Australian Government
Department of Defence
Defence Science and
Technology Organisation

DSTO Partnership Week 2015
Partnership Opportunities
Land Division

Dr Simon Oldfield, Chief Land Division

DSTO Leadership

Chief Defence Scientist
Dr Alex Zelinsky

Deputy Chief Defence Scientist
(Research Services)
Mr Peter Lambert

Deputy Chief Defence Scientist
(Strategy and Program)
Ms Janis Cocking

Deputy Chief Defence Scientist
(Partnerships and Outreach)
Dr Ken Anderson

Client Domain Program Manager Land

Chief Land Division
Dr Simon Oldfield

Chief Maritime Division
Dr Kevin Gaylor

Chief Aerospace Division
Dr Richard Chester

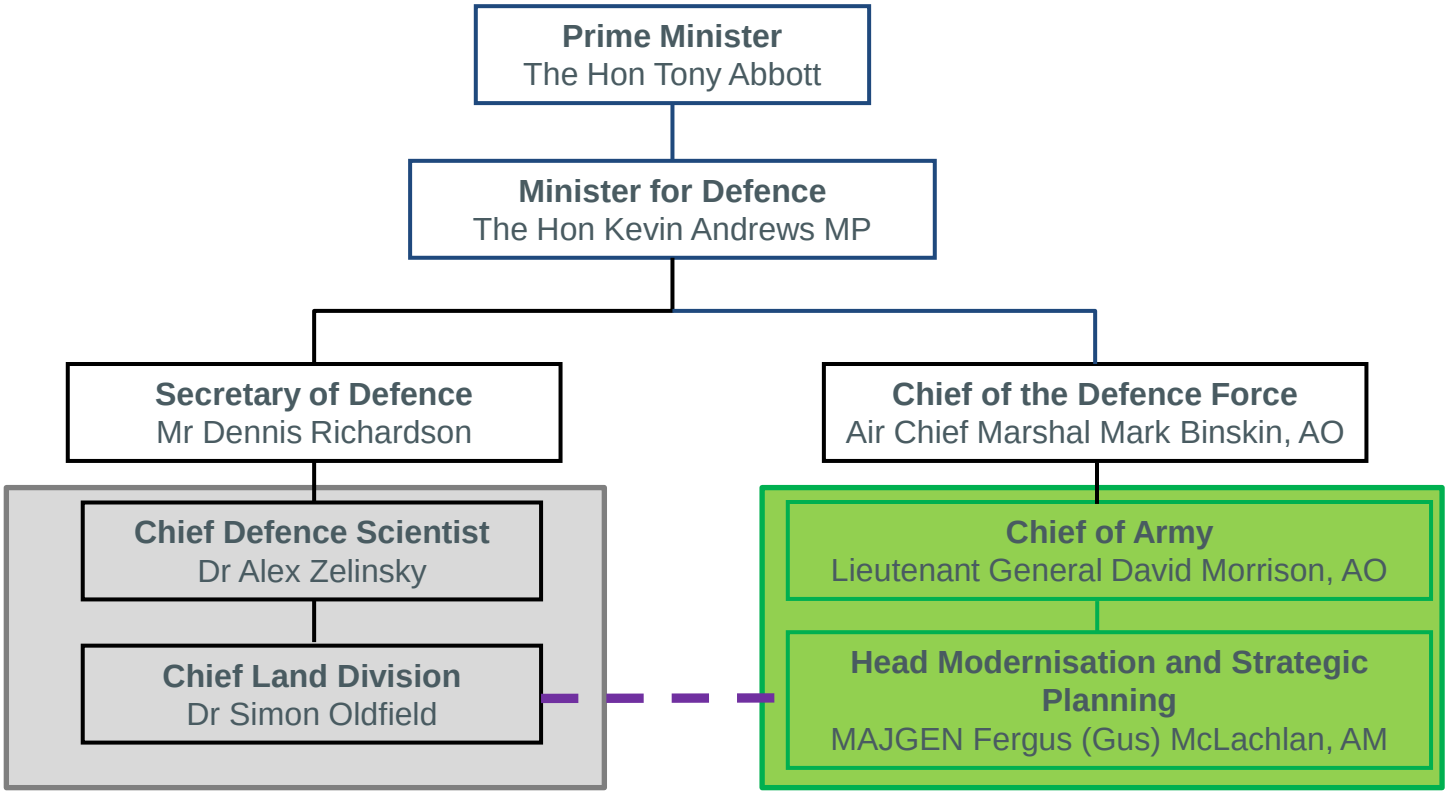
Chief Weapons and Combat Systems Division
Dr John Riley

Chief Cyber and Electronic Warfare Division
Dr Jackie Craig

Chief National Security and Intelligence, Surveillance and Reconnaissance Division
Dr Tony Lindsay

Chief Joint Operations and Analysis Division
Dr Todd Mansell

Land Program Governance

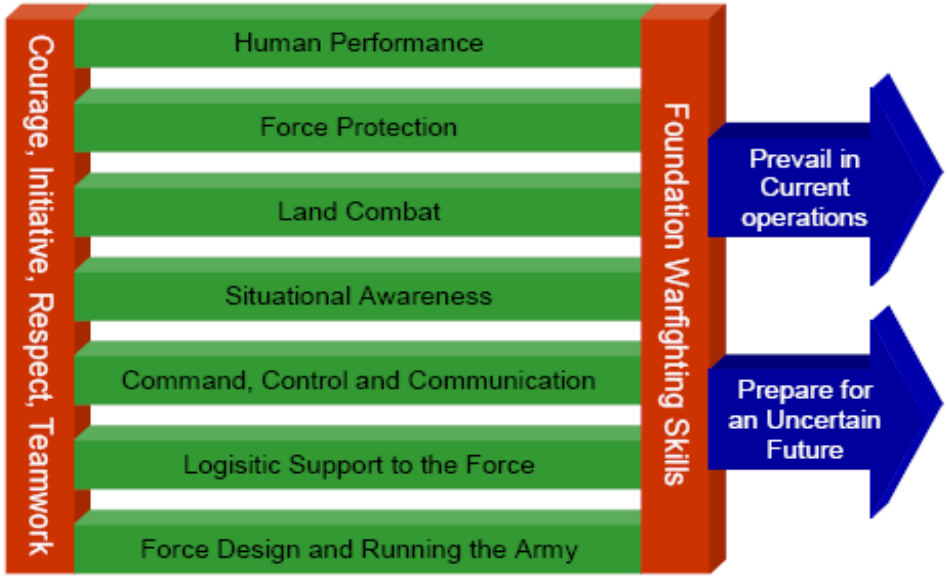


Army Modernisation Lines of Effort

Working together to identify, prioritise and plan R&D

Army Lead	DSTO Lead
LTCOL C.J. Shillabeer	Dr Nick Beagley
MAJ G.J. Colton	Mr. Tim Bussell
LTCOL D.D. Conners	Mr Brian Reid
MAJ L. Hayward	Dr John Percival
MAJ A.S. Walker	Dr Peter Shoubridge
LTCOL R.C. de Rooy	Dr Lin Zhang
COL M.R. Thompson	Dr Tim McKay

AMLE Title



AMLE Governance Model

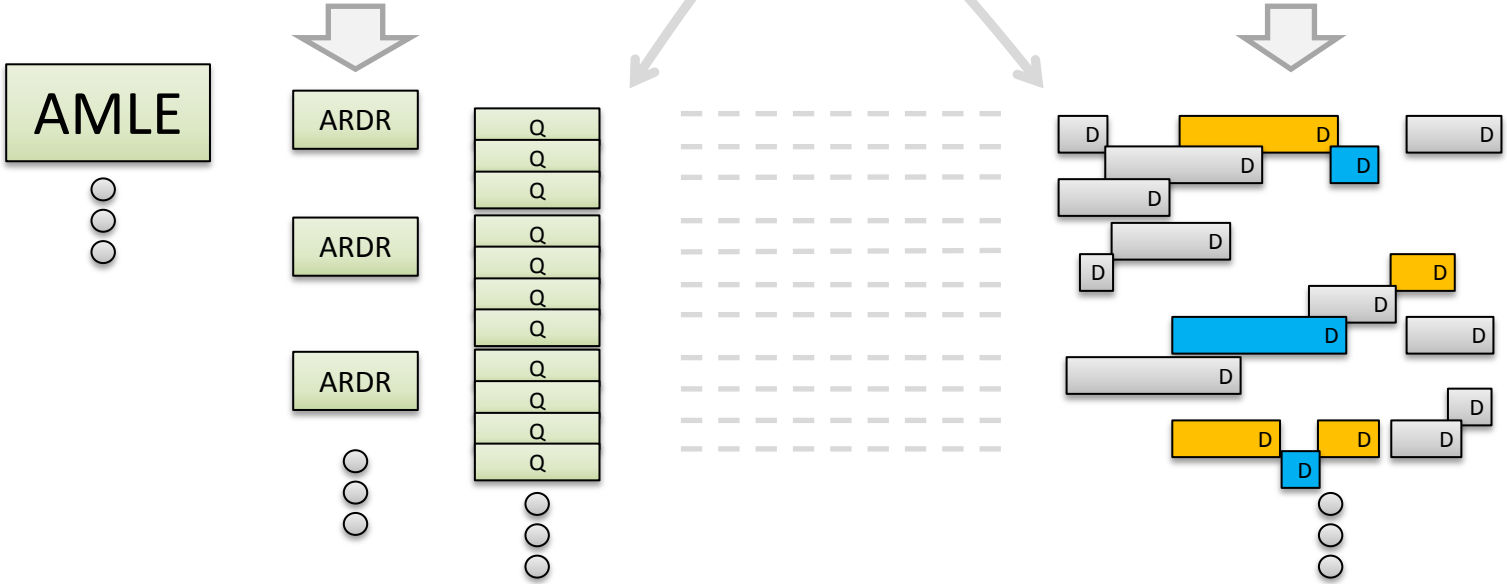
AHQ AMLE Lead

Identifies, consolidates and refines capability questions (Q) grouped under Army R&D Requirements (ARDRs) by Army Modernisation Line of Effort (AMLE), tracking and acting on the outputs.

Refine & Agree

DSTO AMLE Lead

Designs a program adaptively applying available resources to activities and deliverables (D) to the highest priority questions, maximising quality and impact.



Major Science and Technology Capabilities

Land Human Systems
Dr Nick Beagley

- Social Science
- Cognitive
- HSI & Ergonomics
- Physiology
- Injury
- Food & Nutrition

55 Staff

Land Vehicles & Systems
Dr Peter Shoubridge

- Armour
- Logistics
- C2 Systems
- Vehicle Systems
- Architectures
- Integration

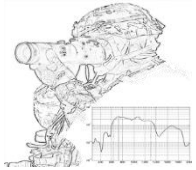
51 Staff

Chemical & Biological Defence
Dr Greg Coia

- Medical Countermeasures
- CB Surveillance
- Synthesis
- Detection
- Protective Equipment
- Hazard Management

48 Staff

Land Personnel Protection
Dr Roger Neill



- Counter Surveillance
- Power & Energy
- CBR Modelling
- Functional Materials
- Radiological Defence
- Vulnerability

29 Staff

Combined Arms Fighting Systems Integration

Mr. Brian Reid

To establish cross technology/cross divisional teams to help Army address critical emerging challenges within the land domain. Including;

- Operating and surviving within the future land environment (crowded/urban, EW contested, uncertain)
- Survive and fight against modern threat systems
- Operate as a networked team of Land, Air and Maritime assets

Principal Scientist (S&T7)

Land Division Partnerships

- Success stories
  - **Physical Employment Standards:** Soldiers fit for trade tasks
  - **Off Axis Viewing Device:** Commercially successful innovation
  - **Diggerworks:** Modernisation of the Soldier Combat Ensemble

- Potential Strategic Partnership opportunities in the future include
  - Cognitive performance & resilience
  - Autonomous Systems
    - Urban Operations with Multi-Mission Autonomous Systems
    - Logistics for distributed combat service support
  - Power and Energy
  - Medical countermeasures consortium

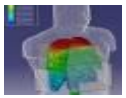
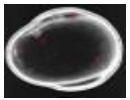
Diggerworks

Stakeholder Partnership

• Shared Goals • Trust & Respect • Risk Acceptance

User Centred Adaptive Acquisition

Threat Directed , Evidence Based & Research Enabled







Etc…

Land Human Systems

Cognition & Behaviour (Adelaide)

"Preparing and understanding the minds of soldiers"

Dr Justin Fidock (acting)

Food & Nutrition (Scottsdale)

"Providing the food required, understanding the food desired"

Dr Terry Moon

Physical Ergonomics (Melbourne)

"Getting the best person and best equipment for the task and environment"

Dr Mark Patterson

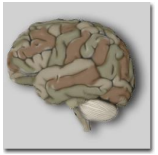
Program Highlights

- Organisational Learning
- Simulation for Training
- Combat Ration Enhancement
- Physical Employment Standards
- Diggerworks
- Soldier Vehicle Integration
- Injury Prevention

Partnerships

- University of Sydney (Cognitive Performance)
- Rheinmetall (Simulation for Training)
- CSIRO/UTAS (Centre for Food Innovation)
- Griffith University (Consumer & Biomech)
- University of Wollongong (PES CoE)
- University of Melbourne (Physical Injury)
- University of SA (Anthropometry & Performance)

Potential Partnership Opportunities



- Enhancing cognitive capacity under extremes of environment & task
- Delivering truly effective training through simulation technologies
- Adaptive organisations through evidence based design and modern media

- Warfighter status monitoring and feedback for peak performance
- Physical resilience to fatigue and injury within environmental extremes
- User Centred Design to realise the full potential of ADF systems

- Raising the bar on ration pack quality
  e.g. Microwave Assisted Thermal Sterilisation
- Understanding and shaping consumer choice and eating behaviour

Land Vehicle & Systems

Advanced Vehicle Systems (Adelaide)

"Vehicle Digitalisation Research: Breathing Life into Army's Combat Vehicles"

Dr Axel Bender

Logistics (Adelaide)

"Land Logistics Research: Science of Sustaining the Army"

Dr Lin Zhang

Survivability (Melbourne)

"Science to Survive and Win"

Mr Paul Phillips

Program Highlights

- Smart federations of on and off board digital services
- Autonomic control of vehicle hosted applications
- Vehicle health and usage monitoring
- Land capability integration
- Land combat vehicles
- Special Ops systems support
- Logistics projects and studies
- Land vehicle protection

Partnerships

- RMIT University
- University of NSW
- Ultra Electronics
- DMTC
- TTCP
- Thales
- Elbit

Systems Integration and Tactical Networking (Adelaide)

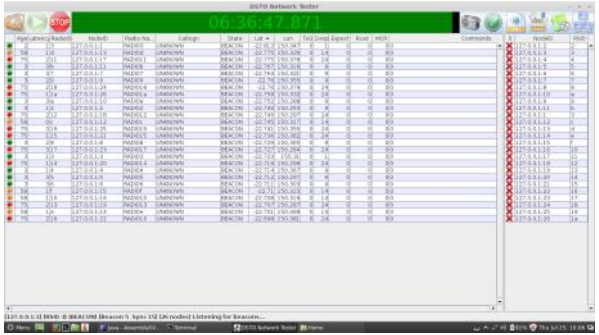
"Unlocking the information for decision superiority"

Mr Kevin Robinson

DSTO Network Analysis Tool (DNAT)

- A potential partnership opportunity

- The DNAT is a field-deployable distributed network characterisation software suite used for tactical IP radio networks.
- It enables measurement of actual network performance in typical tactical data network configurations.



DSTO Network Analysis Tool (DNAT)

- For whom, and why?

- Used as the primary network test tool in both field and laboratory radio network testing in support of current Land Projects LAND75, LAND2072, and LAND2097.
- Providing DSTO and Army a better understanding of the constraints and considerations when deploying contemporary state-of-art radios (e.g. EPLRS, ANW2, and SRW) in typical land-based tactical networks.

DSTO Network Analysis Tool (DNAT)

- Key features

- Radio network traffic stimulation and logging software suite
- Designed for use on low bandwidth networks
- Enables both real-time and post-test analysis of network performance
- Customisable traffic scenarios
- Single ‘Master’ node controls and orchestrates each traffic scenario
- Interface modules written for specific radios
- Extensible framework facilitates integration with future radios

DSTO Network Analysis Tool (DNAT)

- Points of contact

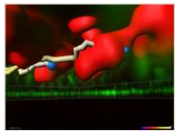
- System architects and developers:
  - **Thomas Schar and Peter Boyd**
- Team Leader:
  - **David Krause**
- Group Leader:
  - **Kevin Robinson**
- Land Vehicles and Systems,
  Land Division, DSTO Edinburgh

Chemical & Biological Defence

Synthesis and Analysis
(Melbourne)

"Enhancing the understanding of chemical hazards and toxins and verifying their use"

Dr Harry Rose



Medical Countermeasures (Melbourne)

"Countering Chemical and Biological Weapons"

Dr Peter Gray

Biosurveillance and Biodetection
(Melbourne)

"Meeting Defence and National Security needs for rapid diagnostics and detection of CB warfare agents"

Dr Mick Alderton

Program Highlights

- Synthetic Biology
- Counter NTA, Ricin and Q-Fever
- Civilian CT and National Security
- Support to L2110 and L3025
- Support to DIO
- Support to SOER
- Support to Joint Health Command
- Counter Proliferation and Arms Control

Partnerships

- LaTrobe University
- University of New South Wales
- Flinders University
- CBR MOU
- Monash University
- Bio 21
- CSIRO

Individual Protection and Hazard Management
(Melbourne)

"Evaluation and development of protective ensembles to meet ADF requirements"

Dr Rebecca McCallum

Black Canary – *Multiple partnerships*

June 2008	Request for real-time sensor on Cartman manikin produced
Dec 2008	MiniFab in collaboration with Catapult sports selected to make prototype MOSS sensors
Aug 2009	Following design iterations, fully working prototypes delivered for testing
Feb 2010	MK1 production MOSS delivered
Aug 2010	TSWG funding application for MIST/ARRAY approved for DSTO /Catapult sports
May 2011	Catapult and DSTO start work on MIST project with iWRX as an electronics subcontractor
July 2011	Catapult and DSTO start work on the Black Canary project
June 2013	Swinburne University and Deakin University engaged to help with MIST program humidity issues
June 2014	Working prototype Black Canary prototype delivered and tested
Jan 2015	Ideation Design and iWRX engaged to make a mk III MOSS sensor for a DSTO international engagement

catapult

CTTSO Combating Terrorism Technical Support Office

miniFAB

DEAKIN UNIVERSITY AUSTRALIA Worldly

SWINBURNE UNIVERSITY OF TECHNOLOGY

Synthetic Biology – *A partnership with university*

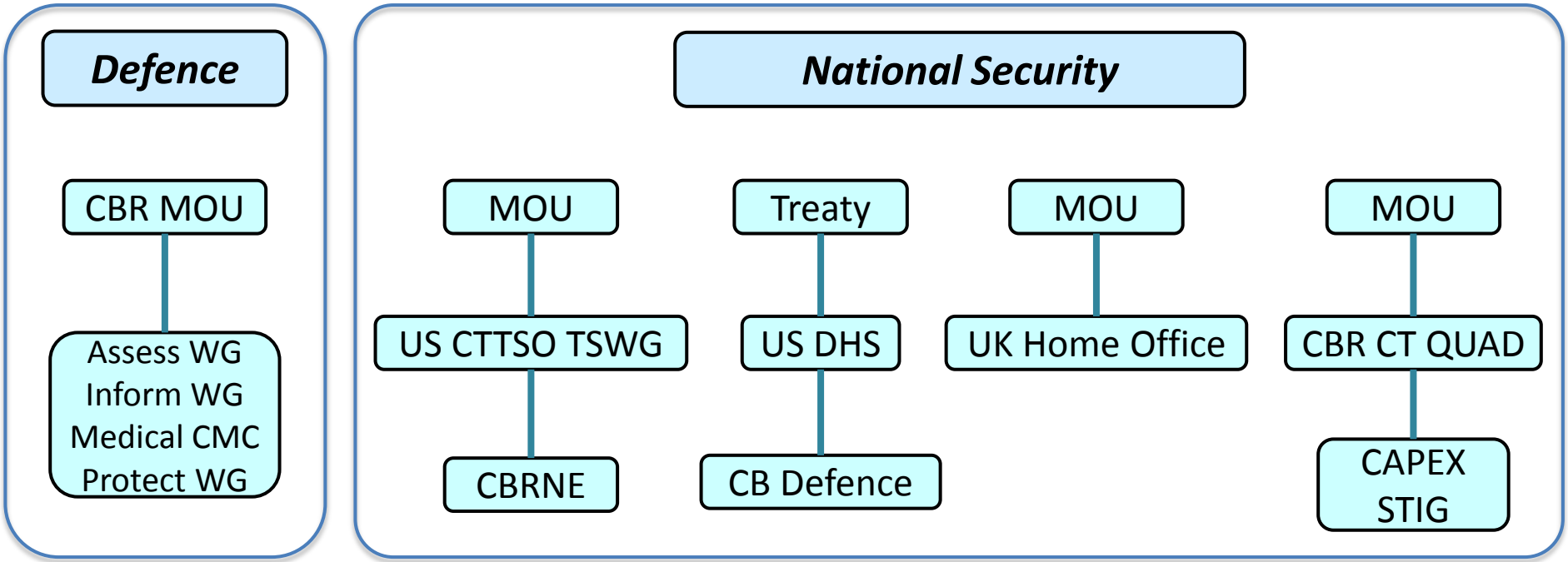
To develop a collaborative research capability in the emerging area of Synthetic Biology.

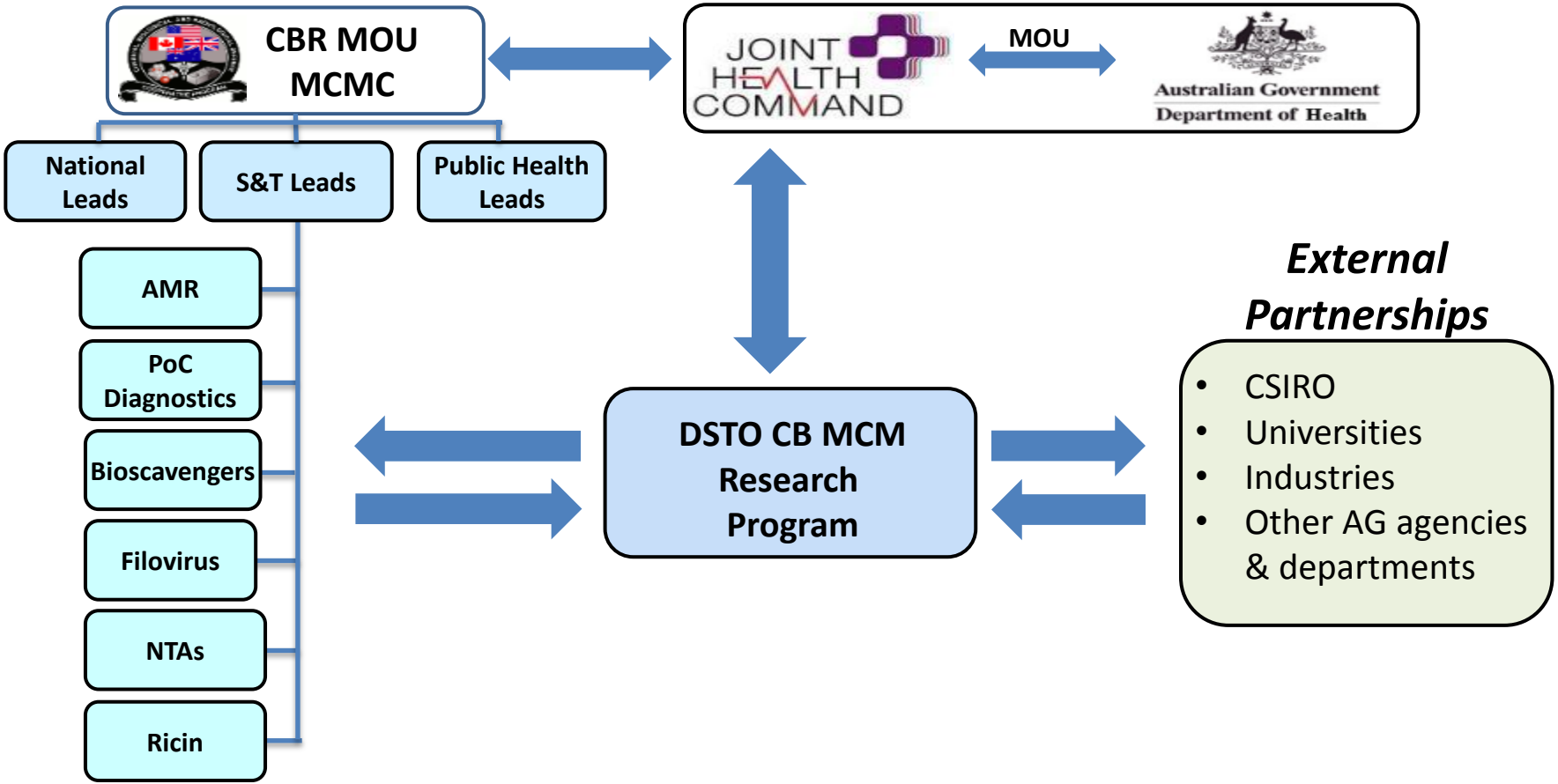
The Research Effort:

5 PhD students, 2 honours students and 2 Postdoctoral Fellows working on:

- **Developing microbial biosensors that can detect and degrade pollutants in remote environments or the sensing of explosives and biological-warfare agents.**

International Partnerships



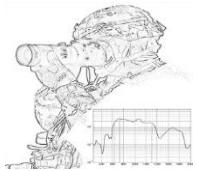

CBR MOU
MCMC
JOINT HEALTH COMMAND
MOU
Australian Government
Department of Health
National Leads
S&T Leads
Public Health Leads
AMR
PoC Diagnostics
Bioscavengers
Filovirus
NTAs
Ricin
DSTO CB MCM Research Program
External Partnerships
CSIRO
Universities
Industries
Other AG agencies & departments

Land Personnel Protection

Hazard Assessment (Melbourne)

"Predict to inform"

Dr Mike Roberts



Integrated Personnel Protection (Melbourne)

"Protect and enable"

Mr Tim Bussell

Priority Developmental Areas (Melbourne)

- Autonomous Systems
- Power and Energy

Program Highlights

- CBRNfx
- Radiological and Aerosol Defence
- Support to SOCOMD
- Power and Energy
- Battle Damage Assessment
- Blast and Ballistics Protection
- BioTerrorism Preparedness SRI
- Camouflage and Signature Management
- Soldier Combat System
- Civilian CT and National Security

Partnerships

- TTCP
- NATO
- CBR MOU
- 20+ University and Government Agencies
- 10+ Other Defence Organisations
- 10+ Industry Organisations

Land Personnel Protection – A 'Broad Church'

In today's environment provision of protection to personnel covers many domains:

- Personnel can be individuals, military units, non-military deployed personnel, and community members
- Many forms of protection are intuitively obvious, others not so:
  - Obvious forms include individual armour systems, signature management, defence against atmospheric agents etc.
  - Less obvious, but equally important include: providing robust, reliable energy systems, protection against infectious disease, use of automation and autonomy to remove personnel from avoidable danger

Potential partnership opportunities

- Long-standing engagements with industry and academia in camouflage and personal protection system development could be extended – e.g. multi-functional materials
- Expansion of capability in Bioterrorism Protection domain – networking for epidemic preparedness at national level: better syndromic surveillance, sophisticated genetic sequencing, autonomous sensors systems

Potential partnership opportunities

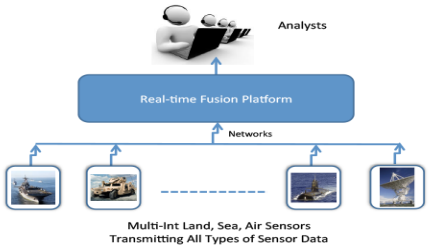
- Development of novel power and energy systems:
  - Individual power systems
  - Novel power systems for use in field deployments
  - Reducing reliance on fossil fuels
  - Multi-functional P & E systems
- Applications of Autonomy:
  - Enhanced Surveillance
  - Enduring surveillance (link to power and energy)
  - Using Autonomous systems to support operations: e.g. medivac, supply/resupply…..

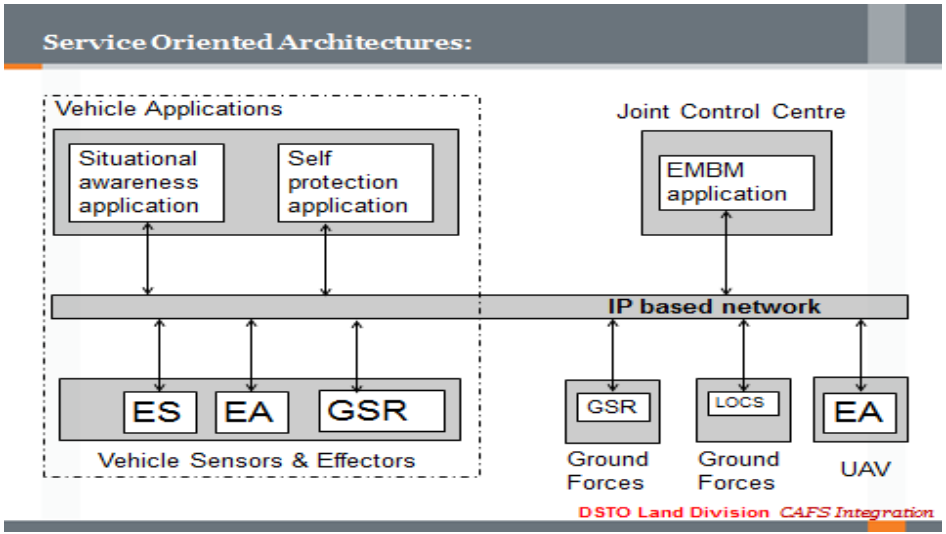
Combined Arms Fighting Systems Integration

Integrated Land Capability : Evolvable vehicles

- A genuinely open architecture will provide opportunities for affordable, low risk integration of third party sensors, effectors, applications and networking
- Will be enabled by System Integration Labs, coalition common open architecture backplanes/growth space
- TRL 2 through to 9

Multi-Int Sensor Fusion and Targeting

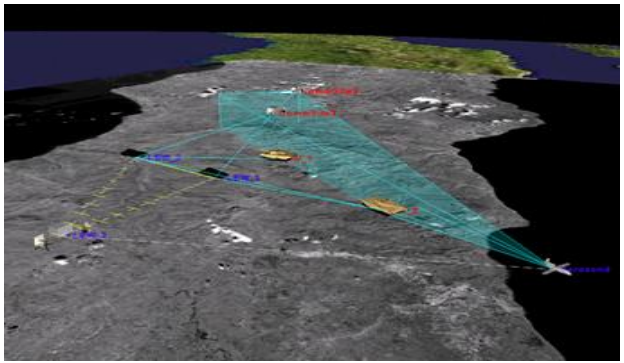


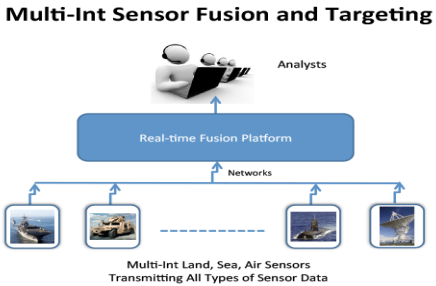


Integrated Land Capability : Future Applications

- Battle Management
- EM Battle Management
- Situational awareness
- Joint fires/cooperative targeting
- PHM, HUMS

- Active self protection
- Decision support
- Intelligence collection/use
- Improved HSI
- Remote medical aid,…..

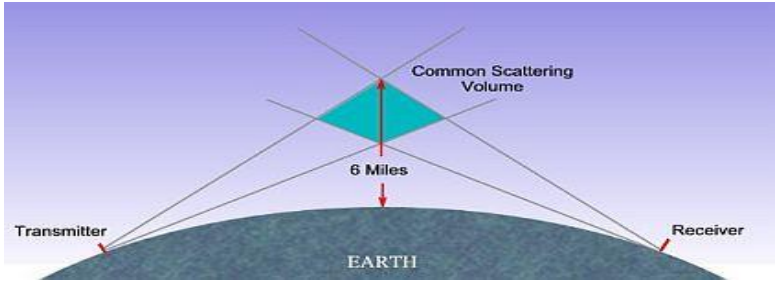




Integrated Land Capability : Assured comms

- Enabled by Software Defined Radio technology
- Based on channel/technology diversity

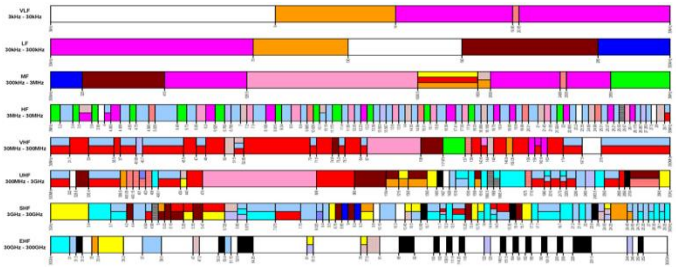
Tropospheric scatter



Software Defined Radio

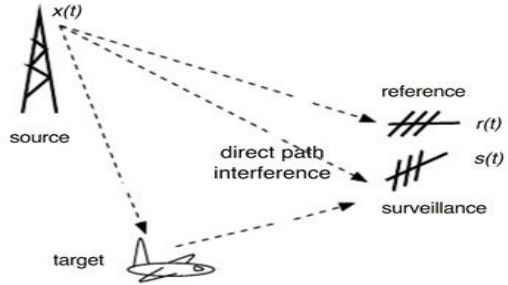
USRP $A5329

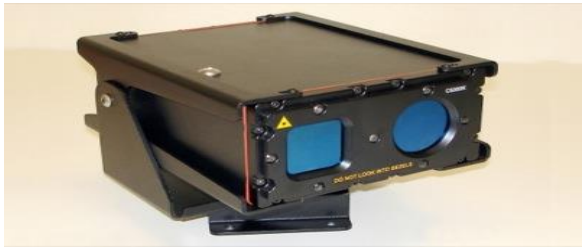
- 2 channels
- 120MHz
- Kintex-7 FPGA
- Dual 10 Gigabit Ethernet
- C++/Python API



Integrated Land Capability : Sensors & Effectors

- Software Defined Radio based sensors & effectors
  - Radar, PCL, ES, EA, multi-static radar, spoofing emitters
- Acoustic (multiplatform)
- DAS based IR sensors operating through HMD
- Retro-reflection based lens detection, …





Questions?