



# Improving Coalitions through S&T Cooperation

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pour la défense Canada

Canada

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# The New Defence and Security Context

## Complex Conflict Spectrum

## Asymmetric Threats



## Global Economy



## Common Defence and Security Agenda

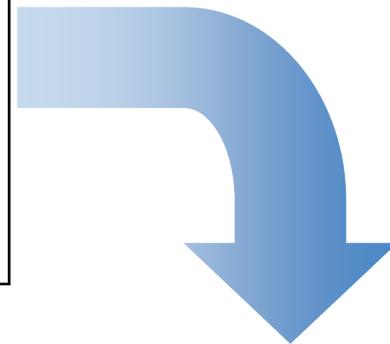
## Globalization of Science and Technology



# Defence and Security S&T – Setting the Government's policy context

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- *Canada First Defence Strategy*
- Extension of CF's Afghanistan mission through 2011
- National Security Statement
- Northern Strategy
- *Advantage Canada – Federal Government's Economic Strategy*



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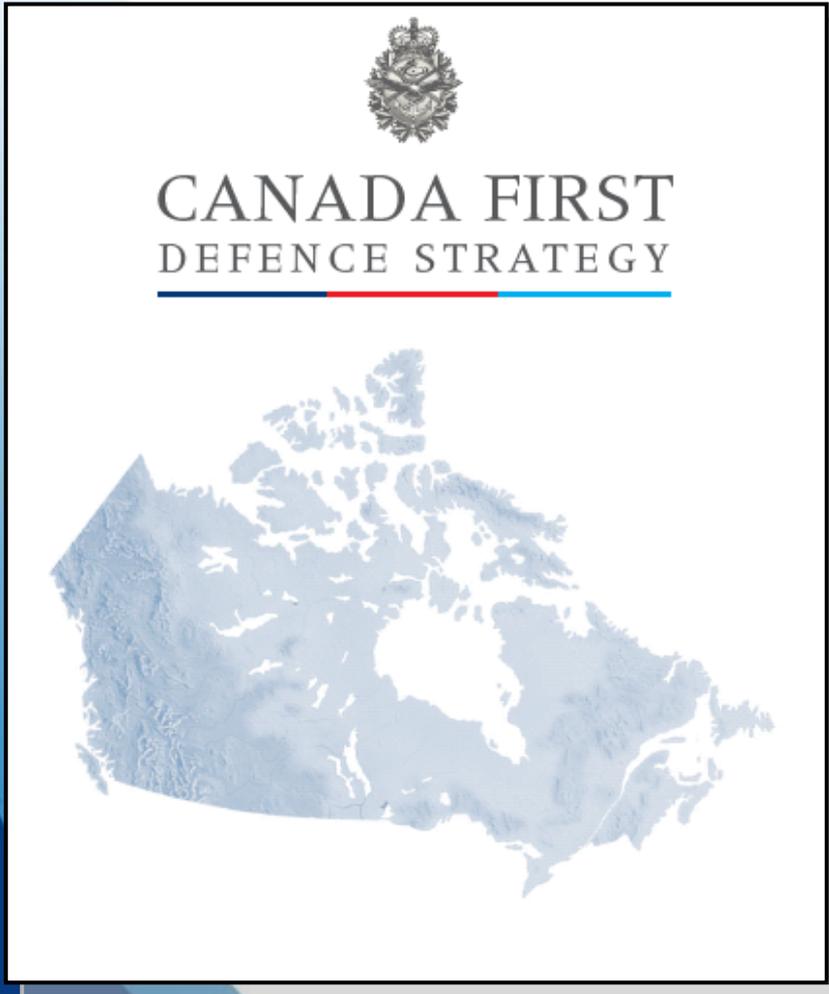
**Defence and Security S&T Strategy:** *Maximize the impact of S&T on Canadian defence and security capabilities **and** on the nation's innovation capacity*



# Canada First Defence Strategy

## May 2008

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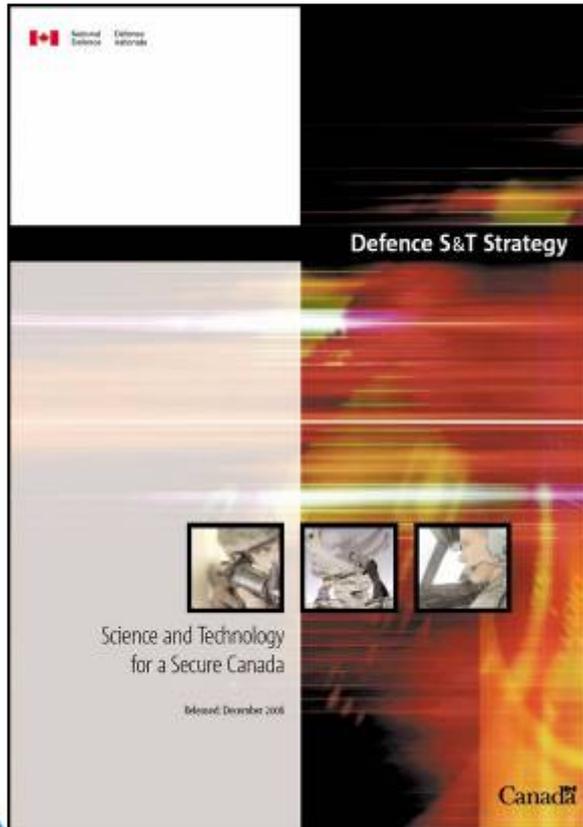


- Defines the government's *Level of Ambition* for the Canadian Forces
- Recognizes the need to balance the defence investment across people, equipment, infrastructure and readiness
- Links defence expenditures and socio-economic expectations
- Provides a stable, long-term fiscal framework



# Defence S&T Strategy – Direction

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- Deliver “full-service” S&T that supports all Departmental decision processes.
- Implement an institution-wide governance construct - *the Defence S&T Enterprise*.
- Evolve the role/focus for the internal S&T capability – *excel at S&T Integration*.
- Establish purpose-built internal and external partnerships - *leverage effort and increase exploitation of results*.



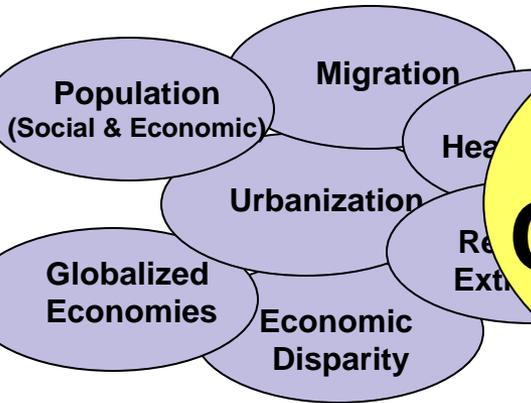
## Science & Technology...

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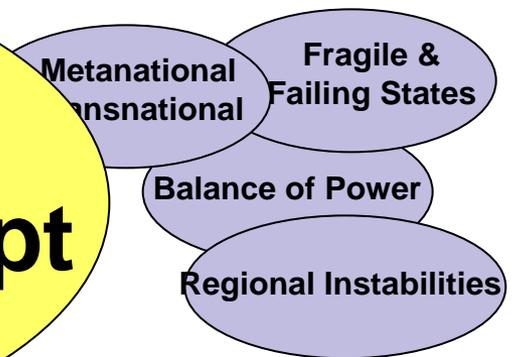
- **Informs emerging Canadian Forces concepts and doctrine**
- **Helps build Canadian Forces capabilities to realize the Canada First Defence Strategy**
- **Helps the CF acquire war-winning technologies – disruptive and enabling**
- **Helps solve Canadian Defence and Security hard problems**

# S&T informs Canadian Forces Emerging Concepts and Doctrine

## Economic & Social Trends

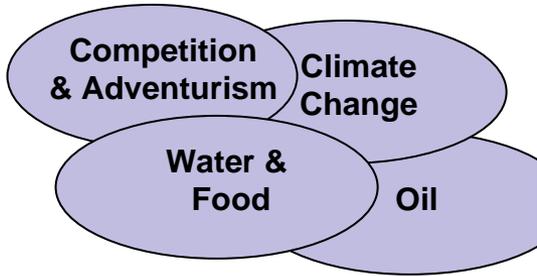


## GeoPolitical Trends



# CF Integrated Capstone Concept

## Environmental & Resource



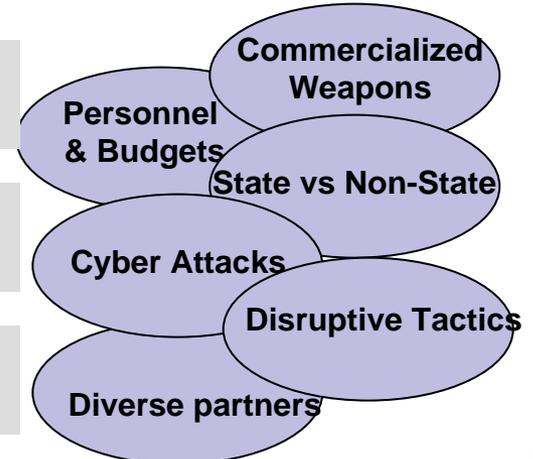
➤ **Comprehensive**

➤ **Integrated**

➤ **Adaptive**

➤ **Networked**

## Military & Security





# **S&T helps build Canadian Forces CFDS Capabilities**

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- 1. Trusted situational awareness, intent prediction and decision making for achieving operational superiority**
- 2. Robust operational command and control**
- 3. Seamless interoperability with other government departments, other Canadian partners and allied forces in a complex environment**
- 4. Agile, tailored force to deploy and operate in complex environments**
- 5. Full-spectrum protection including from weapons of mass destruction**
- 6. Sustainability, affordability, supportability of operations, assets and people**
- 7. Creation of asymmetric advantage by defeating terrorist groups and tactics**
- 8. Defence policy and force development informed and enabled by S&T developments.**



# Potentially disruptive technologies that could provide decisive advantage for the CF

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*For example ...*

- **Quantum capabilities**
- **Autonomous intelligent systems and platforms**
- **Wide-band mobile wireless networking**
- **New sensing (hyper-spectral, terahertz)**
- **Micro-satellites**
- **Virtual reality and neuro-interfaces**
- **Non-conventional weapons**
- **Micro/nano-engineered smart materials**
- **Novel power sources**
- **Bio-based solutions (biometrics, bio-signatures, broad spectrum therapies)**



# S&T helps solve Defence and Security Hard Problems

## Defence

- Defeat the “IED System”
- Enhance soldier survivability
- Build an integrated CF C2 system
- Grow the Force (recruit, train, retain, and duty of care)
- Close the gaps in the CF Strategic Capability Roadmap
- Position Defence to exploit emerging or disruptive technologies
- Reduce the costs of defence systems through-life capability management

## Defence & Security

- Provide a rigorous foundation for defence and security emerging concepts and doctrine (comprehensive, integrated, adaptive, networked)
- Improve northern and maritime situational awareness and response
- Build a reusable national Major Events Security capability
- Defeat the CBRNE terrorist threat
- Enhance the nation’s cyber-security

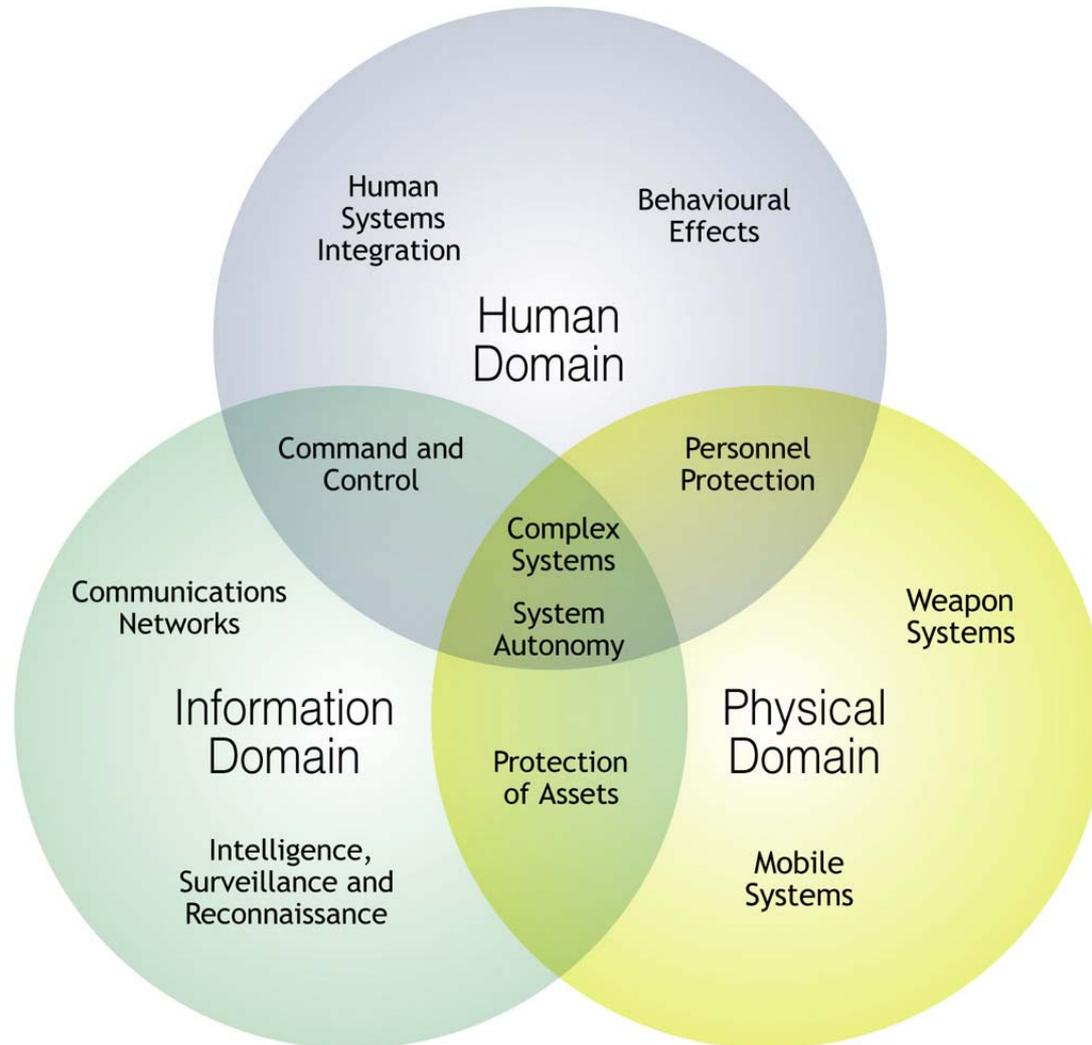
## Global

- Enable the “Green” Canadian Forces
- Find alternative power and energy solutions for the CF



# Areas of S&T Expertise

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# **Roles and Impact of International S&T Cooperation**



# External Partnerships: Allied Defence and Security S&T Collaboration

Leveraged value to Canada  
\$100M (FY08/09)



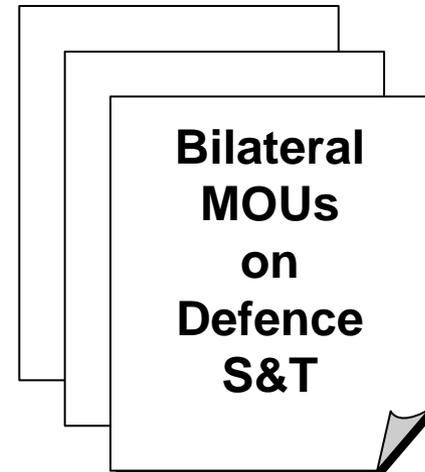
CBR Defense  
Material MOU



North American  
Technology and  
Industrial Base  
Organization



CAN-NLD-SWE MOU

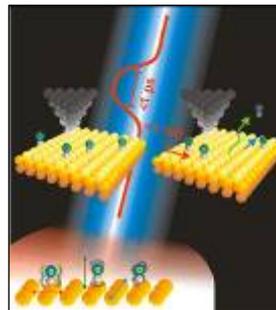




# Defence and Security S&T Cooperation contributes to ...

*... burden sharing in knowledge  
and technology development by ...*

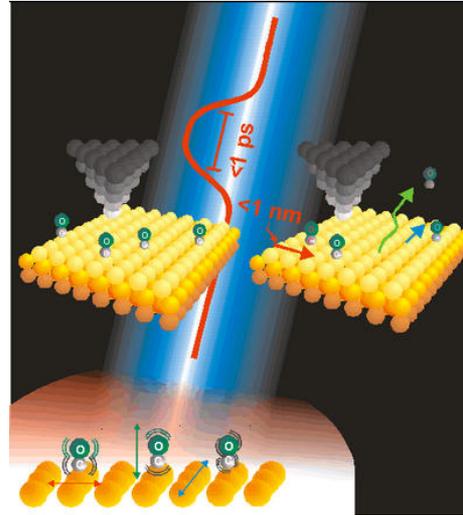
- Understanding and responding to threats
- Exploring emerging S&T for disruptive effect
- Helping shape new military concepts and doctrine
- Providing options for future military capabilities
- Exercising and training on new military capabilities
- Supporting current military operations
- Strengthening domestic security capabilities



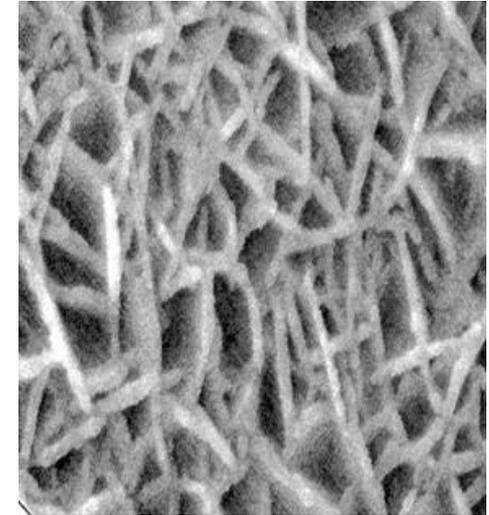
# Exploring emerging S&T for disruptive effect



**Biomechanical  
Energy Harvester**



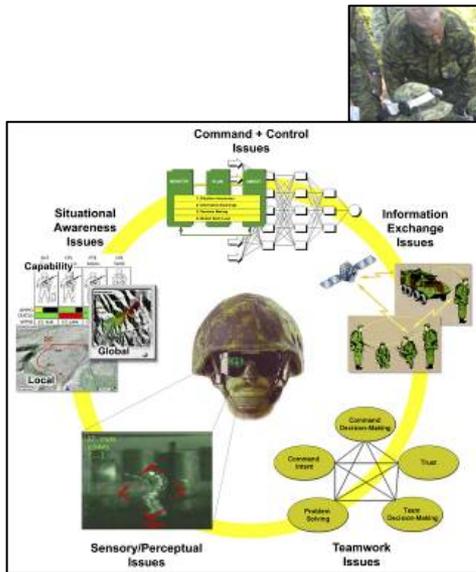
**Femtosecond laser**



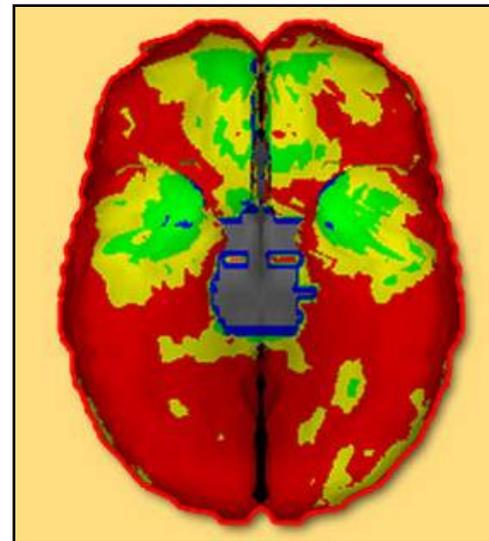
**Surface Treatments**

- Harvesting energy from human movement – meeting soldier power requirements
- Femtosecond laser – manipulating materials for protection, sensors, energetic materials
- Environmentally sensitive surface treatments with enhanced durability

# Providing Options for New Military Capabilities

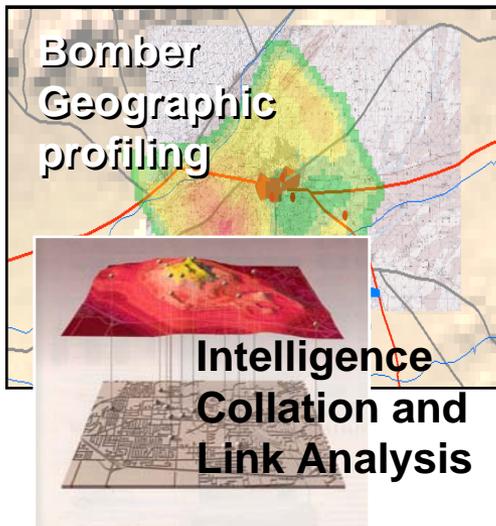


Soldier Information Requirements



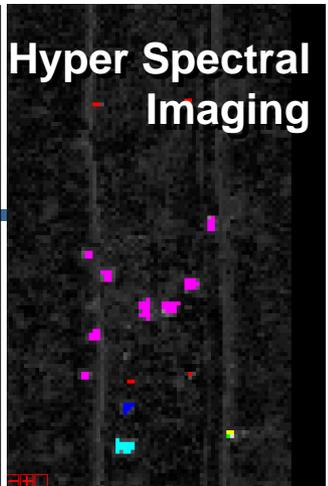
Traumatic Brain Injury Diagnostics

# Supporting current military operations: Counter – IED



**Prevent**

**Detect**



**Respond**

**Mitigate**





# Expectations for S&T Cooperation: a Canadian Perspective

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## *Knowledge Development*

- **Contributes to each nation's MoD decision processes**
- **Informs the national S&T program: future environment; emerging concepts, systems and doctrine; disruptive S&T**
- **Enables an efficient and effective national S&T program: people and personal networks; lexicons and standards; shared awareness; peer review.**

## *Technology Development*

- **Shares the burden in technology and system development**
- **Contributes to reduction of risk in national acquisition programs**
- **Contributes to reduction of through-life cost of military systems**



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# Enhancing International S&T Cooperation – Some Thoughts



# Strategic Challenges in S&T Cooperation

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- **Differing expectations on national S&T Programs**
- **Differing scales of investment in Defence S&T by each country**
- **Differences among the nations' acquisition business models – from COTS/MOTS to custom defence equipment development**
- **Potentially competing economic development objectives**



## Some Principles to Shape the Way Ahead

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- **Trust matters** – Favor coalitions of trusted partners, from warfighters to scientists
- **Knowledge matters** – Balance the S&T cooperation spectrum from knowledge co-development to technology co-development
- **Speed matters** – Synchronize S&T cooperation to the operational need for solutions
- **People are crucial:** smart, informed scientists and engineers enable stronger coalitions (engage the best and the brightest)

DEFENCE



DÉFENSE