

Australian Government Department of Defence Science and Technology



INVITATIONAL SYMPOSIUM ON TRUSTED AUTONOMOUS SYSTEMS SURVIVING THE UNPREDICTED > 9 - 11 MAY 2016 > SOUTH AUSTRALIA

Welcome

Dr Alex Zelinsky Chief Defence Scientist



Port Botany: Container Handling Automation





Fully automated from April 2015





Science and Technology for Safeguarding Australia

Rio Tinto: Mine Automation





Automated trucks pickup, haul & dump 2012

Operations centre commissioned 2010

Deployed cab-less drill 2014

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Deployed driverless train 2012





Defence: ISR Automation



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DST GROUP

- Global Hawk flies US to Australia and operates out of RAAF Edinburgh in 2001.
- DSTO scientist and Project Director, Dr Jackie Craig, led the Australian R&D team.
- Australia to acquire 7 high-altitude MQ-4C Triton unmanned aircraft in early 2020s to for maritime patrol capability and surveillance.

Australian Defence: ISR Automation





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ScanEagles 2007-2012 in Afghanistan, flew 6,200 missions 32,000hrs



RAAF Heron deployed 2010-2012 in Afghanistan.

Since 2012 used for training prior to introduction of MQ-4C Triton



US Defense: Towards a Third Offset Strategy

Adversaries are developing their own ISR-strike networks—with emphasis on missile systems – to challenge conventional U.S. power projection

To "offset," US will leverage its "core competencies" in

- unmanned systems,
- long range and low-observable airpower,
- undersea warfare, and
- complex systems engineering

"Premium on survivable forward presence and global responsiveness"



Program Context

Trusted Autonomous Systems - Strategic Research Initiative



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Australian Commercial, Industrial and Defence applications to date are *automation solutions*

So, where are all the *autonomous systems in Defence operations*?

- Defence environments are complex and contested
- Consequences of error unacceptably high for automation
- We can't expect a different result if we do more of the same

Tyche Strategic Research Initiative

- Aims to place Australia in the World's Top 5 in the science of trusted autonomous systems (TAS) in 7 years
- Strategic and focused research
- Defence requires deep expertise in this domain
- NEW science & repurposing existing techniques
- Next Generation Technologies Fund based on partnering



Persistent, long range "solo" operations



Smart awareness and smart mission execution



Science and Technology for Safeguarding Australia

TTCP Autonomy Strategic Challenge

Littoral: Base protection, Critical infrastructure protection, Counter-smuggling

- 2016 C2 Systems Trials (US,UK,AS)
- 2017 Platform Autonomy Trials (US,UK,CA,NZ)
- 2018 "Autonomous Warrior" Trial (AS Nov)

Australian Defence Vessel (ADV) Ocean Shield for UxV launch, command and control, recovery





Objectives

- Human "on the loop" control of multiple simultaneous UxV missions
- Machine-learned plans
- Minimal operator interaction
- Autonomous systems that assess intent by probing / interaction
- Littoral threats and unknowns (manned & unmanned)











Conclusion

- Uncertainty remains a fundamental limitation to the use of autonomous machines in core Defence Operations.
- Tyche is a foundational research program to develop new research skills in trusted autonomous systems to meet this challenge.

 We're establishing a new Cooperative Research Centre in Trusted Autonomous Systems under the Next Generation

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Technologies Fund

RALIAN CENTRE FOR ROBOTIC VISION



We look forward to reaching World Class with you.



Science and Technology for Safeguarding Australia



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THANK YOU

