

Science and Technology within NATO

Science & Technology for Defence: Luxury or Need?

Royal Higher Institute for Defence, 7 March 2013

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Science and Technology Board Chairman

Outline

- NATO Science and Technology
- NATO's Science and Technology Organisation (STO)
- STO Programme of Work
- Conclusions

NATO Science and Technology

- S&T which is performed in a NATO context
 - Nations and NATO bodies
- S&T
 - Generation and application of state-of-the-art, validated knowledge for security and defence purposes
 - Scientific Research, Technology Development, Transition, Application and Field Testing, experimentation
 - Related activities: systems engineering, operational research and analysis, synthesis, integration and validation of scientific evidence-based knowledge

NATO S&T: Mission

- To help position the Nations' and NATO's S&T investments as a strategic enabler of *the knowledge and technology advantage for the defence and security posture* of NATO Nations and partner Nations, by:
 - Conducting and promoting S&T activities that *augment and leverage the (S&T) capabilities and programmes* of the Alliance, of the NATO Nations and the partner Nations [...]
 - Contributing to NATO's ability to enable and influence security- and defence-related *capability development and threat mitigation* [...]
 - *Supporting decision-making* in the NATO Nations and NATO

NATO S&T: Governance

- The Science and Technology Board will exercise unified governance of NATO S&T by:
 - ... NATO S&T *Strategy* and ... NATO S&T *Priorities*
 - ... Focal Point for *coordinating* ... the *S&T activities* of ... *NATO Programmes of Work*, by
 - ... Strategy and Priorities Alignment
 - Mutual Awareness of Activities
 - Avoidance of duplication
 - Achieving Synergies

NATO S&T: Strategic Objectives



NATO S&T: Strategy and Priorities

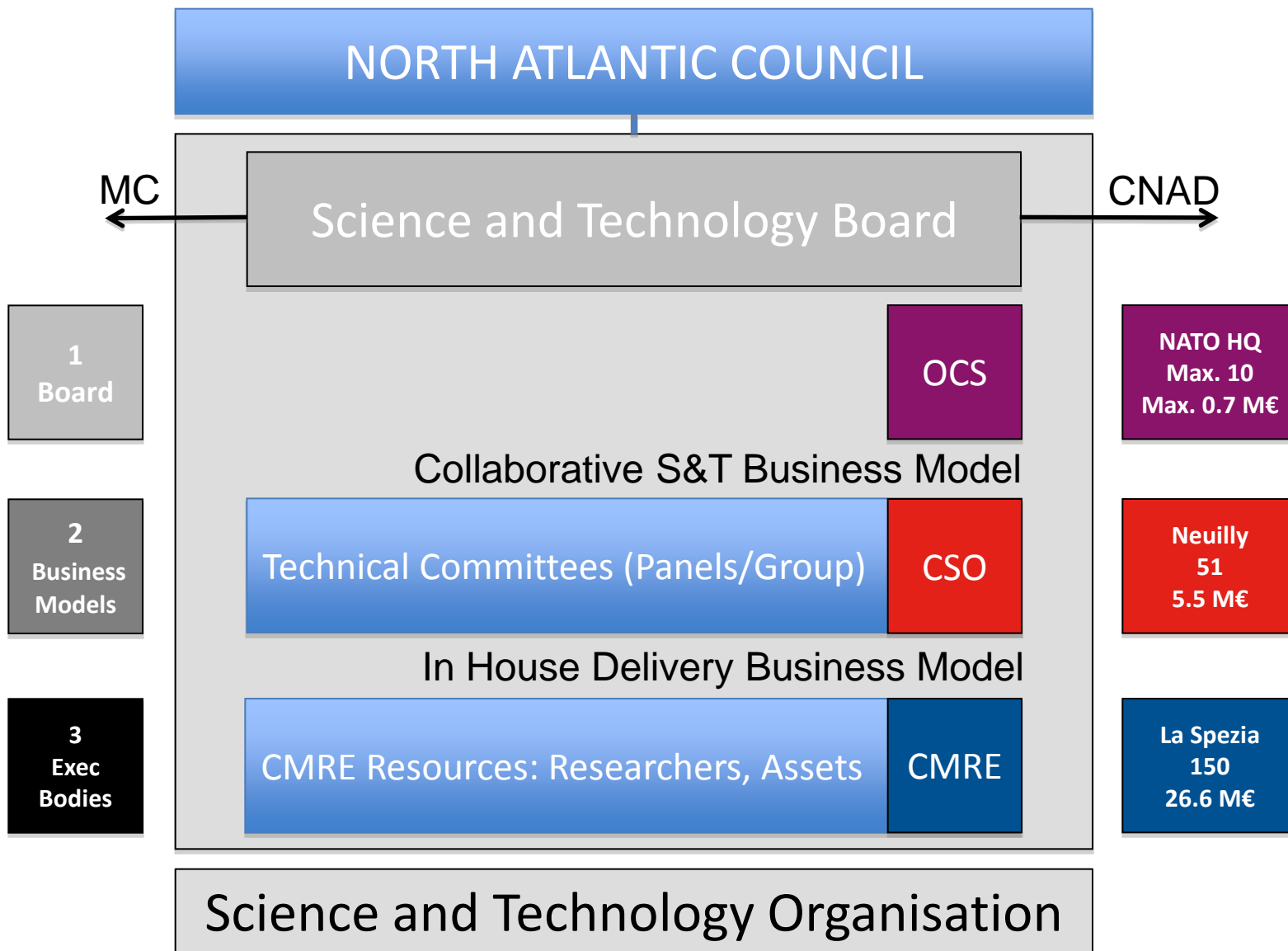
- NATO S&T Strategy
 - Approved by the Council – January 2013
 - Implementation Plan
 - Action Plans of the Stakeholders
 - Coordination Plan
- NATO S&T Priorities
 - Drivers
 - Military requirements
 - Hard Problems
 - Emerging/emerged Disruptive Technologies
 - Processes/list to be revised as part of the Strategy Implementation

NATO's S&T: Scope

- Very broad scope
 - From “Traditional” technology to “Human Factors”
 - From “Conceptual/systems” thinking to “support to delivering hardware”
 - From the (very) long term to the shorter term
 - From the “physical space” (air, land, sea ...) to the virtual space (cyberspace)
 - From the low TRL to the high TRL
 - ...

NATO's Science and Technology Organisation

- S&T Programme delivery
 - *Nations' and NATO bodies' network of Scientists and Engineers*, delivering through a *collaborative* business model
 - Scientific and technical committees, composed of subject matter experts, supported by a Collaborative S&T Support Office (CSO)
 - *NATO's Research and Experimentation Centre*
 - Centre for *Maritime* Research and Experimentation (CMRE)
- NATO S&T and STO governance and leadership
 - *Governance* is vested in the *Science and Technology Board*
 - *Leadership* is exercised by the *Chief Scientist*, Chair of the S&T Board and Scientific Advisor to NATO leadership



NATO's STO: Value Added

- Nations' perspective:
 - “The value of the existence of the STO is within the Nations”
 - Through the network, making the Nation(s) and NATO stronger
 - The STO is a lever, a multiplier, ... (not “*the Research Institute of NATO*”)
 - The CMRE is part of that network, and adds a (niche) “lab” dimension to the STO

NATO's STO: Expertise

- **Centre for Maritime Research and Experimentation**
 - Maritime, and particularly the undersea; may extrapolate into other domains to meet customers' demands
- **STO Technical Committees (Panels-Group)**
 - Applied Vehicle Technology
 - Human Factors and Medicine
 - Information Systems Technology
 - Modelling and Simulation
 - Systems Concepts and Integration
 - System Analysis and Studies
 - Sensors and Electronics Technology

The CMRE: Collaboration At Sea



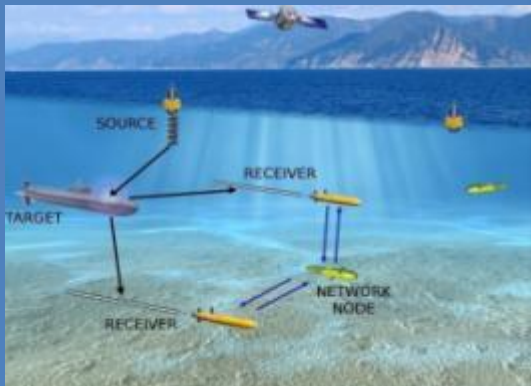
R/V ALLIANCE



R/V LEONARDO



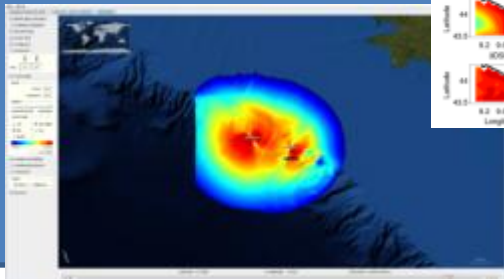
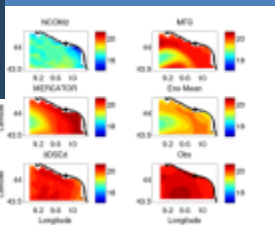
Cooperative Anti-Submarine Warfare



Autonomous Naval Mine Countermeasures



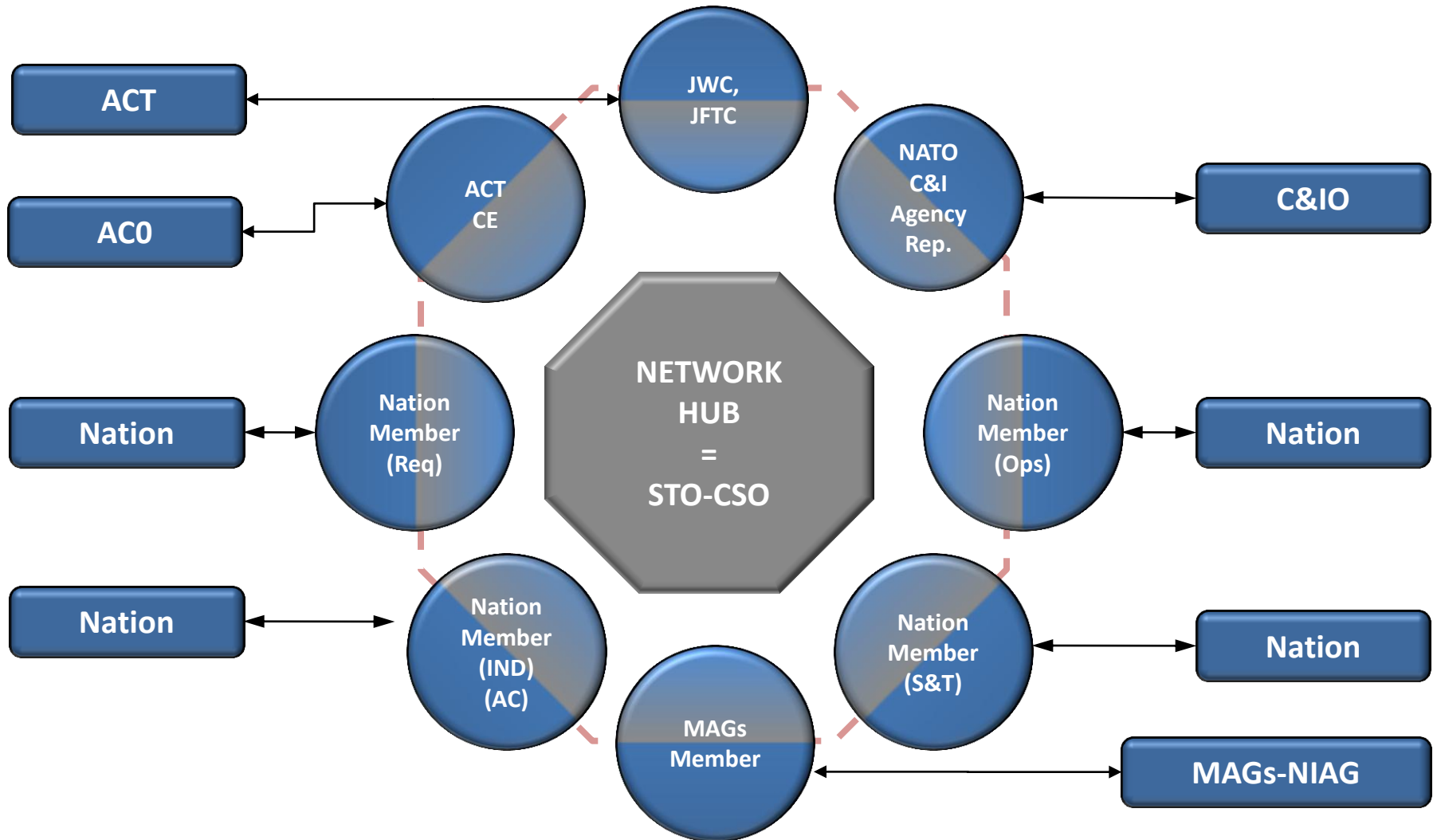
Environmental Knowledge and Operational Effectiveness



Maritime Security

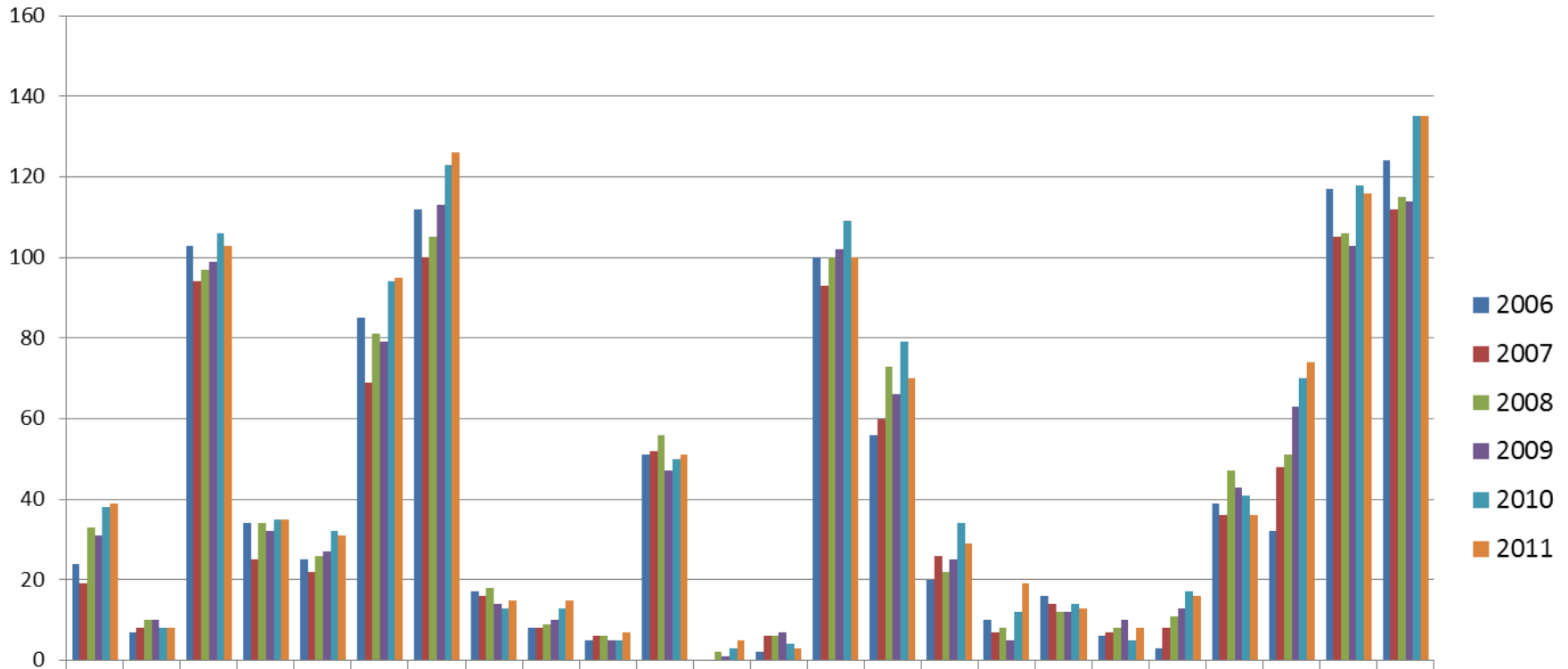


NATO's Collaborative S&T



NATO's Collaborative S&T: Participation Trends

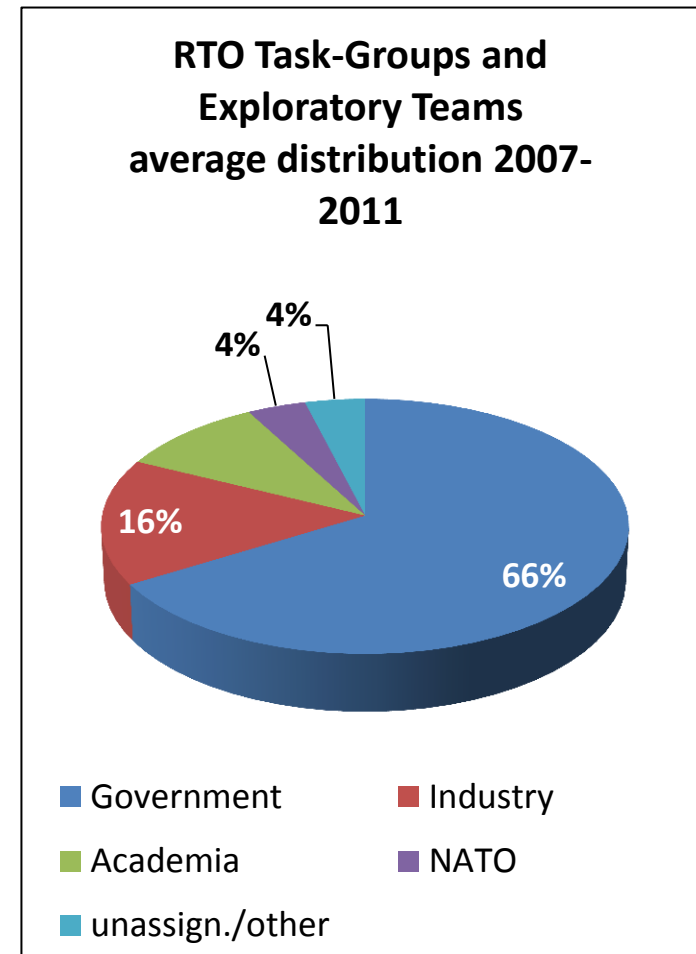
Total # Activities per Nation



NATO NATIONS' PARTICIPATION

NATO S&T: Participation Trends

- Broad community
 - Government
 - Academia
 - Industry
- Collaborative S&T:
 - Important Industry and Academia participation
- CMRE:
 - CMRE relationships with Industry to evolve in the context of the new CMRE business model



NATO's Collaborative S&T: Deliverables

Network delivering validated knowledge and information for Defence and Security

Reports & Standards

Technology Demonstrations

Educational Opportunities

A Knowledge & Information Base
for NATO and the Nations

Toolbox:

- **SY:** Symposia (>100 people, 3-4 days)
- **SM:** Specialists' Meetings (<100 people, 2-3 days)
- **WS:** Workshops (selected participation, 2-3 days)
- **TG:** Task Groups (study group, 3 years max.)
- **LS:** Lecture Series (junior and mid-level scientists)
- **TC:** Technical Courses
- **ST:** Specialists' Teams (quick reaction)
- **ET:** Exploratory Teams

NATO's Collaborative S&T: portfolio

- Support/Contribute to:
 - Interoperability
 - Innovative system solutions
 - Assessment to transition of technologies
 - Advice on the implications of disruptive technologies
 - Decision making
 - Military force generation and employment
 - Capability development
 - Confidence building and Threat mitigation

Stability & Control prediction methods

- **AVT-161: Assessment of Reliable Stability & Control Prediction Methods for NATO Air Vehicles and Sea Vehicles (2009-2012)**
- **AVT-216: Evaluation of Prediction Methods for Ship Manoeuvring and Control (follow-on)**
- **Objectives:** Assess the state-of-the-art in computational fluid dynamics methods
- **RESOURCES funded by 15 Nations**
 - *Labour Cost for 25 active participants (over 3 years)*
 - *Transportation & Shipment Cost*
 - *Production Cost of Wind Tunnel Model*
 - *Wind Tunnel Test Facilities (2 x Europe, 1 x USA)*
- **RESOURCES (direct) funded by NATO**
 - *Editorial & Publication Services, Panel Support*
- **Research Results are available to all NATO Nations!**

Leverage



Blast Injuries




- October 2011: Symposium on (Halifax, NS, Canada)
- Objective: Mitigating the Risk and Improving Force Resiliency
 - Defined the beginnings of blast toxicology:
 - Illustrated impact of training
 - Framed life sciences research necessary for improved helmets and body armour
 - Affirmed the need for multidisciplinary research in a NATO cooperative environment
- A long-standing effort:
- 3 Task-Groups and 1 Exploratory Team on-going in 2012-2013
 - Injury Assessment Of Vehicle Occupants
 - Environmental Toxicology of Blast Exposures
 - Force Sustainment: Rehabilitation, Regeneration and Prosthetics
 - Standardization of Functional Outcome Metrics for Assessing Patients

CMRE PoW: ISR

Data to Decision - Modern military oceanography

- Networks of long endurance, stealthy, robotic vehicles exchanging target information underwater
- Operational and tactical advantage through covert assessment of the littoral battle space to detect threats and provide commanders with better courses of actions



- 
- Decision
 - Assess impact, quantify risk, evaluate courses of action, and allocate assets
 - Performance
 - Forecast conditions/behaviours in time and space, and fuse in situ observations
 - Environment
 - Cost-effective, discreet, low-risk, robotic sampling

S&T: Luxury or need?

- NATO's S&T Reform context
 - The scarcity of resources
 - The difference S&T makes in today's strategic context
 - Global, complex, interdependent, speed
 - The need to extract more value out of NATO S&T
 - A NATO wide approach: unified governance of NATO S&T
 - NATO S&T Strategy, priorities, coordination, synergy
 - More visibility, more accessibility, more imbrications in the processes and the decision making
 - Permanent S&T presence in the HQ: NATO Chief Scientist and Office
 - “Demand-Supply’ dialogue: managing expectations

Conclusions

- The World is complex and increasingly interdependent, creating new challenges for Nations and NATO
- NATO S&T makes the difference, by commonly addressing and anticipating security and defence needs of the Alliance and its member Nations
- NATO S&T (the STO) provides an attractive framework: all stakeholders can extract/leverage value out of NATO S&T, using interaction mechanisms having proved their effectiveness
- NATO S&T is evolving to increase the added value of NATO S&T for all stakeholders (Nations!)

Your Nation's points of entry

- **Principal STB Member for Belgium**
 - Col. Richard MARCHAL
 - Richard.Marchal@mil.be

- **National Coordinator for Belgium**
 - Maj Erik VAN DE SCHOOR
 - erik.vandeschoor@mil.be



Thank you for your attention



“Scientific results cannot be used efficiently by soldiers who have no understanding of them, and scientists cannot produce results useful for warfare without an understanding of the operations.”

Theodore von Kármán (1881-1963)

“Les hommes de pensée préparent les hommes d’action mais ne les remplacent pas”

Gustave Le Bon (1841 – 1931)