



Australian Government

Department of Defence
Science and Technology

EDTAS

**EMERGING DISRUPTIVE TECHNOLOGY
ASSESSMENT SYMPOSIUM**

SPACE TECHNOLOGIES

OFFICIAL PROGRAM 5-6 MARCH 2019.
WOODSIDE BUILDING, PERTH WA

dst.defence.gov.au/edtas

 #EDTAS

SYMPOSIUM AGENDA

Day 1 – Tuesday 5 March 2019

0830	Registration	Boolah Daa Moort
0900	Welcome remarks, introduction, scene setting and Keynote <ul style="list-style-type: none">• John Smith, Noetic• Professor Peter Klinken AC, Chief Scientist of Western Australia• Dr Lynn Booth, Chief Joint and Operations Analysis Division, Defence Science and Technology• Colonel (Ret'd) Pam Melroy, Director of Space Technology and Policy, NOVA Systems Australia	Cara Auditorium
1000	Morning Tea	Boolah Daa Moort
1020	EDTAS PROCESS EDTAS process and workshop overview <ul style="list-style-type: none">• Dr Dale Quinn, Defence Science and Technology• John Smith, Noetic	Cara Auditorium
1050	TEAM BUILDING ACTIVITY Move to break-out areas and conduct team building activity	Boolah Daa Moort
1130	SESSION 1: ADVANCES IN SPACE LAUNCH TECHNOLOGIES <ul style="list-style-type: none">• Dr Douglas Griffin, University of New South Wales• Dr Patrick (Paddy) Neumann, Neumann Space• Dr Allan Paull, University of Queensland• Mr Matthew McKinna, Defence Science and Technology	Cara Auditorium
1230	LUNCH	Boolah Daa Moort

	WORKSHOP 1	
1315	Brief on Workshop 1	Cara Auditorium
1330	Ideas generation	Boolah Daa Moort
1430	SESSION 2: FUTURE TECHNOLOGIES FOR OPERATING IN SPACE <ul style="list-style-type: none"> • Dr Andrew Seedhouse, Defence Science and Technology • Professor Andy Koronios, UNISA • Dr Timothy Payne, Lockheed Martin Australia - STELaRLab • Dr Andrew Dowse, Edith Cowan University 	Cara Auditorium
1530	WORKSHOP 2 Brief on Workshop 2	Cara Auditorium
1540	AFTERNOON TEA	Boolah Daa Moort
1600	WORKSHOP 2 Consideration of supporting elements	Boolah Daa Moort
1715	DAY 1 WRAP Wrap-up of Day 1 and briefing on Networking Event	Cara Auditorium
1730	NETWORKING EVENT	Robonaut's Lab
1900	Close	

SYMPOSIUM AGENDA

Day 2 – Wednesday 6 March 2019

0830	Registration	Boolah Daa Moort
0900	Day 2 welcome and Keynote Address 3 <ul style="list-style-type: none">• Dr Andrew Seedhouse, Defence Science and Technology• Mr Anthony Murfett, Deputy Head, Australian Space Agency	Cara Auditorium
0940	SESSION 3: COMPREHENSIVE SPACE DOMAIN AWARENESS <ul style="list-style-type: none">• Professor Phil Bland, Curtin University• Mr Travis Bessell, Defence Science and Technology• Dr Milica Symul, Australian National University• Dr Derek Rogers, BAE Systems Australia	Cara Auditorium
1040	WORKSHOP 3 Brief on Workshop 3	Cara Auditorium
1050	MORNING TEA	Boolah Daa Moort
1110	WORKSHOP 3 Revisit concepts and develop contingency	Boolah Daa Moort
1215	LUNCH	Boolah Daa Moort
1300	SESSION 4: EXPLOITING INFORMATION AND DATA FROM SPACE CAPABILITIES <ul style="list-style-type: none">• Professor Mark Reynolds, University of Western Australia• Dr Coen van Antwerpen, Defence Science and Technology• Mr Brett Biddington, Biddington Research• Associate Professor Hamid Laga, Murdoch University	Cara Auditorium

1410	WORKSHOP 4 Refine concepts and prepare pitch	Boolah Daa Moort
1500	AFTERNOON TEA (CONCURRENT WITH WORKSHOP 4)	Boolah Daa Moort
1530	SYNDICATE PRESENTATIONS Briefing on judging of pitches and presentation of syndicate pitches	Cara Auditorium
1700	Symposium close and event dinner details	Cara Auditorium
1830	Symposium dinner and keynote <ul style="list-style-type: none"> • Professor Peter Klinken AC, Chief Scientist of Western Australia • His Excellency the Honourable Kim Beazley, Governor of Western Australia 	Parmelia Hilton
2100	Close	

GENERAL INFORMATION

CONDUCT OF THE SYMPOSIUM

Defence Science and Technology (DST), in partnership with the University of Western Australia, Curtin University, Edith Cowen University, Murdoch University and Noetic Group are hosting an Emerging and Disruptive Technology Assessment Symposium (EDTAS) on Space Technologies.

EDTAS delegates have been drawn from academia, industry and defence to help Defence strategic planners understand the impact, be it transformational or disruptive, of emerging and potentially disruptive technologies for Defence and National Security, in the 10 to 20+ year timeframe.

We request that you be at the appropriate venue before the specified start of each session so that the agenda and discussion can flow freely.

DRESS REQUIREMENTS

The dress code for the symposium is business casual with the exception of the event dinner, for which business attire is requested.

VENUE ACCESS/SECURITY

You are requested to wear your EDTAS2019 name tag and EDTAS lanyard for all events (including the event dinner at the Parmelia Hilton).

MEDIA FILMING

Please note that specialist media may be present at the symposium also that the keynote presentations and panel sessions (including the arising Q&A) will be live streamed at <https://www.youtube.com/user/DSTOvideo>.

By attending the symposium, you accept the potential that your image may be used in this way.

MEALS

Morning tea, lunch and afternoon tea will be provided in the entrance foyer on the first floor of Woodside's Boolah Daa Moort facility. The networking event will be held in the Robonaut's Lab at Woodside, while the event dinner will be held at the Parmelia Hilton.

ASKING A QUESTION OF KEYNOTE AND PANEL SPEAKERS

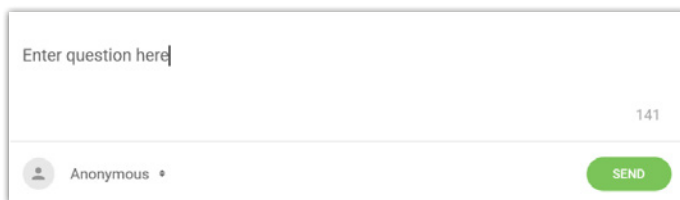
Step 1: Enter in your internet browser 'slido.com'.

Step 2: Enter event code 'W612' in the provided input box:

W612

JOIN

Step 3: Enter your question in the provided input box. Note questions are limited to 300 characters and can be submitted either anonymously or you can enter your name. Once you have completed typing in your question click the send button.

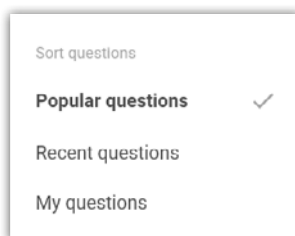


Questions will be asked by the event MC. If you wish for your question to be directed towards a specific speaker (please refer to the event program for the listing of speakers) – please indicate this at the start of the question (see example to the right).

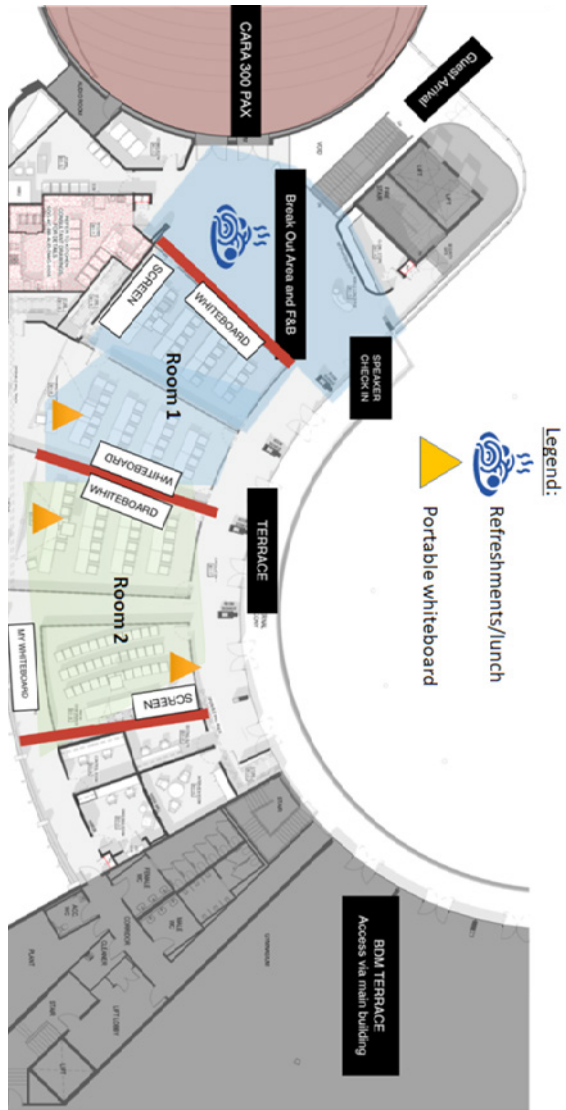
Step 4: You can choose to vote for a question by clicking on the 'Like' icon. This will elevate the question in the list of questions to be asked.



Note that you can display the questions on your screen as follows. Generally, the MC will ask the questions in order of popularity. Please note that the list of questions will be archived at the end of each Keynote/Panel session.



VENUE MAP



ROOM 1

Syndicates 1–4

ROOM 2

Syndicates 5–10

THEMES

- Theme 1: **Earth observation** space technologies that will provide down-stream (terrestrial) benefits for Australia in 2040 and beyond.
- Theme 2: **Communications** space technologies that will provide down-stream (terrestrial) benefits for Australia in 2040 and beyond.
- Theme 3: **Sensor networks enabling** space technologies that will provide down-stream (terrestrial) benefits for Australia in 2040 and beyond.
- Theme 4: **Positioning, navigation and timing** space technologies that will provide down-stream (terrestrial) benefits for Australia in 2040 and beyond
- Theme 5: **Logistics (e.g. transport, storage, asset management and tracking functions) enabling** space technologies that will provide down-stream (terrestrial) benefits for Australia in 2040 and beyond.

SYNDICATE THEMES PRIMER

Earth observation is conducted by Earth observation or Earth remote sensing satellites. These satellites are specifically designed for Earth observation from orbit and include military purposes such as reconnaissance but also non-military uses such as environmental monitoring, meteorology, map making etc. Most Earth observation satellites carry instruments that should be operated at a relatively low altitude (LEO). To get (nearly) global coverage with a low orbit they must be a polar orbit or nearly so. A low orbit will have an orbital period of roughly 100 minutes with about 25 deg between successive orbits, with the result that the ground track is shifted towards west. Most Earth observation satellites are in sun-synchronous orbits (SSO), which is a nearly polar orbit around a planet, in which the satellite passes over any given point of the planet's surface at the same local mean solar time.

Communications satellites relays and amplifies radio telecommunications signals via a transponder; it creates a communication channel between a source transmitter and a receiver at different locations on Earth. Communications satellites are used for television, telephone, radio, internet, and military applications. Many communication satellites are in geostationary orbit (GEO) 35,700 km above the equator, so that the satellite appears stationary at the same point in the sky, so the satellite dish antennas of ground stations can be aimed permanently at that spot and do not have to move to track it. The high frequency radio waves used for telecommunications links travel by line of sight and so are obstructed by the curve of the Earth. The purpose of communications satellites is to relay the signal around the curve of the Earth allowing communication between widely separated geographical points. Communications satellites use a wide range of radio and microwave frequencies. To avoid signal interference, international organizations have regulations for which frequency ranges or 'bands' certain organizations are allowed to use. This allocation of bands minimizes the risk of signal interference.

Sensor networks, specifically Wireless sensor networks (WSNs) refers to a group of spatially dispersed and dedicated sensors for monitoring and recording the physical conditions of the environment and organizing the collected data at a central location. WSNs measure environmental conditions like temperature, sound, pollution levels, humidity, wind, and so on. WSNs are spatially distributed autonomous sensors to monitor physical or environmental conditions, such as temperature, sound, pressure, etc. and to cooperatively pass their data through the network (including a satellite-enabled network) to a main location. Modern networks are bi-directional, also enabling control of sensor activity. Although wireless sensor networks were motivated by military applications such as battlefield surveillance; today such networks are used in many industrial and consumer applications, such as industrial process monitoring and control, machine health monitoring, and so on. An umbrella terms for sensors networks is the Internet of things (IoT), which is the network of devices such as vehicles, and home appliances that contain electronics, software, sensors, actuators, and connectivity which allows these things to connect, interact and exchange data

Position, navigation and timing satellites provide a combination of three distinct, constituent capabilities:

- Positioning, the ability to accurately and precisely determine one's location and orientation two-dimensionally (or three-dimensionally when required) referenced to a standard geodetic system (such as World Geodetic System 1984);
- Navigation, the ability to determine current and desired position (relative or absolute) and apply corrections to course, orientation, and speed to attain a desired position anywhere around the world, from sub-surface to surface and from surface to space; and
- Timing, the ability to acquire and maintain accurate and precise time from a standard (Coordinated Universal Time, or UTC), anywhere in the world and within user-defined timeliness parameters. Timing also includes time transfer.

When PNT is used in combination with map data and other information (weather or traffic data, for instance) the result is the most popular and recognizable service--the modern navigation system better known as the Global Positioning System (GPS). The GPS concept is based on time and the known position of GPS specialized satellites. The satellites carry very stable atomic clocks that are synchronized with one another and with the ground clocks. Any drift from true time maintained on the ground is corrected daily. In the same manner, the satellite locations are known with great precision. GPS receivers have clocks as well, but they are less stable and less precise.

Each GPS satellite continuously transmits a radio signal containing the current time and data about its position. Since the speed of radio waves is constant and independent of the satellite speed, the time delay between when the satellite transmits a signal and the receiver receives it is proportional to the distance from the satellite to the receiver. A GPS receiver monitors multiple satellites and solves equations to determine the precise position of the receiver and its deviation from true time. At a minimum, four satellites must be in view of the receiver for it to compute four unknown quantities (three position coordinates and clock deviation from satellite time).

GPS satellites orbit at an altitude of approximately 20,200 km (MEO) and have an orbital period of approximately 12 hours so they pass over the same locations, or almost the same locations, every day. The satellites in the GPS constellation are arranged into six equally-spaced orbital planes surrounding the Earth. Each plane contains four 'slots' occupied by baseline satellites. This 24-slot arrangement ensures users can view at least four satellites from virtually any point on the planet.

Logistics (e.g. transport, storage, asset management and tracking) is the management of the flow of things between the point of origin and the point of consumption in order to meet requirements of customers or corporations. The resources managed in logistics can include physical items such as food, materials, animals, equipment, and liquids; as well as intangible items, such as time and information. The logistics of physical items usually involves the integration of information flow, materials handling, production, packaging, inventory, transportation, warehousing, and often security. The minimization of the use of resources is a common motivation in all logistics fields.

SPEAKER PROFILES



**JOHN 'JP'
SMITH DSM**

**General Manager
National Security
and Defence,
Noetic Group**

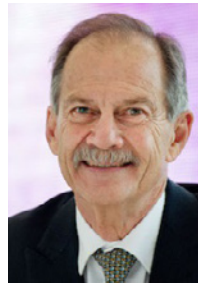
John (JP) Smith is a highly experienced leader with a significant track

record of success in the management and mentoring of people from small teams up to large organisations. JP has been a Principal Consultant with Noetic since January 2013 after retiring from the Australian Regular Army at the rank of Colonel. JP has a wide array of experience working with government agencies and non-government organisations, in complex international and multinational environments, in diplomatic, operational and representational spheres. He excels in environments requiring innovation and change, as an accomplished communicator and team-builder, with strong motivational skills, guiding people and projects to successful outcomes.

JP is known for his ability to work with organisations and draw people and skills together to produce practical solutions to often intractable problems. JP typically leads Noetic's major projects, providing a sounding board, quality assurance and guidance to ensure Noetic achieves agreed objectives. He brings a capacity to listen, understand and interpret, and provide innovative options and alternate insights. At its core, his work style is to 'keep it practical'. JP is a firm believer that solutions must be implementable and useable.

JP has worked across Noetic's broad portfolio of projects in government, emergency services and the private sector. He has applied his knowledge and experience to strategic advice and reviews, training in organisational learning and has supported numerous organisations with planning, preparation and training for contingencies and crisis management.

JP leads Noetic's provision of futures thinking support to DST, and the wider Defence and National security environment, including the EDTAS symposium series.



**PROF PETER
KLINCKEN AC**

**Chief Scientist of
Western Australia**

Professor Klincken is a leading Western Australian medical research scientist, highly regarded for

his work in advancing the understanding of genes involved in leukaemia, cancer and anaemia. His many research achievements include the discovery of a gene that suppresses the growth of tumours.

After obtaining his PhD from The University of Western Australia, he undertook research at the US National Institutes of Health in Washington and the Walter and Eliza Hall Institute in Melbourne.

His previous roles have included Professor in Clinical Biochemistry at The University of Western Australia; Director of Research at

the Royal Perth Hospital; and the Director of the Harry Perkins Institute of Medical Research (previously the Western Australian Institute for Medical Research).

Under his stewardship, the Perkins Institute attracted world-class national and international researchers to the State and made numerous acclaimed medical discoveries. He also spear-headed the development of two new state-of-the-art medical research facilities, Perkins North in Nedlands (QEII Medical Centre) and Perkins South in Murdoch (Fiona Stanley Hospital).

Professor Klinken brings a wealth of knowledge and expertise to the role of Chief Scientist. His input will support the Government in growing the State's science industries to achieve future prosperity for Western Australians.

Professor Klinken was appointed a Companion of the Order of Australians (AC) in the June 2017 Queen's Birthday Honours.



DR LYNN BOOTH

Chief Joint and Operations Analysis Division, DST

Lynn Booth has a B.A. in Physics and a D.Phil. in Astrophysics from the University of Oxford.

Prior to joining DST Dr Booth worked for five years for the UK Ministry of Defence at the Propellants, Explosives and Rocket Motor Establishment and the Royal Armaments Research and Development Establishment, modelling the properties of rocket exhaust plumes.

She joined DST in 1989 and worked in DST laboratories in both Adelaide and Sydney, where her work focused on submarine and anti-submarine warfare operations research. She spent two years seconded to the Directorate of Naval Warfare at Maritime Headquarters as their first Staff Officer (Science).

Dr Booth moved to Canberra in October 2001 as Director Strategic Analysis Policy in DST's Science Policy Division. Given the timing much of her time was devoted to considering how Australia's S&T community might better support Australia's counter-terrorism community.

From 2003-2006 she was seconded into the Department of the Prime Minister and Cabinet as Head of the Science, Engineering and Technology Unit, coordinating research programs to support whole of government national security requirements.

She returned to DST Headquarters in 2006 to manage DST Strategy and Policy and Strategic Reform. She contributed to the 2009 Defence White Paper through leadership of the Science & Technology Companion Review.

From 2011-2017 she worked at DST Fishermans Bend as Research Leader Aerospace Systems Effectiveness in Aerospace Division of DST, leading research teams in human factors, simulation, autonomy and rotary wing sciences. She led the DST program for Army and Navy Aviation, and was also the DST Relationship Manager for the DST – Airbus Group Australia Pacific strategic industry alliance.

Dr Booth was appointed Chief of Joint and Operations Analysis Division in 2017.



COLONEL (RET'D) PAMELA A. MELROY

Director, Space Technology and Policy, Nova Systems

Pam Melroy is a retired Air Force test pilot and former NASA

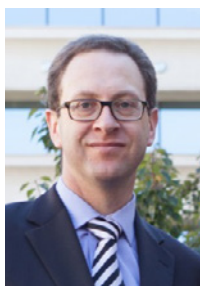
astronaut and Space Shuttle commander.

She was commissioned in the United States Air Force and served as a KC-10 copilot, aircraft commander, and instructor pilot. Melroy is a veteran of Operation Just Cause and Operation Desert Shield/Desert Storm, with over 200 combat and combat support hours. She went on to attend the Air Force Test Pilot School at Edwards Air Force Base, California. Upon her graduation, she was assigned to the C-17 Combined Test Force, where she served as a test pilot until her selection for the Astronaut Program. She has logged more than 6,000 hours flight time in more than 50 different aircraft.

Selected as an astronaut candidate by NASA in December 1994, Melroy reported to the Johnson Space Center, Texas, in March 1995. She flew three missions in space: as Space Shuttle pilot during STS-92 in 2000 and STS-112 in 2002, and as Space Shuttle Commander during STS-120 in 2007. All three missions were assembly missions to build the International Space Station. She is one of only two women to command the Space Shuttle. While an astronaut, she held a variety of positions to include performing astronaut support duties for launch and landing and Capsule Communicator (CAPCOM) duties in mission control. Melroy served on the Columbia Reconstruction Team as the lead for the crew module and served as Deputy

Project Manager for the Columbia Crew Survival Investigation Team. In her final position, she served as Branch Chief for the Orion branch of the Astronaut Office. She has logged more than 924 hours (more than 38 days) in space.

Colonel Melroy retired from the Air Force in 2007, and left NASA in August 2009. After NASA, she served as Deputy Program manager for the Lockheed Martin Orion Space Exploration Initiatives program and as Director of Field Operations and acting Deputy Associate Administrator for Commercial Space Transportation at the Federal Aviation Administration. She went on to serve as Deputy Director, Tactical Technology Office at the Defense Advanced Research Projects Agency (DARPA). Pam Melroy now is Director, Space Technology and Policy at Nova Systems.



DR DALE QUINN

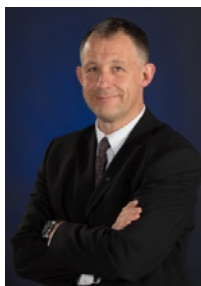
Group Leader, Concept and Futures, JOAD, DST

Dr Dale Quinn graduated with a PhD in Physics from the University of New South Wales (Canberra) in 2002, shortly after joining DST in late 2001. Shortly after joining DST, he was seconded as an embedded analyst into Australia's New Air Combat Capability project, which resulted in a Government decision in 2009 to choose the Lockheed Martin F-35A. Dale remained with that project, with increasing degrees of responsibility, until late 2009.

As a senior aerospace operations analyst,

Dale has built a research career in understanding the requirements for and application of Australian air power, working across DST, Defence and internationally in the development of concepts and the assessment of options. As an embedded scientist in the NACC project, Dale led the analysis of air combat requirements resulting from Government guidance as expressed in Defence white papers, associated classified guidance and endorsed scenarios. This also included several trips to the US and UK as lead analyst for Australian participation in F-35 simulation events and associated Technical Interchange meetings.

Dale is currently the Group Leader for the Concepts and Futures team in DST. That team is comprised of multidisciplinary researchers that conduct specific horizon scanning and technology-watch activities on identified emerging and potentially disruptive technologies in the 15 to 30-year timeframe. This includes hosting the Emerging and Disruptive Technology Assessment Symposia (EDTAS). The outcomes of their analysis informs longer-term investment in the DST strategic research program as well as providing emerging technology advice to Defence and National Security stakeholders.



DR DOUGLAS GRIFFIN

Chief Engineer, UNSW Canberra Space

Dr Griffin is Chief Engineer for the UNSW Canberra Space Group, with

current professional responsibilities in the management of multi-disciplinary teams for the development of space missions and spacecraft systems.

This role covers the entire scope of the development life-cycle; from the initial proposal, feasibility assessment and contract negotiation through to implementation and flight operations. This demands strong skills in a broad range of technical disciplines in order to successfully manage the competing requirements in space mission design and development. This role also requires strong leadership and people management skills to effectively manage teams of Physicists and Engineers.

The schedule and financial constraints of space programmes requires the effectively use of Project Management skills to cost, plan and track the progress of the programmes.

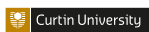


PROF ALLAN PAULL

Chair of Future Hypersonic Technologies, University of Queensland

Allan Paull gained his PhD in applied

mathematics at UQ and subsequently obtained a MEngSc within the Dept. of Mechanical Engineering at UQ. He has worked for 33 years in hypersonics, primarily in the field of supersonic combustion and flight testing. He has been employed at NASA Langley Research Center (USA), DLR (Goettingen, Germany) and GASL (NY, USA) and UQ where he held the position of an



ARC Professor and was an ARC Professorial Research Fellow. He was subsequently employed at the DST and remained an Adjunct Professor to UQ until 2019, when he rejoined UQ again in the position of DST Chair in Future Hypersonic Technologies. He developed theoretical approaches for the operations of scramjets as well as for wind tunnels. He has led the HyShot, HyCAUSE and HIFiRE hypersonic flight programs. In total, he has been the lead for 14 flight tests. He now concentrates on advanced concepts.



MR MATTHEW MCKINNA

Rocket Propulsion and Ballistic Systems, WCSO, DST

Matthew McKinna was awarded a Bachelor of Aerospace Engineering with

honours from The University of Adelaide in 2006 before joining DST in 2007. Working initially in Weapons Modelling and Simulation, in 2008 he joined the Weapons Propulsion group as a propulsion engineer working on system design and analysis for a variety of air-breathing and chemical propulsion systems. This work has included safety and performance analysis for in service systems, acquisition advice as well as world leading research in collaboration with international partners resulting in Divisional awards for Science and Technology excellence, as well as a Chief Defence Scientist Gold commendation. Recent work includes a lead role in the Advanced Tactical Booster Technology international collaboration addressing next generation

high performance rocket technologies for a range of applications. He is currently the lead for the Rocket Propulsion & Ballistic Systems Discipline, in the Missile and Space Propulsion Group.



MR ANDREW SEEDHOUSE

Chief National Security and ISR Division, DST

Mr Seedhouse joined DST after a long and distinguished career at the Defence

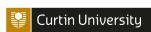
Science and Technology Laboratory (Dstl) in the United Kingdom.

At Dstl, Mr Seedhouse held a number of positions, most recently as Innovation Lead and Head of the Centre for Defence Enterprise.

As Innovation Lead, Mr Seedhouse was responsible for planning Dstl's defence and security innovation activities and championing innovation development. He worked with Ministry of Defence Headquarter to develop a new innovation environment, helping to deliver the objectives of the government's Strategic Defence and Security Review.

As the Head of the Centre for Defence Enterprise, Mr Seedhouse engaged with small to medium enterprises in support of the Government's Small Business Research Initiative. During this time, he acted as a Director for the Rainbow Seed Fund investing in small businesses, creating high value science and technology (S&T) jobs and increasing UK exports.

From 2015 to 2016, Mr Seedhouse was Dstl's



Chief Technology Officer. In this role, he championed S&T in Defence and supported the development of S&T capability to meet the future demands.

Prior to this, Mr Seedhouse spent 18 years providing leadership to three Dstl departments, setting S&T strategy, developing investment plans, and engaging with industrial, academia, and international agencies.

He has 28 years' experience in Intelligence Surveillance Targeting and Reconnaissance (ISTAR) and is the Executive Chair of The Technology Cooperation Programme (TTCP) ISTAR Group, leading the ISTAR programmes on behalf of United States, Australia, Canada, New Zealand and the UK.



PROF ANDY KORONIOS

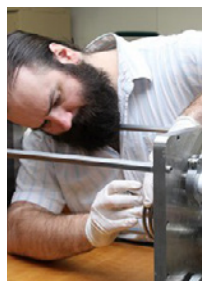
**Dean, Industry and Enterprise,
University of South Australia**

Professor Andy Koronios is the Dean: Industry & Enterprise

at the University of South Australia. He previously spent 15 years as the Head of the School of Information Technology & Mathematical Sciences at UniSA. Andy holds academic qualifications in Electrical Engineering, Computing and education and a PhD from the University of Queensland. Andy has extensive experience in both commercial and academic environments and his research interests include information quality, data management and governance, analytics and the strategic exploitation of information. Andy has

established two University Research Labs and a funded Research Centre and was the Research Program Leader for Systems Integration and Interoperability in the CIEAM CRC.

Andy is currently leading a bid to establish a space industry-focused Cooperative Research Centre (CRC) aimed at catapulting Australia into the global space industry through collaborative research and development with the support of over 80 participants from industry, government and academia.



DR PATRICK 'PADDY' NEUMANN

**Chief Scientist and Founder,
Neumann Space**

Paddy studied aerospace engineering and

physics as an undergraduate, which is where he first started working with electric propulsion systems. During his honours, masters and doctoral work he has refined the system he inherited, from a system optimised for the study of thin film deposition to one that serves as a testbed for thruster prototypes.



DR TIMOTHY PAYNE

**Senior Research Engineer, Lockheed Martin Australia,
STELaRLab**

Tim Payne is a senior Engineer in the Science, Technology,

Engineering Leadership and Research Laboratory (STELaRLab) for Lockheed Martin Corporation. STELaRLab is Lockheed Martin's first internationally-based Research and Development (R&D) Laboratory.

Prior to his role at Lockheed, Tim was with DST for twenty eight years. He held positions as Research Leader Joint Capability Analysis, Program leader Support to Operations, Scientific Advisor Special Operations and Group Leader Imagery MASINT (Material and Signature Intelligence) Exploitation Systems. He also setup and ran DST's CubeSat program.

Tim's research has included Synthetic Aperture Radar (SAR), Image processing, data fusion, tracking and neural networks.

He graduated from Royal Melbourne Institute of Technology with a BEng in Communication Electronic Engineering and a BSc in Mathematics, followed by a PhD in Engineering at the University of Adelaide.

as well as managing command and control systems, space systems and information technology. He had key leadership roles in electronic and information warfare, and broader capability planning.

Between 2008 and 2012, Andrew worked to develop future capabilities for the Australian Defence Force, the efforts of which were recognised with his appointment as a Member of the Order of Australia. Subsequently he was in charge of Air Force strategy and planning, then oversaw Defence information and communications technology operations, and in recognition of his performance in these roles he was promoted to an Officer in the Order of Australia.

In addition to his bachelor degree, he has a Graduate Diploma in Legal Studies, Masters of Science and Doctor of Philosophy. He is a graduate of the Australian Institute of Company Directors and is a Fellow Chartered Professional Engineer.



**DR ANDREW
DOWSE AO**

**Director Defence
Research
Engagement, Edith
Cowan University**

Andrew Dowse
joined Edith Cowan
University after a

37 year career with the Royal Australian Air Force. He joined the RAAF as an engineer cadet in 1981 and, after completing a degree in Communications and Electronics Engineering at RMIT, graduated as an electronics officer. His career included working in air defence and communications,



**MS MEG
O'NEILL**

**Executive Vice
President and Chief
Operations Officer,
Woodside**

Meg O'Neill had
a Bachelor of
Engineering - Ocean
Engineering and Chemical Engineering, and
a Masters in Ocean Systems Management.

With more than 20 years in the global oil and gas business, Meg is responsible for Woodside's global logistics, drilling, production, HSEQ, reservoir management

and the operations of all Woodside producing facilities. Prior to joining Woodside she was responsible for ExxonMobil's major projects across Africa, including Angola, Nigeria, Tanzania and Mozambique, and was Executive Advisor to the Chairman of ExxonMobil in 2016. She also worked as Vice President, Asia Pacific and Managing Director, Norway for ExxonMobil.



MR ANTHONY MURFETT

Deputy Head, Australian Space Agency

Mr Anthony Murfett is the Deputy Head of the Australian Space Agency.

Anthony reports to Dr Megan Clark AC and is responsible for performance of the organisation and has oversight of strategy, policy and operations. Prior to this role, Anthony was the Minister Counsellor (Industry, Science and Education) at the Australian Embassy in Washington DC. Anthony's role was to develop and implement strategies to strengthen Australia's engagement with the industry and innovation, science, research and education systems in the US and Canada.

Areas of focus include the space industry and policy, innovation ecosystems, the digital economy, and resources policy. Previously, Anthony was the General Manager of the Growth Centres Branch within the Department of Industry, Innovation and Science. His key responsibility was advising the Australian Government on the policy,

design and implementation of the Industry Growth Centres Initiative (a key program focused on lifting the competitiveness of growth sectors in Australia).

Anthony has also been the General Manager of the Productivity and Competitiveness Branch and the Precincts and Coordination Branch. In these roles he was responsible for advising the Australian Government on matters such as sectoral policy, IP policy and strategic industry policy. He has also been responsible for Australia's Cooperative Research Centres program, which is focused on supporting medium to long term industry-led research. Anthony has also worked across a number of areas within the industry and innovation portfolios within the Australian Government. These include the Australian Research Council and IP Australia (Australian Patent Office).

Anthony is a member of the Australian Institute of Company Directors and has completed the Senior Executive Fellows Program at the Harvard Kennedy School of Government. He also has a background in biotechnology and immunology



PROF PHIL BLAND

John Curtin Distinguished Professor, Curtin University

Phil Bland is a Professor of Planetary Science at Curtin University. He came to Australia on an ARC Laureate Fellowship in 2012. Previously he was Director of the Imperial College London

planetary research centre. His research is focused on the origin and evolution of the solar system; how our planet formed; how it acquired the ingredients for life. He has been on multiple planetary mission science teams. In 2006, Asteroid '1981 EW21' was renamed '(6580) Philbland' in recognition of his contributions to planetary science.

He is Director of the Desert Fireball Network (DFN) project, and founded the multi-award winning Fireballs in the Sky outreach and citizen science program. In 2015 Professor Bland established a formal partnership between NASA and Australia in planetary, space and exploration science that provides Australian planetary scientists with ground-floor access in NASA mission concept development. In 2018 he founded the Curtin Space Science and Technology Centre: the largest planetary research group in the southern hemisphere. His team have been partnering with Lockheed Martin since 2016, translating DFN technology into applications in space situational awareness.



MR TRAVIS BESSELL

Senior Research Scientist, NSID, DST

Travis Bessell is a senior research scientist at DST. Travis received a Bachelor degree in Computer Systems

Engineering from Flinders University, Australia in 2005 and a Masters degree in Signal and Information Processing from the University of Adelaide, Australia in

2008. His research interests include target tracking, sensor fusion and space situational awareness. Travis recently spent a year on technical exchange at the United States Air Force Research Laboratory working in their Space Situational Awareness program. Since returning from this attachment he now leads the SSA program of work at DST.



DR MILICA SYMUL

Managing Director, ANU Institute for Space, Australian National University

Milica Symul is Managing Director/COO of the newly

created innovation institute, InSpace, headquartered at the Australian National University (ANU).

Milica supports business development and investment opportunities for InSpace and manages flagship programs. Previously, Milica performed the role of Deputy Director of Advanced Instrumentation and technology Center (AITC), and General Manager of Research School of Astronomy and Astrophysics. Milica has also experience in venture capital investments, including portfolio fund manager for ANU Connect Ventures. Milica holds PhD in physics from ANU, specializing in atomic and molecular physics.



PROF MARK REYNOLDS

Head of School, Engineering & Mathematical Science, School of Physics, Mathematics and Computing,

University of Western Australia

Mark Reynolds obtained his Bachelors degree at The University of Western Australia (UWA) with honours in Pure Mathematics and Statistics, his PhD at Imperial College London (IC) in Computing and a Diploma in Education from UWA.

After lecturing at Kings College London, he moved back to Perth and then to UWA as an Associate Professor. He is currently the head of the School of Physics, Mathematics and Computing. His research interests include AI, Machine Learning, Logic, Formal methods in Software Engineering and Optimisation.

Dock ships project, then as the Program Manager and System Architect leading the establishment and growth of the Saab's Centre of Excellence in Autonomous Vessels, before contributing to setting up the R&D program for the combat system of Australia's future submarines.

Prior to this Dr Rogers was a Product Development Manager with BAE Systems Australia on an electronic warfare self-protection program for the Chinook and Blackhawk helicopters. Dr Rogers also worked for Motorola in both Australia and on assignment in the USA on location-based technology for vehicles and individuals; technology we now take for granted some fifteen years later.

Outside of industry, Dr Rogers is an Adjunct Professor in Systems Engineering with the University of South Australia and a member of a Red Cross committee on International Humanitarian Law because of his expertise in emerging technologies. He was also on a federal government advisory committee on intellectual property for similar reasons.

Dr Rogers is a recognised Fellow, Engineering Executive and Chartered Professional Engineer of Engineers Australia, and a Senior Member of the Institute of Electrical and Electronic Engineers.



DR DEREK ROGERS

Space Systems, Engineering Manager, BAE Systems Australia

Dr Derek Rogers is an Engineering Manager with BAE Systems

Australia in the emerging area of Space 2.0. Derek returned to BAE in September 2018 after nine years with Saab Australia. First as the Deputy System Engineering Manager for the combat system of the Landing Helicopter



DR COEN VAN ANTWERPEN

Strategic Systems Analysis, NSID, DST

Dr van Antwerpen was awarded his PhD in theoretical nuclear physics in 1995 and

commenced working at DSTO on satellite surveillance studies. During his more than two decades at DST, Dr van Antwerpen has been involved in and led a range of activities: ISR studies, whole-of-force experimentation, countering IED technologies, supporting current ADF operations, technology assessments and most recently the small satellite program that had a launch and operation of the Buccaneer cube satellite. He currently leads the Strategic Systems Analysis group in DST.



**MR BRETT
BIDDINGTON
AM**

**Principal, Biddington
Research**

Brett Biddington founded a consulting company in 2010 that specialises in space and cyber security

matters. He led the team that delivered the International Astronautical Congress, in Adelaide in 2017. Previously he was a member of Cisco Systems' global space team and before that an officer in the Royal Australian Air Force (RAAF) specialising in intelligence, security and capability development. His responsibilities in the latter role included sponsorship of space projects and the Jindalee Over-the-horizon Radar Network (JORN) project.

He chairs the Advisory Board of the Victorian Space Science Education Centre (VSSEC) and is a director of two organisations: Space Environment Research Cooperative Research Centre (SERC); and Institute for Regional Security (IFRS), a Canberra-based 'think

tank' focused on national strategy and the development of young leaders working in the national security domain.

He holds an Adjunct Professorial appointment at Edith Cowan University in Perth. He was admitted as a Member of the Order of Australia for services to the Australian space sector in 2012.

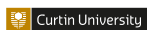


**ASSOC PROF
HAMID LAGA**

**Computer Graphics,
Computer Vision,
Artificial Intelligence
and Machine
Learning, Murdoch
University**

Hamid Laga received his PhD degree from Tokyo Institute of Technology (Japan) in the area of computer vision and computer graphics. He is currently an Associate Professor at Murdoch University and a member of the Artificial Intelligence and Image Processing Research Group. His main expertise is in the areas of Computer Graphics, Computer Vision, and Artificial Intelligence, with a particular focus on how to leverage, using AI techniques, the continuously growing large amounts of data in order to solve long-standing problems in computer vision and graphics. Examples include (1) 3D/4D reconstruction, modelling and analysis, (2) modelling and simulation for medical diagnosis and training, (3) virtual and augmented reality in medical applications, and (4) computer vision with applications to medicine and image-based plant phenotyping in agriculture.

Hamid Laga co-authored two books published, respectively, in 2017 and 2019,



and has published more than 34 articles in top journals. He is the recipient of several awards including the Best Paper Awards at the Eurographics Symposium on Geometry Processing (2017) and the IEEE International Conference on Shape Modelling (2006), the APRS/IAPR Best Paper Prize at DICTA (2012), and the Japan Society of Art and Science Award (2008). He was also the recipient of the Japan Society for the Promotion of Science Fellowship in 2016, and is the Chief Investigator on ARC Linkage projects dealing with image-based plant phenotyping and big data analytics in agriculture and plant biology.



THE HONOURABLE KIM BEAZLEY AC

Governor of Western Australia

The Honourable Kim Beazley AC is the 33rd Governor of Western Australia.

Prior to being installed as Governor on the 1st May 2018, Mr Beazley had dedicated almost three decades to a career in Federal Parliament, representing the WA seats of Brand and Swan.

In 2009, Mr Beazley was awarded the Companion of the Order of Australia for service to the Parliament of Australia through contributions to the development of government policies in relation to defence and international relations, and as an advocate for Indigenous people, and to the community.

Mr Beazley was born in Perth, Western Australia. He completed a Bachelor of Arts

and Master of Arts at the University of Western Australia. In 1973, he was awarded the Rhodes Scholarship for Western Australia and completed a Masters of Philosophy at Oxford University. He has honorary doctorates from the University of Notre Dame (Western Australia) and Murdoch University.

Mr Beazley was a Minister in the Hawke and Keating Labor Governments (1983-1996) holding, at various times, the portfolios of Defence, Finance, Transport and Communications, Employment Education and Training, Aviation, and Special Minister of State. From 1995 to 1996, Mr Beazley was Deputy Prime Minister and Leader of the Australian Labor Party and Leader of the Opposition from 1996 to 2001, and 2005 to 2006. Mr Beazley served on parliamentary committees, including the Joint Intelligence Committee and the Joint Foreign Affairs, Defence and Trade Committee.

After his retirement from politics in 2007, Mr Beazley was appointed Winthrop Professor in the Department of Politics and International Relations at The University of Western Australia. In July 2008 he was appointed Chancellor of the Australian National University, a position he held until December 2009.

Mr Beazley took up an appointment as Ambassador to the United States of America in February 2010. He served as Ambassador until January 2016.

Upon returning to Australia from Washington in 2016, Mr Beazley was appointed as President of the Australian Institute for International Affairs (2016-17), Co-Chairman of the Australian American Leadership Dialogue (2016-18), Distinguished Fellow at the Australian Strategic Policy Institute, and a Director and Distinguished Fellow at the Perth USAsia Centre.

