Australian Government

DEFENCE INDUSTRY & INNOVATION

Trusted Autonomous Systems Defence CRC

Professor Rob Sale
Deputy Chair

2016 Defence White Paper and Industry Policy Statement

Australian Defence Organisation

Defence Driven Priorities

Capability and enterprise needs

Force Design ⟷ Technology Foresighting

Next Generation Technologies Fund

Defence Innovation Hub

Defence Innovation Portal (CDIC)

Funded Collaborative Research Programs

Funded Collaborative Innovation Programs

Australia's Innovation System

- Academia
- Public Research Agencies
- Industry
  - Small to medium enterprises
  - Primes
- Industry Growth Centres

TRUSTED AUTONOMOUS SYSTEMS – DEFENCE COOPERATIVE RESEARCH CENTRE

Announcements

First Defence Cooperative Research Centre Formed

18 December 2017

Minister for Defence Industry, the Hon Christopher Pyne MP, today announced the formation of the first Defence Cooperative Research Centre (CRC) for Trusted Autonomous Systems with inaugural participating members BAE Systems Australia, RMIT University, DefendTex and the Department of Defence, represented by Defence Science and Technology Group.

Minister Pyne said the Defence CRC is being set up under the Next Generation Technologies Fund, with $50 million invested over seven years to deliver trustworthy smart-machine technologies for new defence capabilities based on advanced human-machine teaming concepts.

"The Defence CRC establishment is based on a sound formation plan developed by Chair Mr Jim McDowell, in collaboration with a panel of independent experienced experts from industry, academia, Defence and the UK Defence Science and Technology Laboratory," Minister Pyne said.

"I thank the panel for their expert advice in shaping the Defence CRC which will play a vital role in giving Defence a game-changing capability."

The expert panel included former Australian Chief Scientist Ian Chubb, Professor Hugh Durrant-Whyte, the UK Defence Ministry's Chief Science Adviser, Air Vice Marshall Neil Hart (Retd), and Mr Paul Marrow, former CEO of GD Defence Australia.

"Additional companies and universities will join as participating members and research partners as the Defence CRC grows and takes on more projects," Minister Pyne said.

"Initially, there will be three Defence CRC research projects led by BAE Systems, Thales Australia and Lockheed Martin in the land, maritime and aerospace domains."

Minister Pyne also announced that as the outcome of a competitive process the headquarters of the Defence CRC for Trusted Autonomous Systems will be located in Queensland.

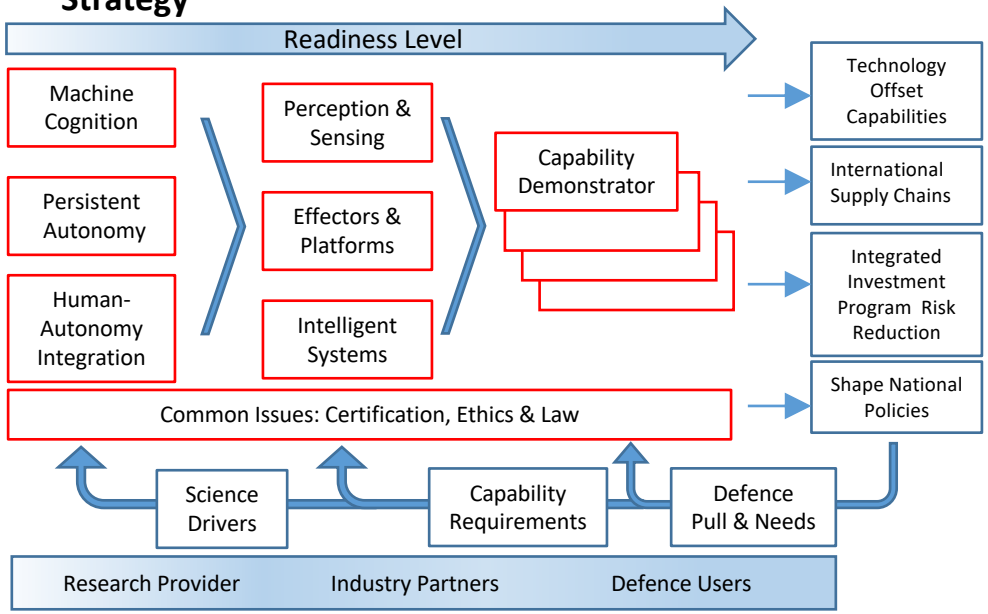
The Hon Christopher Pyne MP
Minister for Defence Industry

Delivery

Land: Networked Autonomy
Maritime: Littoral Operations
Air-Space: Persistent Autonomy

- Autonomous learning systems
- Human-machine collaborative decision-making
- Network-enabled autonomous systems

Strategy



Capability Demonstrator:

Industry Demo + Human-on-loop C2

https://www.business.gov.au/centre-for-defence-industry-capability/defence-innovation-portal/defence-crc-for-trusted-autonomous-systems

NEXT GENERATION TECHNOLOGIES FUND

Next Generation Technologies

"A Strategic Investment in S&T"

Technology driven Transformational Defence Domains:

- Cyber and Electronic Warfare
- Integrated ISR
- Space Capabilities
- Undersea Warfare

Game Changing Technology:

- **Trusted Autonomous Systems**
- Enhanced Human Performance and Resilience (Inc. Medical Countermeasures)
- Hypersonics technology
- Quantum Technologies
- Multidisciplinary Material Sciences

NEXT GENERATION TECHNOLOGIES FUND

INTENT STATEMENT

To research, develop, enhance, demonstrate and evaluate the Defence utility of autonomous systems for future operations.

PURPOSE:

- Develop and deliver world-leading autonomous and robotic war fighting assistive technology
- Build new and innovative IP through focused research and technology programs
- Assist Australian industry in developing new, improved and competitive autonomy technologies
- Evaluate the utility of autonomous systems to Defence through capability demonstrations

METHOD:

- Foster collaboration between Defence, industry and research organisations;
- Increase SME participation in collaborative research;
- Improve research skills and capabilities in the Australian Defence industry
- Agile “build a little - test a little - repeat”

ENDSTATE:

- Transform the capacity and ability of Defence to acquire, deploy and sustain leading-edge autonomous and robotic technology
- Improve the competitiveness, productivity and sustainability of Australian Industry.

NEXT GENERATION TECHNOLOGIES FUND

TAS DCRC Goal and Objectives

- **Goal**:
  - To deliver world-leading autonomous and robotic technologies to Australian Defence that enables trusted and effective cooperation between humans and machines
- **Objectives**:
  - Develop highly self-sufficient and survivable systems; (level 4+)*
  - Develop highly self-determining and self-aware systems; (level 4+)*
  - Develop human-autonomy systems that are human and context aware
  - Increase the speed to reach a deployable state for trusted autonomous systems;
  - Increase the scalability and reduce the cost of autonomous systems technology solutions;
  - Educate in the ethics and legal aspects of autonomous systems and shape National policy;
  - Advocate and shape National regulations.

* International Vehicle Standard Level 4: “May be human piloted but never needs to be. If in trouble seeks human assistance. If assistance not forthcoming goes into a safe mode of operation.”

NEXT GENERATION TECHNOLOGIES FUND

Research Program

- Autonomous systems have been promised for decades but they still haven't arrived. ***Why***? Is it because…

they aren't resilient enough?

Persistent Autonomy

- managing uncertainty and unpredictability,
- persistent perception,
- multi-modal fusion,
- self-healing systems,
- assertive actuation.

they aren't smart enough?

Machine Cognition

- machine learning,
- artificial intelligence,
- symbolic reasoning and logic,
- theory of mind,
- planning,
- decision making,
- social agents.

people don't trust them?

Human-Autonomy Integration

- human-machine models,
- behavioural and social models,
- psychometrics,
- shared decision making,
- trust and uncertainty,
- communications and narrative.

- We can't expect a different result if we do the same research!
- New science and repurpose existing techniques

FUND

Functional Technology Program

Pull through and integrate outcomes from the fundamental research into three areas:

Perception and Sensing

- resilient perception,
- scene, situation and self-understanding,
- modular low-cost intelligent sensors,
- bio-inspired sensing.

Effectors and Platforms

- self-managing platforms,
- adaptable platforms and effectors,
- bio-inspired platforms,
- micro-systems, novel actuation,
- low observability.

Intelligent Systems

- multi-modal, multi-platform, data fusion,
- multi-platform, multi-role decision making,
- human-system integration.

NEXT GENERATION TECHNOLOGIES FUND

Capability Demonstrator Program

- **Showcase integrated capabilities** against Defence requirements
  - counters to anti-access and area denial systems;
  - remote surveillance of ocean, land, air and space;
  - urban and littoral operations.
- Demonstrate to Defence **new ways to acquire** autonomous systems capabilities
  - Capability lifetimes *radically* more fleeting
  - Autonomous systems potential for *radically* lower cost and larger scale
  - Agile method philosophy supported by continuous integration environment
  - Rapid system re-certification
- Show Defence how fast these technologies may be adapted for ***deployable*** autonomous systems to create competitive advantage

FUND

Centre for Defence Industry Capability (CDIC)

The **Centre for Defence Industry Capability (CDIC)** supports Australian businesses entering or working in the defence industry.

The CDIC is an initiative of the Defence Industry Policy Statement. Its purpose is to help transform the Defence and industry relationship, facilitate innovation and exports, and fund defence industry development, critical defence business maturity and skilling.

Contact details are: 132846 and : www.business.gov.au/CDIC

NEXT GENERATION TECHNOLOGIES FUND

Questions?

NEXT GENERATION TECHNOLOGIES FUND