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Australian Defence Science & Technology - making the difference

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Pacific Operational Science and Technology Conference
Hawaii
July 2008

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Discussion Topics

- What's new in Australia?
- Defence Science making the difference
- Flagship Programs
- Capability Technology Demonstrator Program

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New Govt - New initiatives

- White Paper Review
- Force Structure Review
- Companion Reviews
- Budget measures

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White Paper Review 2008

- Australian Minister for Defence, the Hon Joel Fitzgibbon MP, announced a new Defence White Paper.

- The White Paper will be underpinned by a series of Companion Reviews. These reviews will be a key input to developing Defence business and budget priorities out to 2030.

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Companion Reviews

- Defence Capability Plan Review
- Preparedness, Personnel and Operating Costs Review
- Logistics Review
- Estate Review
- Workforce Review
- Industry Capacity Review
- Workforce Review
- Industry Capacity Review
- Information and Communications Technology Review
- Science and Technology Review

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Defence Budget Measures

- **3% annual growth until 2018 (2 extra years)**
- In 2008-09, ~$22.6B
- $1.036 billion for ADF operations

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Defence Budget Measures

- Defence needs to find savings of $10B over next decade
- $1B per year needs to be found to pay for Defence Capability Plan and Operations
- 5% cuts to the operational budget !
- Overseas travel cuts
- Reduction of Civilian staffing numbers

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Science Making the difference

- "Shapes Vector" Network security
- Nulka - Anti-ship Missile Defence – Off Board decoy
- Aircraft repairs/ fatigue testing
- High strength steel
- Barra sonobuoy
- Laser Airborne Depth Sounder
- Jindalee Operational Radar Network – Over the Horizon Radar

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Flagship Technology Initiatives

- Automation of the Battlespace
- Fibre Laser Sensor Technology
- Smart Materials and Structures
- Hypersonic flights

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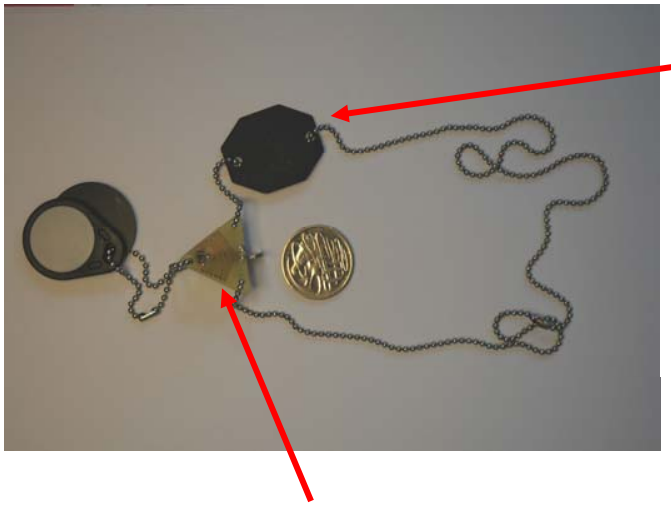
Capability & Technology Demonstrators

- Allows Australian Defence Industry to demonstrate how advanced technology can enhance Defence capability
- $210 M invested since 1998
- Average CTD $2m; 3 years



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Recent Capability & Technology Demonstrators

- Ka Band Satellite On-The-Move Communications System
- Field Portable Supersonic Particle Deposition unit
- Special Sonar for Submarines
- Elongate Solar Cells for Energy Generation
- Adaptive Tuned Mass Damper for Submarine Engines
- Miniaturised GPS Anti-Jam Module
- Low Band Direction Finding Sub-System
- Tactical Electronic Warfare Open Architecture RF Subsystem
- Rifle Fired High-Velocity Grenade Launcher
- Low Cost On-Store Telemetry
- Battlefield Integrated Tactical Exploitation of Sensors
- Take-Off and Landing Aid for Helicopter Maritime Operations

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DSTO at a Glance

- Budget (08-09) – $400m (approx)
- 12 Research divisions
- 2400 staff
- 8 sites across Australia

Questions?

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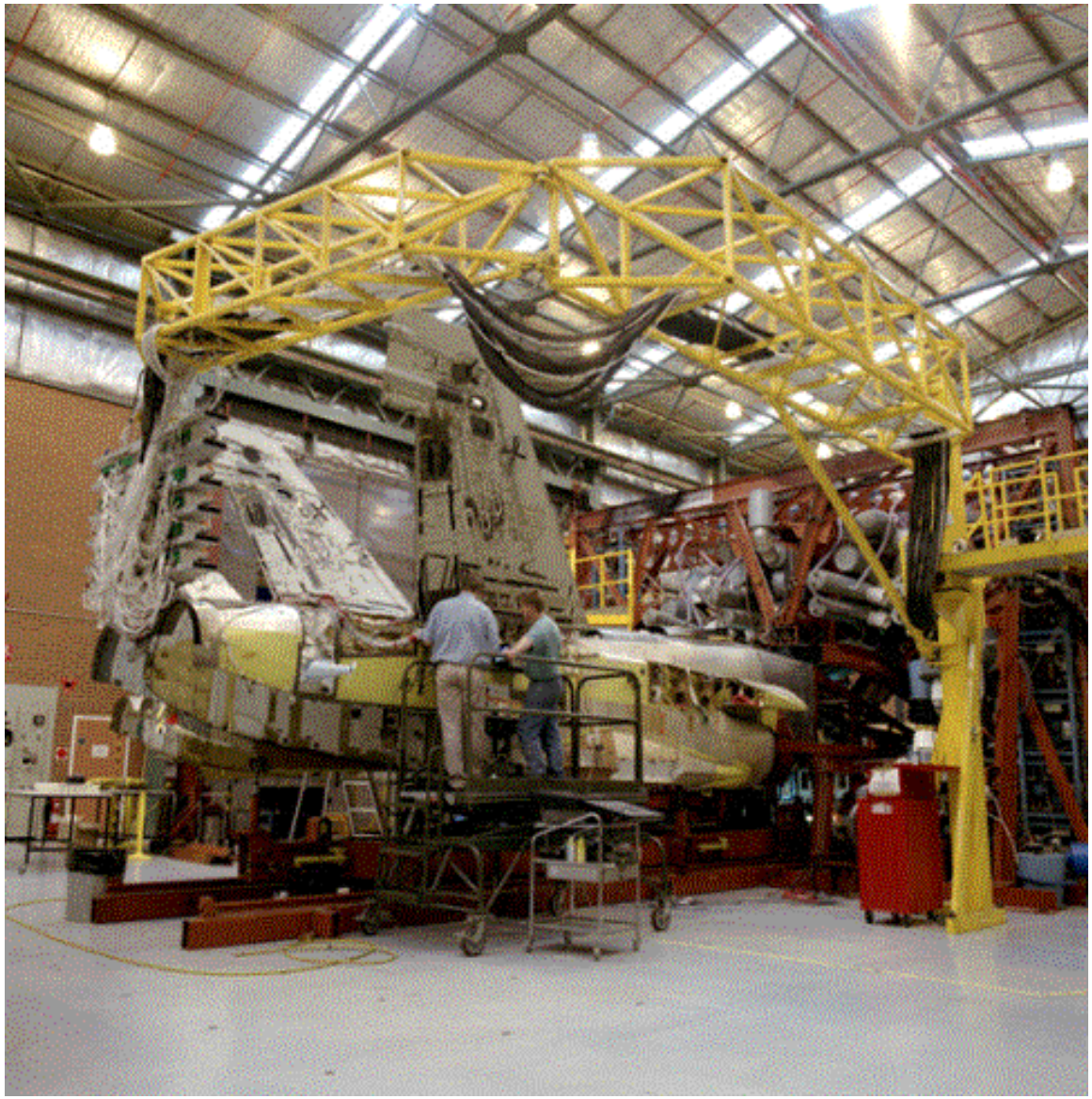
F/A-18 Fatigue Test



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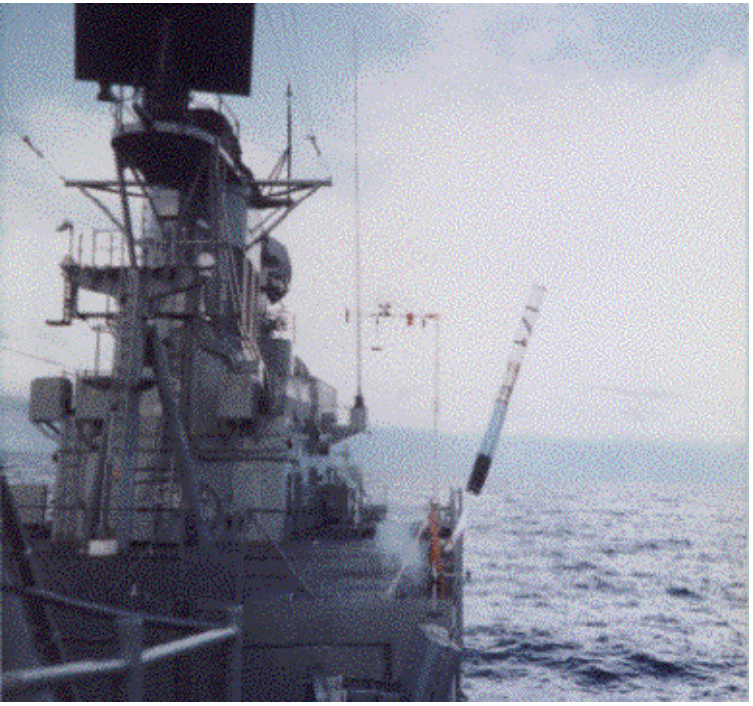
NULKA



- Hovering rocket to seduce anti-ship missiles
- DSTO invention
- Australia – US joint development
- Deployment to Australia, US, Canada

Scale of the Problem

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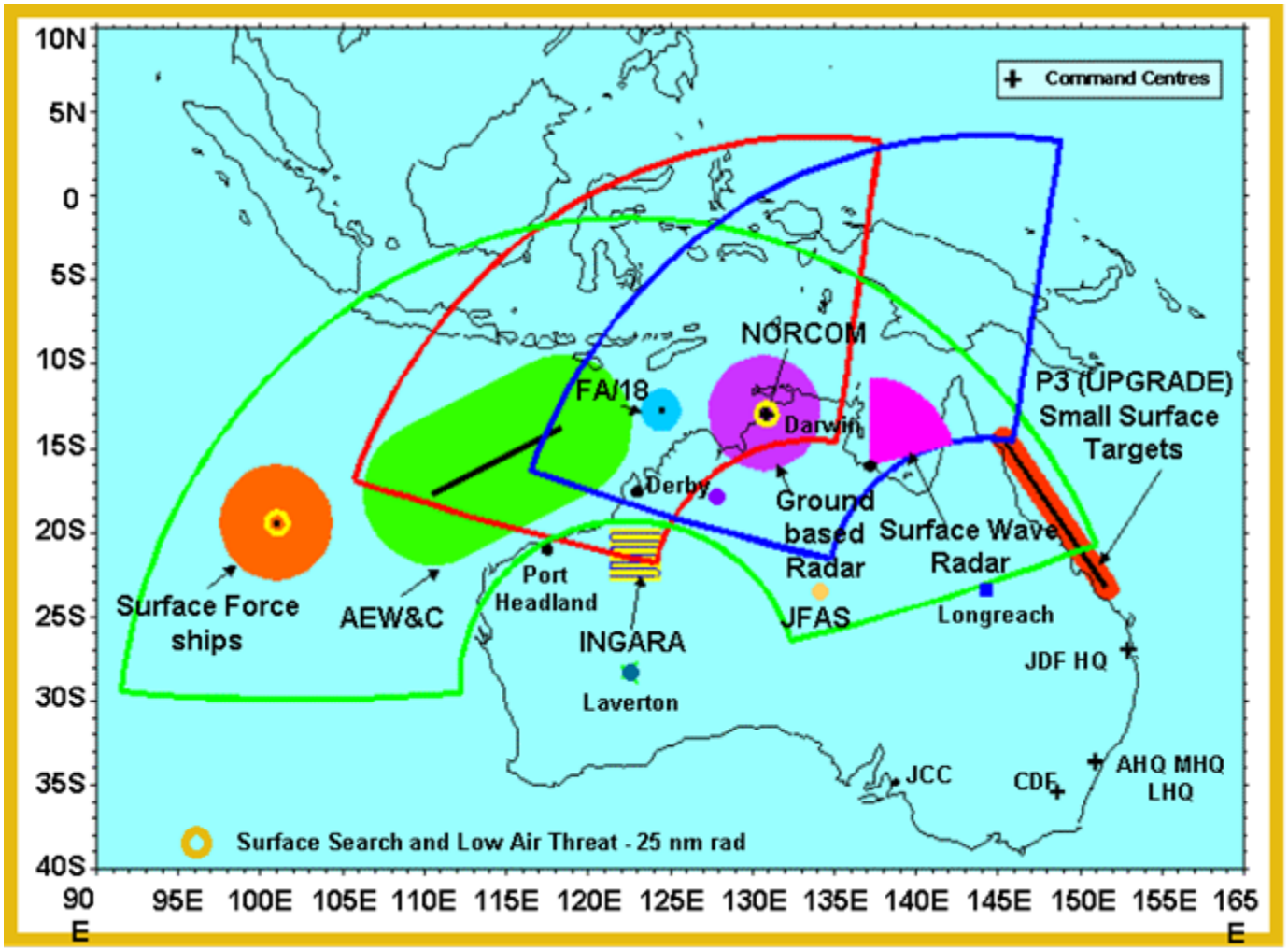
Sphere of Surveillance



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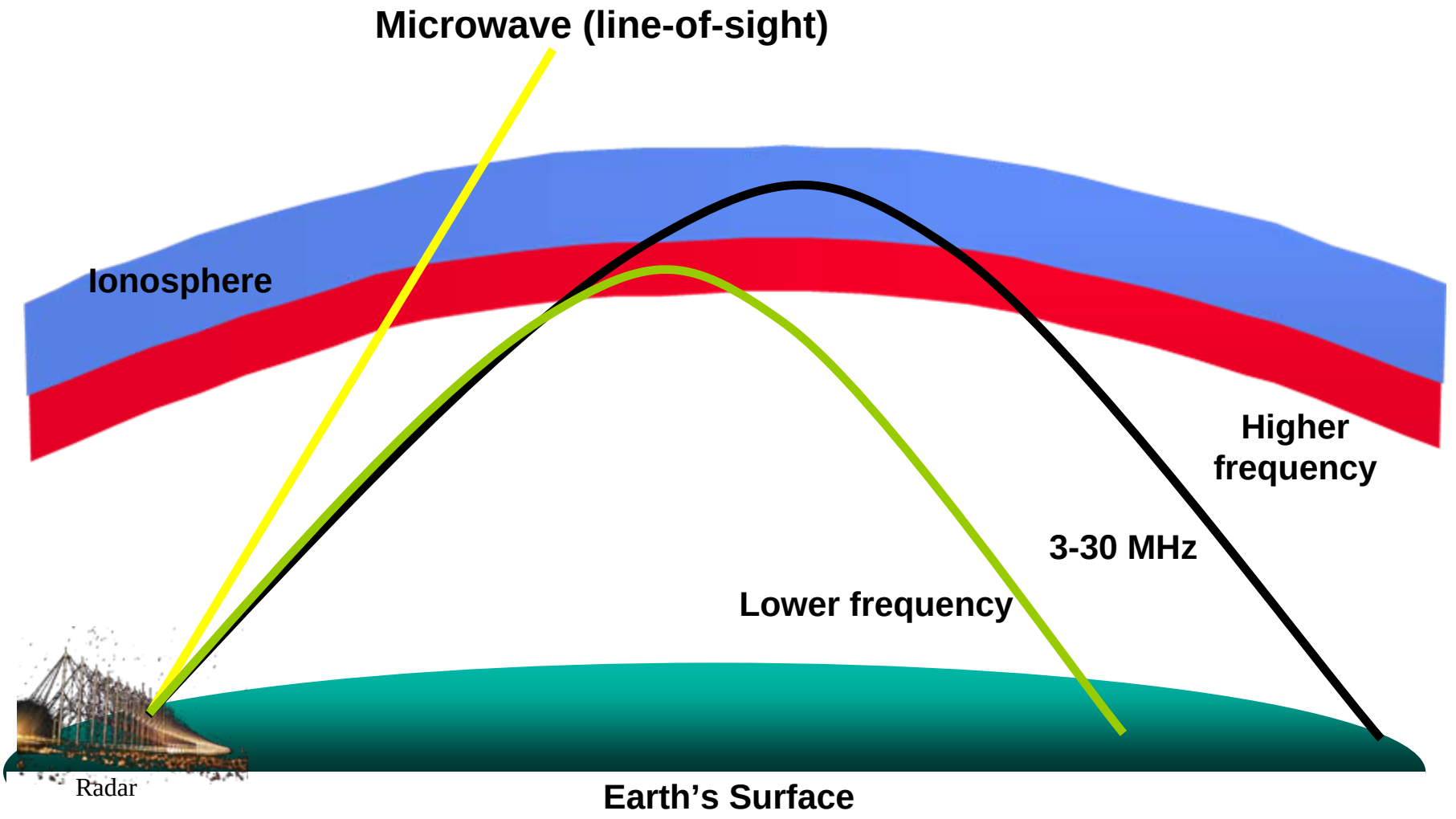
Over-the-Horizon Radar



Range 1000km – 3000km

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OTHR Current Capability

… the ADF's wide area surveillance system will provide the potential for continuous real-time coverage of our northern air and sea approaches …

Defence 2000 White Paper

- Wide area surveillance
- Spot surveillance

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OTHR Future Capability

Aims

- Maritime domain awareness
- Small aircraft targets
- Missile defence
    - Early launch detection
- Track Accuracy

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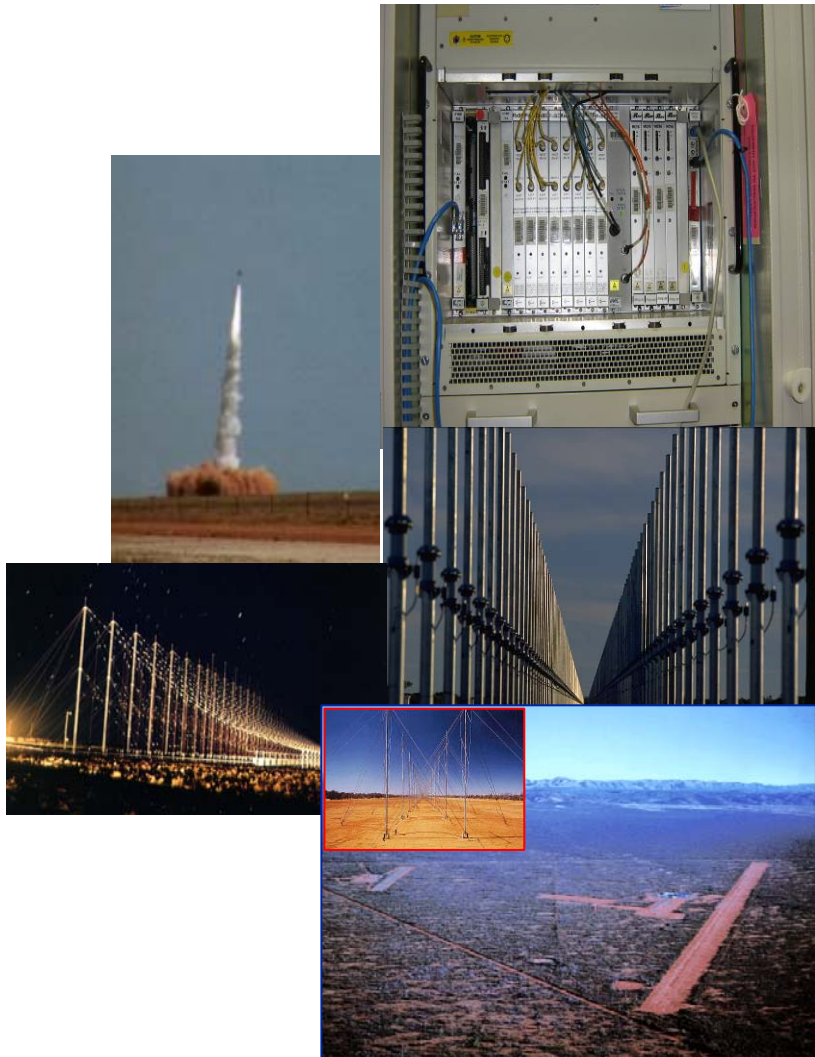
JORN Phase 5 Enhancement Program

DSTO hardware and signal processing innovations provide performance enhancements, together with cost and timeline reductions

JP2025 Phase 5: 2006-12

- Improved Track Accuracy
- Improved Coverage
  - 8 fold increase
- Enhanced Detection
- Electronic Protection
- Radar Management
- Reduced cost of operation/training



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What is Shapes Vector?

- A fully-integrated system for monitoring and surveillance of ultra-large computer networks, critical infrastructure, physical security

- Modular Architecture
  - Allows easy integration and wrappeing of third party systems and components
  - Novel method for semantic integration of in house developed and third party components

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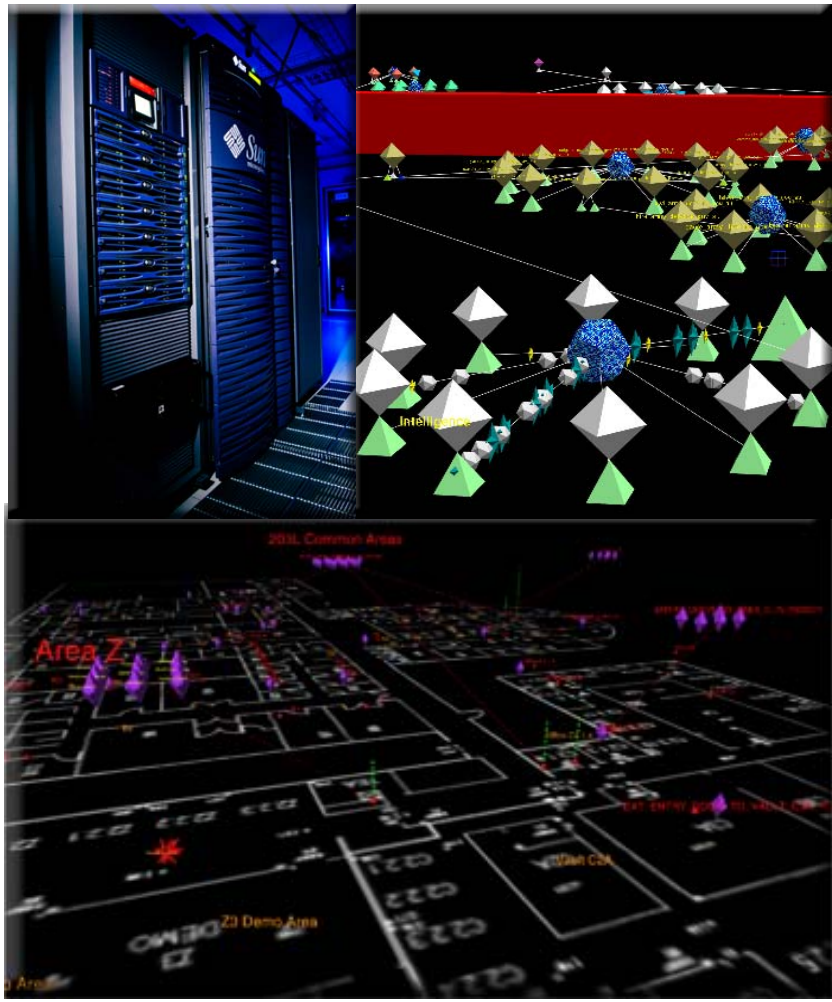
SV as a Unified Security System

- SV system offers ability to:
  - automatically deduce many forms of knowledge about a network, and
  - comprehensively integrate that knowledge into a single consistent environment
- SV Processes knowledge as semantically-meaningful units
- Can correlate with other monitoring systems, e.g., Physical Base Security/Acces, visual surveillance



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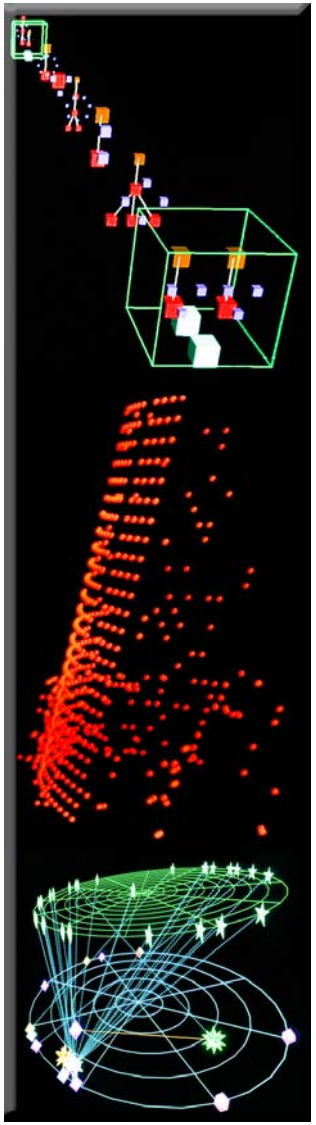
Beyond COTS Capabilities

- "State of the Art" COTS Security tools can detect types of threat at network perimeter (usually those which are context-free)
- Some have limited detection of site-defined policy breaches
- Beyond this, all other phases of the investigative process remain intensively manual
- Consequently, still need lots of people to 'police' even a moderate-sized network



- SV can provide more comprehensive protocol analysis, leading to greater coverage of network perimeter threat
- SV has a detailed language for defining and monitoring local site policy which can include physical infrastructure as well as cyberspace
- SV is easily customisable

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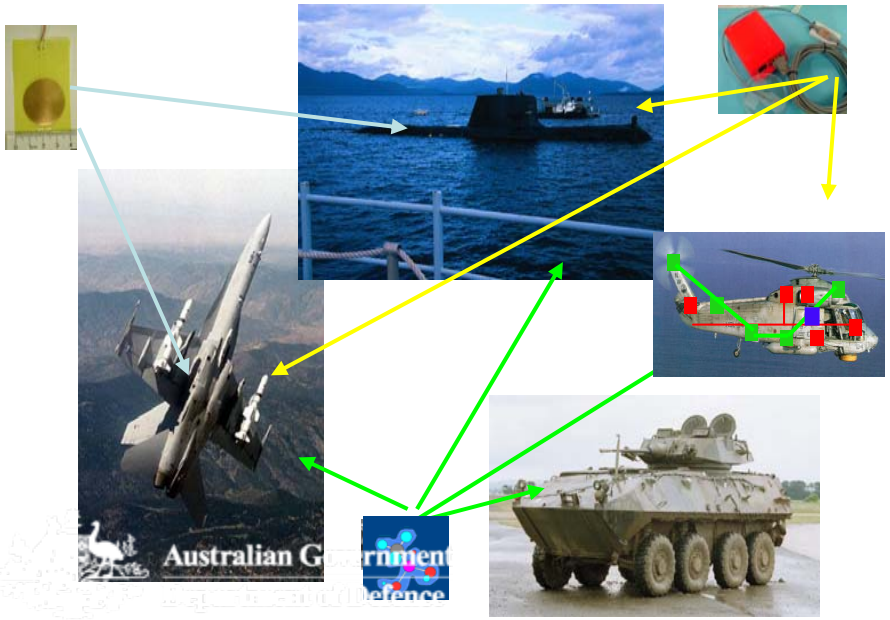
Smart Materials & Structures

Nano-materials can display novel properties not available with current (macro-) materials -

SMS focuses on exploring opportunities



Through SMS - DSTO is:

- Developing smart platform sensing/management systems for reduced cost of ownership and increased platform safety
- Developing smart materials using transformational nano-scale concepts to enhance platform capability
- Focusing on emerging technology in smart sensors, systems using micro / nanotechnology, MEMs, OE, automation

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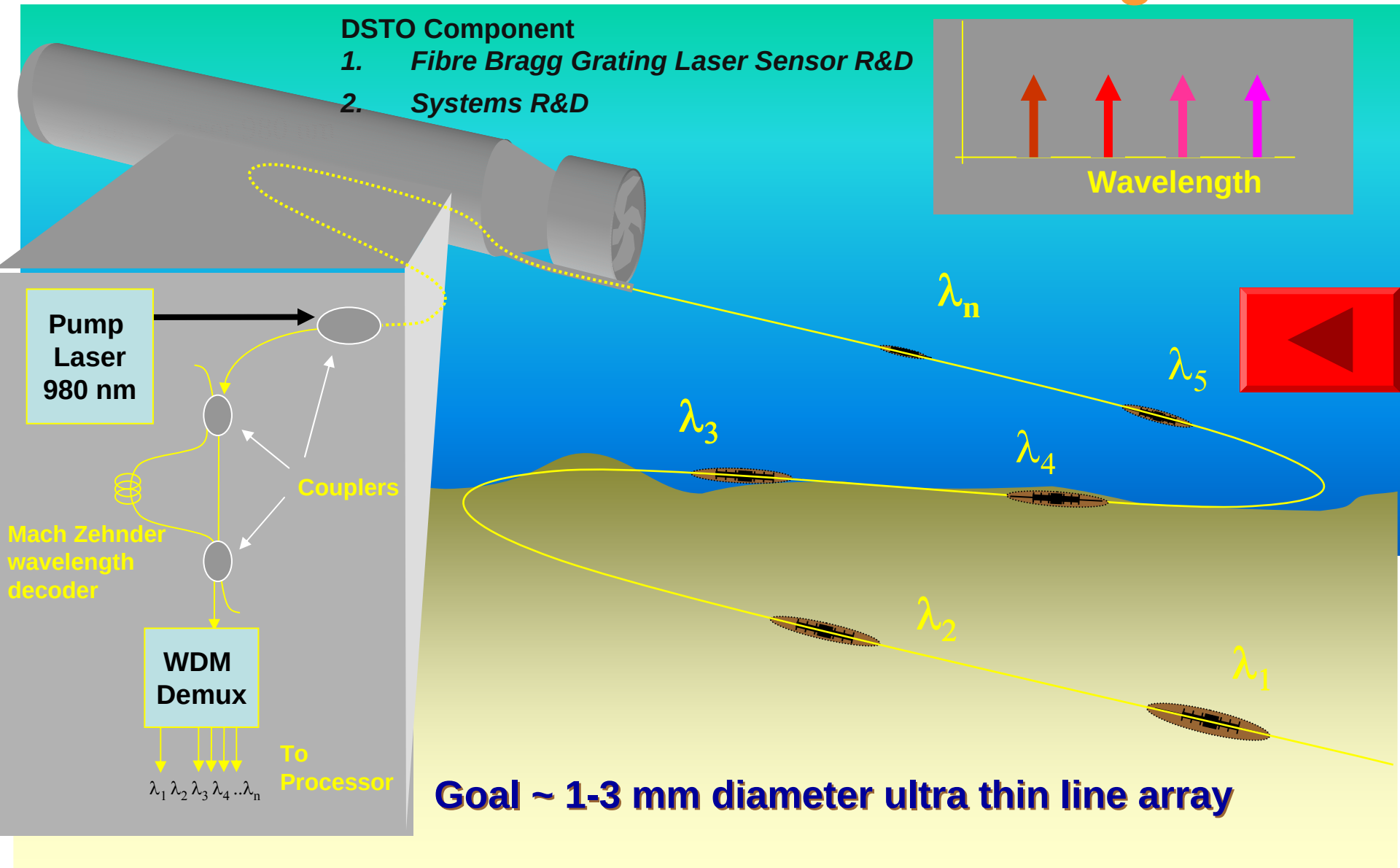
Fibre Bragg Gratings in Acoustic Sensing

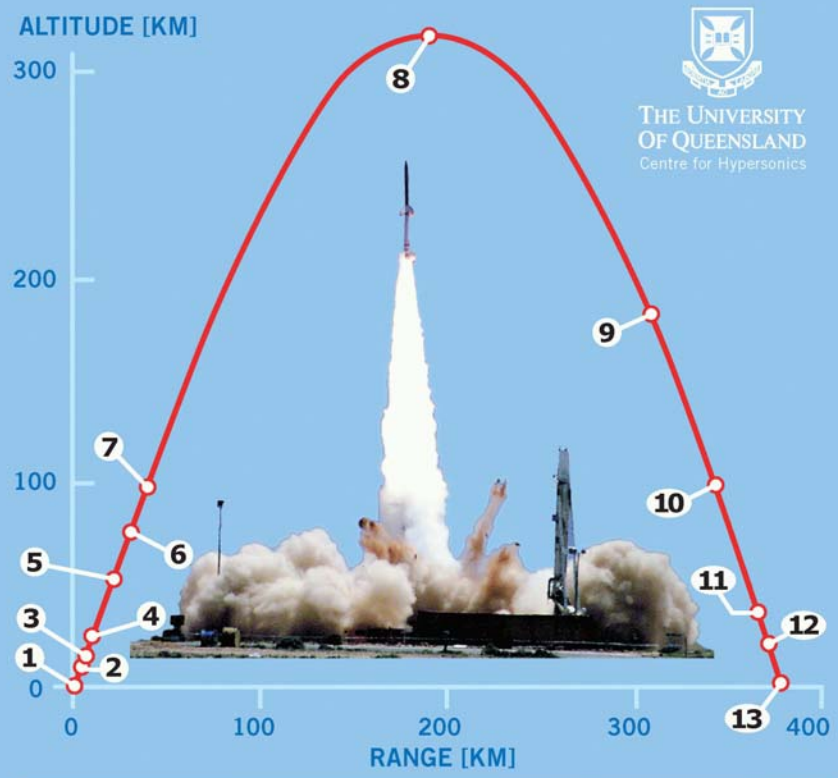
DSTO Component

1. ***Fibre Bragg Grating Laser Sensor R&D***
2. ***Systems R&D***



Goal ~ 1-3 mm diameter ultra thin line array

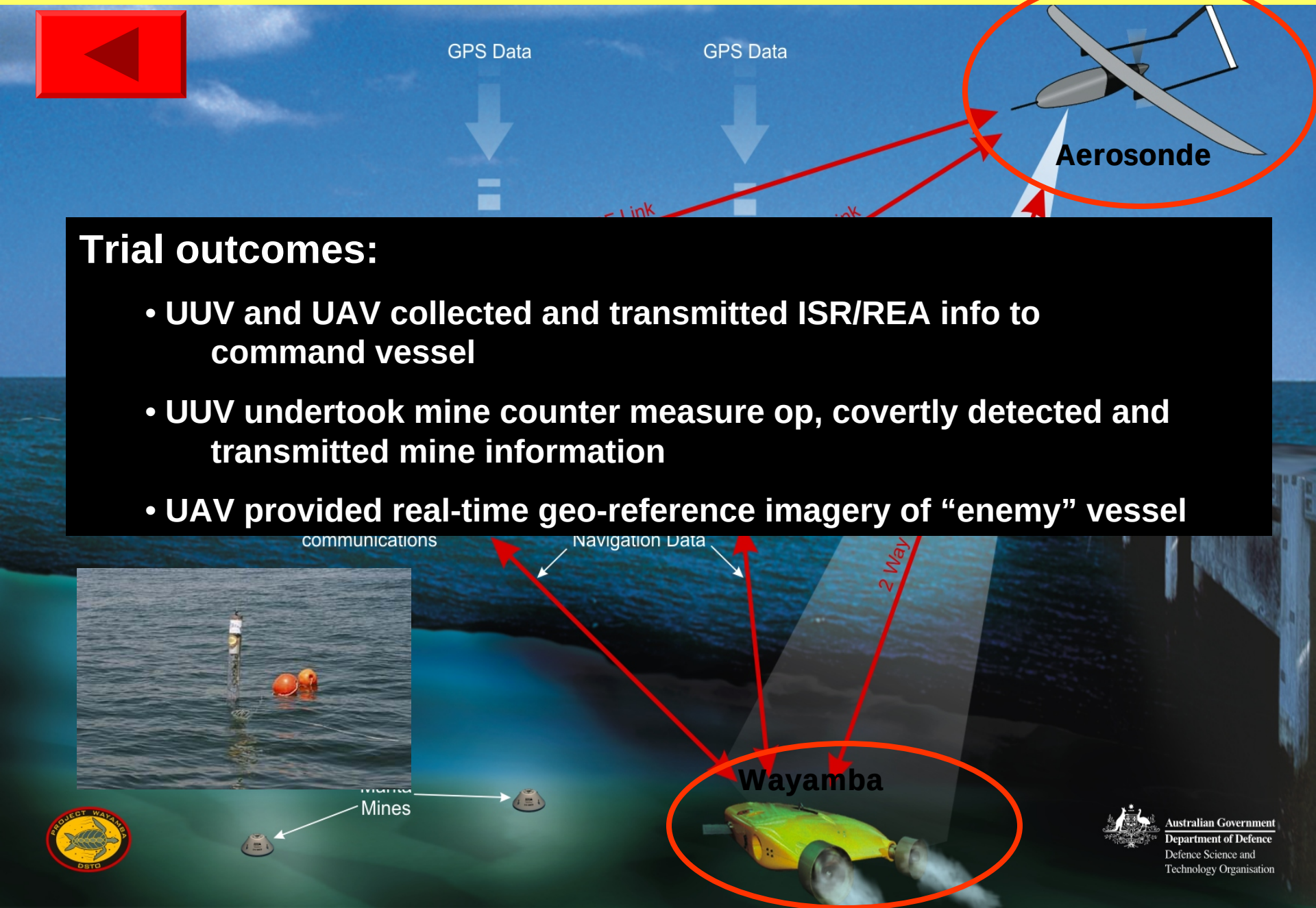
Nominal HyShot Mission Profile



THE UNIVERSITY OF QUEENSLAND
Centre for Hypersonics

		Time	Altitude	Speed – Mach
1	Terrier Ignition	– 0 SEC,	0 KM,	M0
2	Terrier Burnout	– 6.03 SEC,	3.44 KM,	M 3.6
3	Stage Separation	– 6.04 SEC,	3.5 KM,	M 3.6
4	Orion Ignition	– 16 SEC,	12.8 KM,	M 3.3
5	Orion Burnout	– 42.4 SEC,	56.4 KM,	M 7.1
6	Nosecone Eject	– 63 SEC,	100 KM,	–
7	Start Attitude Control Manoeuvre	– 73 SEC,	115 KM,	–
8	Apogee	– 281 SEC,	315 KM,	–
9	Re-enter Atmosphere	– 510 SEC,	80 KM,	M 8.0
10	‡ Start Experiment	– 529 SEC,	35 KM,	M 7.6
11	‡ Stop experiment	– 535 SEC,	23 KM,	M 7.6
12	Impact	– 565 SEC,	0 KM,	M 0.67

Automation of Battlespace Initiative



Trial outcomes:

- UUV and UAV collected and transmitted ISR/REA info to command vessel
- UUV undertook mine counter measure op, covertly detected and transmitted mine information
- UAV provided real-time geo-reference imagery of “enemy” vessel

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