the Group's state of affairs in future financial years.

Note 23. Group information

The registered office and principal place of business of the Group is:

SmartSat CRC Ltd
Level 3, McEwin Building
Lot Fourteen, North Terrace
Adelaide, SA, 5000

In the Directors' opinion:

- the consolidated financial statements and notes are in accordance with the Australian Accounting Standards - Simplified Disclosures, the *Australian Charities and Not-for-profits Commission Act 2012*, the *Australian Charities and Not-for-profits Commission Regulations 2022* and other mandatory professional reporting requirements;
- the attached financial statements and notes give a true and fair view of the Group's financial position as at 30 June 2024 and of its performance for the financial year ended on that date; and
- there are reasonable grounds to believe that the Group will be able to pay its debts as and when they become due and payable.

Signed in accordance with a resolution of the Board of Directors:

Dr. Michele Allan AO
Chair

Prof. Andy Koronios
CEO & Managing Director

25 September 2024

BDO

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INDEPENDENT AUDITOR'S REPORT
TO THE MEMBERS OF SMARTSAT CRC LTD

Report on the Audit of the Financial Report

Opinion

We have audited the financial report of SmartSat CRC Ltd (the registered entity) and its subsidiaries (the Group), which comprises the consolidated statement of financial position as at 30 June 2024, the consolidated statement of profit or loss and other comprehensive income, the consolidated statement of changes in equity and the consolidated statement of cash flows for the year then ended, and notes to the consolidated financial report, including material accounting policy information, and the directors' declaration.

In our opinion the accompanying financial report of SmartSat CRC Ltd, is in accordance with Division 60 of the *Australian Charities and Not-for-profits Commission Act 2012*, including:

i. Giving a true and fair view of the Group's financial position as at 30 June 2024 and of its financial performance for the year ended on that date; and
ii. Complying with Australian Accounting Standards – Simplified Disclosures and Division 60 of the *Australian Charities and Not-for-profits Commission Regulations 2022*.

In our opinion the accompanying financial report presents fairly, in all material respects, the financial position of the Group as at 30 June 2024, and its financial performance and its cash flows for the year then ended in accordance with Australian Accounting Standards – Simplified Disclosures.

Basis for opinion

We conducted our audit in accordance with Australian Auditing Standards. Our responsibilities under those standards are further described in the Auditor's responsibilities for the audit of the Financial Report section of our report. We are independent of the Group in accordance with the auditor independence requirements of the Australian Charities and Not-for-profits Commission Act 2012 (ACNC Act) and the ethical requirements of the Accounting Professional and Ethical Standards Board's APES 110 Code of Ethics for Professional Accountants (including Independence Standards) (the Code) that are relevant to our audit of the financial report in Australia. We have also fulfilled our other ethical responsibilities in accordance with the Code.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

Other information

The directors are responsible for the other information. The other information obtained at the date of this auditor's report is information included in the Directors' report, but does not include the financial report and our auditor's report thereon.

Our opinion on the financial report does not cover the other information and we do not express any form of assurance conclusion thereon.

In connection with our audit of the financial report, our responsibility is to read the other information and, in doing so, consider whether the other information is materially inconsistent with the financial report or our knowledge obtained in the audit or otherwise appears to be materially misstated.

If, based on the work we have performed on the other information obtained prior to the date of this auditor's report, we conclude that there is a material misstatement of this other information, we are required to report that fact. We have nothing to report in this regard.

Responsibilities of the directors for the Financial Report

The directors are responsible for the preparation of the financial report that gives a true and fair view in accordance with Australian Accounting Standards – Simplified Disclosures and the ACNC Act and for such internal control as the responsible entities determine is necessary to enable the preparation of the financial report that gives a true and fair view and is free from material misstatement, whether due to fraud or error.

In preparing the financial report, the directors are responsible for assessing the Group's ability to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless the responsible entities either intends to liquidate the Group or to cease operations, or has no realistic alternative but to do so.

The directors are responsible for overseeing the Group's financial reporting process.

Auditor's responsibilities for the audit of the Financial Report

Our objectives are to obtain reasonable assurance about whether the financial report as a whole is free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with the Australian Auditing Standards will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of this financial report.

A further description of our responsibilities for the audit of the financial report is located at the Auditing and Assurance Standards Board website (http://www.auasb.gov.au/Home.aspx) at: http://www.auasb.gov.au/auditors_responsibilities/ar3.pdf

This description forms part of our auditor's report.

BDO

BDO Audit Pty Ltd

JDCarver

Josh Carver
Director

Adelaide, 25 September 2024

Original artwork by Aunty Julie Jones,
Saltwater Freshwater Dharug Woman,
2023 ©

SMARTSAT
COOPERATIVE RESEARCH CENTRE

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Australian Government
Department of Industry, Science and Resources

AusIndustry
Cooperative Research Centres Program