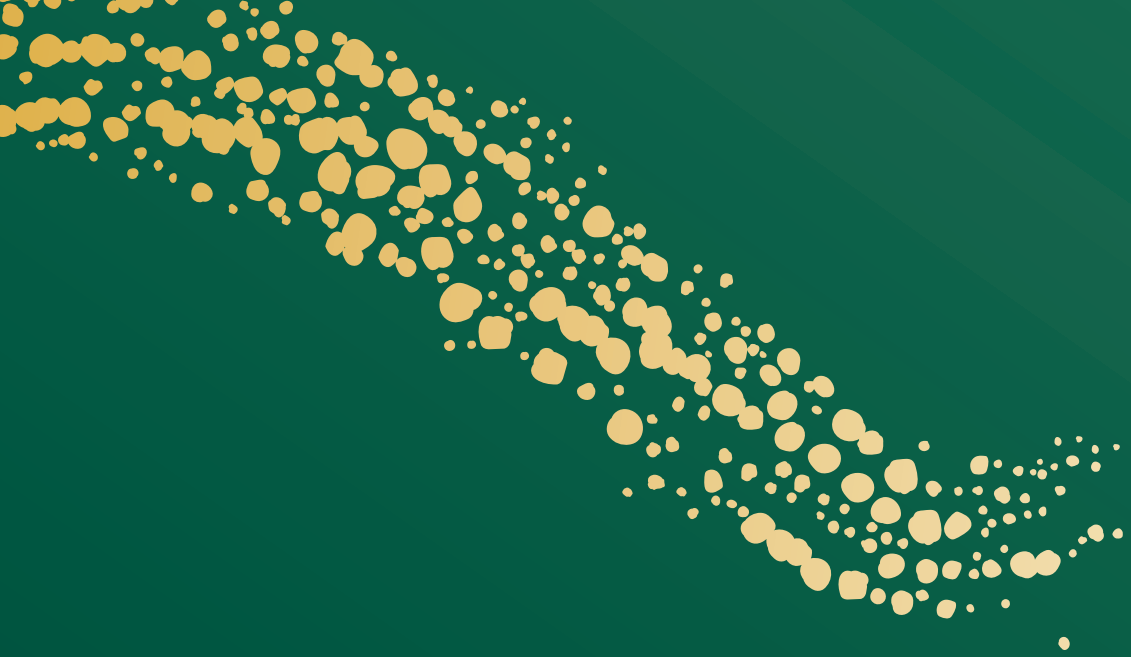
Australian Government

Australian Trade and Investment Commission

TRUSTED AUTONOMOUS SYSTEMS

Robotics, Autonomous Systems and AI

Australian Defence Industry Report and Matrix



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Acknowledgement of country

In the spirit of reconciliation we acknowledge the Traditional Custodians of country throughout Australia and their connections to land, sea and community. We pay our respect to their elders past and present and extend that respect to all Aboriginal and Torres Strait Islander peoples today.

Cover:

Courtesy of OCIUS Technology Ltd

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Image courtesy of Department of Defence

Overview

Australian companies are leaders in defence-related robotics technologies. This includes niche, low-cost robotic systems for small and mid-sized applications in land, sea and air domains. Australian pioneers are also leveraging Artificial Intelligence (AI) to increase the persistence, range, autonomy and teaming capabilities of defence vehicles. This combination of robotics and AI has created an emergent defence-industry subsector – Robotics, Autonomous Systems and Artificial Intelligence or RASAI.

Thanks to our mining and transport industry, Australian companies are already world leaders in field robotics. When combined with advanced manufacturing capabilities, this means Australian companies are now creating new RASAI capabilities quickly. What's more, the Australian defence capability budget – worth A$270billion over the next decade – is being channelled towards advanced defence systems. This presents huge opportunities for defence-related RASAI platforms in Australia.

This report analyses Australia's domestic expertise in RASAI. The Capability Matrix identifies Australian companies that have export-ready RASAI capabilities and fast-evolving expertise. The Matrix will help overseas defence companies find partners who have relevant skills. The Matrix will also help global defence customers to assess areas of RASAI expertise in Australia's civil-defence ecosystem.

Image courtesy of Department of Defence

See Australian RASAI matrix on page 8

Global market trends and opportunities

The global defence robotics market – the core customer for RASAI technologies – was worth A$19.5 billion in 2020 (Source: Defence Robotics – Global Market Trajectory and Analytics Report, February 2022). With a projected compound annual growth rate of 9.5%, the defence robotics market will likely be worth A$32.8 billion by 2026.

The associated market for unmanned aerial vehicles (UAVs) is also growing quickly – and pivoting towards the Asia-Pacific region. The cumulative market for UAVs for the decade from 2021 is estimated at A$223 billion. During this period, the Asia-Pacific region is projected to account for 38% of global military aircraft purchases. This includes China and India, and the rapid projected adoption of combat UAVs (Source: Global Military UAV Market 2021–2031, October 2021).

The role of RASAI in Defence

RASAI is now the focus of significant research investment around the world. Its appeal is that it can upgrade capabilities across all defence domains. This includes space, and electronic and cyber warfare. Some research and development has already resulted in real-world applications.

RASAI technologies are proven game changers. They can fulfill numerous, laborious activities currently undertaken by servicemen and servicewomen. These include activities that are dirty, dull, dangerous and dear. RASAI-based systems can also act as force multipliers: they enable a small number of teams or platforms to achieve a military effect far greater than those numbers traditionally allow.

RASAI and Australian defence

The Australian Defence Force (ADF) is an early adopter of robotics technologies. This is partly because of local expertise. Australia's agriculture and mining industries have organically developed world-leading autonomous systems to help run commercial operations in vast, remote areas. This means many companies described in this report have already created dual-use, civil-military RASAI technologies.

The ADF wants RASAI technologies to help replace, augment or revolutionise current capabilities. This makes Australia's Department of Defence an enthusiastic investor in RASAI platforms – targeting these types of technologies through $3 billion in defence innovation program funding. It also makes Defence a partner for dynamic local innovators. Defence envisages using robots in multiple platforms, payloads and control systems. Domestic expertise in artificial intelligence will prove especially valuable.

Image courtesy of Department of Defence

In practical terms, the ADF's current focus is to use RASAI to improve mission outcomes. The ADF also believes that integrating RASAI capabilities into backend activities will enhance frontline military capability. Therefore, RASAI is also gaining traction in non-combat areas – including defence logistics, training and predictive maintenance.

Australian capabilities: land, sea, air – and beyond

Commercial research in Australia is helping to advance the capabilities of RASAI platforms. This includes advances in the basic parameters of autonomous platforms: size, weight, power, and cost (SWaP-C). These advances mean that domestic RASAI capabilities are helping to accelerate the adoption of autonomous systems in Australia's military forces.

Australia's defence industries recognise the potential for RASAI to be integrated with emerging technologies, in particular:

- hypersonic vehicles
- additive manufacturing
- neural interfaces.

The Australian Department of Defence is exploring the potential of integrating RASAI technologies to enhance the warfighting capabilities of the ADF. These range in type, from perception and control system attacks to information warfare and platform destruction.

Future platforms

The next generation of RASAI platforms will include advanced vision-based AI and advanced swarming enabled systems. Developing these technologies will enable robotics and autonomous systems to deliver persistent, wide-area operations on land, in the air and at sea. They will powerfully augment current human-based systems, especially in monitoring and surveillance.

Australian companies are helping to create these future platforms. The Australian companies described in this matrix have developed new RASAI capabilities in recent years across multiple domains. They are dynamic and enterprising. They are looking for opportunities to partner with global defence companies to augment potential and create game-changing capabilities.

RASAI Defence Industry Capability Matrix

RASAI systems are created through the convergence of numerous technologies. For the purpose of presenting this Capability Matrix we have devised a taxonomy clustering the technical expertise in Australian industry around four primary areas:

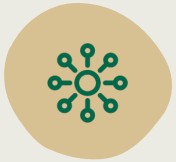
- Edge platforms
- Agents
- Decision aids
- Social protocols

Additionally, capabilities are mapped against their domain of operation: air, land, sea and digital. We encourage you to search for companies of interest by exploring the wide array of RASAI technologies included in the Matrix. If you would like to get in touch with any of the companies listed, feel free to reach out to us using the contact details listed.

Benefits of RASAI for defence

Increased safety for human operators

Operations in areas denied to or dangerous to humans
(termed "Anti-Access/Area Denial" or A2/AD)



Force multiplication
(creating mass)

Persistent presence

Increased manoeuvre options
(through low cost and large numbers attritable RAS – expendable)

Speed of action and response

The RASAI Matrix

ORGANISATION	PLATFORM				EDGE PLATFORMS				SOCIAL PROTOCOLS		DECISION AIDS				AGENT SYSTEMS	State/HQ
					Robots	Remote robotics	Autonomous robots	Autonomous teaming robots	Telecomm protocols	Agreement protocols; multi-agent protocols	Situational awareness & mission planning systems	Multi-agent decision systems	Network decision systems	Agent decision systems	Agents	
Additive Engineering	AIR	LAND	SEA	DIGITAL	●	●	●	●								VIC
ADVI	AIR	LAND		DIGITAL	●	●	●				●	●		●	●	NSW
Agent Oriented Software	AIR	LAND	SEA	DIGITAL	●					●	●	●	●	●	●	VIC
AIMS	AIR	LAND	SEA	DIGITAL		●	●	●		●	●			●	●	QLD
AMC			SEA	DIGITAL			●	●		●	●			●	●	TAS
Athena AI	AIR	LAND											●	●		QLD
Australian Droid & Robot	AIR	LAND	SEA		●	●	●		●						●	QLD
BAE Systems Australia	AIR	LAND	SEA	DIGITAL	●	●	●				●	●	●			ACT
Baird Technology					●	●	●	●			●	●				QLD
Baraja							●									NSW
Bia5		LAND			●	●	●				●					QLD
Blue Ocean Marine Tech Systems			SEA		●	●	●			◗	●	●	◗	◗	◗	WA
BlueZone			SEA		●	●	●									NSW
BosTECK										●	●	●	●	●	●	QLD
CAETRON		LAND			◗	◗	◗									QLD
Chironix		LAND			●	●	●	●			●	●			●	WA
Consunet				DIGITAL			◗		●	◗	◗	◗	●	●	◗	SA
Deakin University	AIR	LAND	SEA		●	●	●				●	●		●		VIC
DefendTex							●			●		●	●	●	●	VIC
Department 13	AIR			DIGITAL	●	●	●		●	●	●					ACT
DroneShield	AIR	LAND	SEA	DIGITAL							●	●	●	●		NSW
ECLIPS Logistics		LAND		DIGITAL	●	●	●				●			●	●	QLD
Emesent	AIR	LAND	SEA	DIGITAL	●	●	●			◗	◗	◗		●	●	QLD
EPE	AIR	LAND			●	●	●				●	◗	◗	◗	●	QLD
GeoDrones Australia	AIR	LAND	SEA	DIGITAL	●		●				●	●				ACT

Semi-circle denotes capability currently in development

The RASAI Matrix

Continued from previous page.

ORGANISATION	PLATFORM				EDGE PLATFORMS				SOCIAL PROTOCOLS		DECISION AIDS				AGENT SYSTEMS	State/HQ
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Gilmour Space Technologies	AIR						●	●		●	●	●		●	●	QLD
Hiroco	AIR	LAND	SEA	DIGITAL						◗	◗	◗		◗	◗	NSW
Intelligent System Design	AIR	LAND	SEA	DIGITAL	●	●	●				●			●		NSW
Marathon Robotics		LAND			●	●	●		●	●		●			●	NSW
MEMKO	AIR		SEA		●	●	●				●					VIC
Moog					●	●	●				●	●				VIC
Myriad Technologies	AIR	LAND	SEA								●	●				QLD
Navantia Australia			SEA				●				●			●		NSW
NDE Solutions	AIR	LAND	SEA		●	●		◗								SA
Ocius Technology Ltd			SEA		●	●	●	●	●		●		●	●		NSW
RMIT University	AIR			DIGITAL	●			●		●		●		●	●	VIC
SaberAstro						●					●			●		SA
Seeing Machines	AIR	LAND	SEA								●		●			ACT
Skyborne Technologies	AIR	LAND			●	●	●					●				QLD
SphereDrones	AIR	LAND	SEA	DIGITAL	●	●	●				●	●		●		NSW
Stahl Metall	AIR	LAND	SEA		●	●	●	◗			◗	◗			●	VIC
SYPAQ	AIR	LAND	SEA	DIGITAL	●	●	●				●	●		●		VIC
Textron Systems Australia	AIR				●		●									VIC
The Whiskey Project Group			SEA				●	●			●	●	●		●	NSW
Turbine MachineGenes	AIR		SEA				◗				◗	◗		◗		QLD
Universal Field Robotics		LAND			●	●	●				●	●		●	●	QLD
University of New South Wales	AIR	LAND	SEA	DIGITAL	●	●	●	●	●	●		●	●	●	●	NSW
University of Queensland	AIR	LAND	SEA		●	●										QLD
University of Technology Sydney	AIR	LAND	SEA		●	●	●	●				●				NSW

Semi-circle denotes capability currently in development

Austrade

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Trusted Autonomous Systems

Trusted Autonomous Systems (TAS) is Australia's first Defence Cooperative Research Centre. It is uniquely equipped to deliver research into world-leading autonomous and robotic technologies. Its goal: to enable trusted and effective cooperation between humans and machines. Trusted Autonomous Systems aims to improve the competitiveness, productivity, and sustainability of Australian industry through industry-led projects with real translation opportunities to move technology rapidly from universities into industry and ultimately into leading edge capability for the Australian Defence Force.

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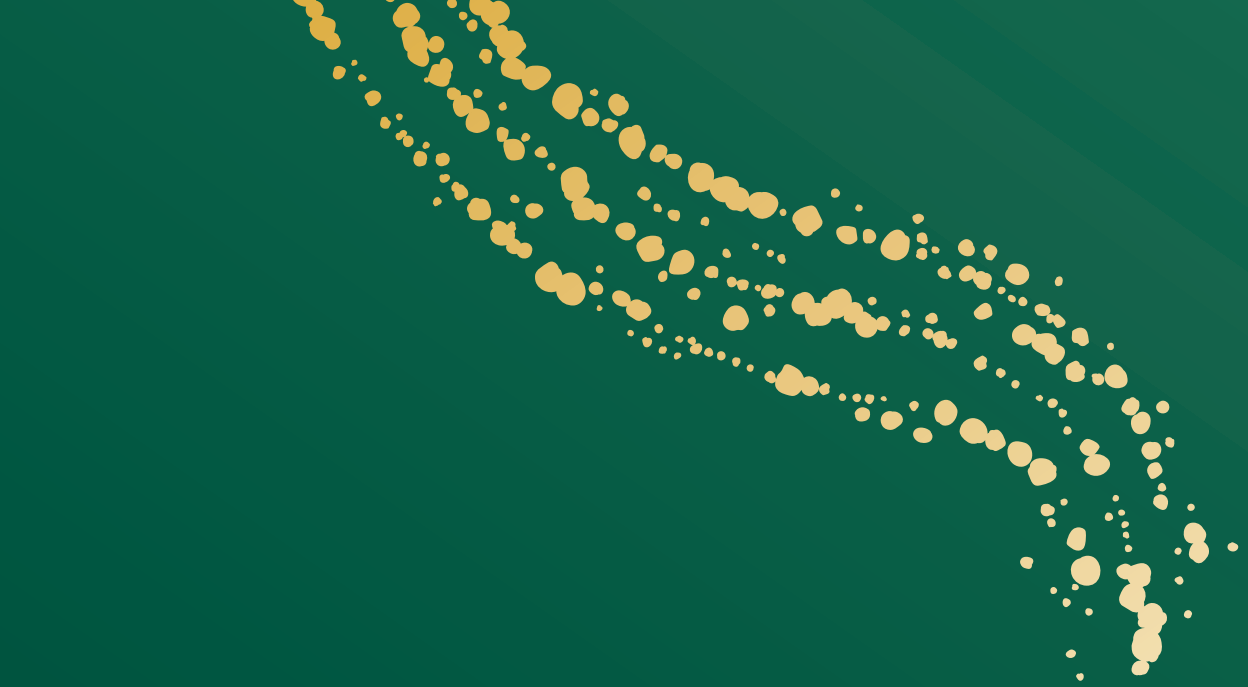
Image courtesy of Department of Defence



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