

Scientific Publications

Seabed characterization for mine hunting sonar performance and mine burial predictions / Nielsen, Peter L.; Fox, Warren L. J. -- La Spezia: CMRE, 2013/04. (Monographs; CMRE Formal Report (FR series) CMRE-FR-2013-002 - NATO Unclassified

Traffic route extraction and anomaly detection (TREAD): vessel pattern knowledge discovery and exploitation for maritime situational awareness / Pallotta, Giuliana; Vespe, Michele; Bryan, Karna. -- La Spezia: CMRE, 2013/02. (Monographs; CMRE Formal Report (FR series) CMRE-FR-2013-001 - NATO Unclassified- Released on 5th April.

First validation of the Submerged Remote Sensing technique for the estimation of Kd using glider data. / Pennucci, G.; Trees, C.; Osler, J. CMRE-FR-2013-003. April 2013.

Development and testing of automated glider Matlab algorithms for quality control of optical irradiance data Version 1.0. / Pennucci, G.; Garau, B., CMRE-MR-2013-005. April 2013.

The Multistatic Tactical Planning Aid (MSTPA) - User Guide V4.1.2R. / Strode, C.; Oddone, M., CMRE-SP-2013-001. May 2013.

Investigating the transfer of environmental uncertainty to signal excess. / Strode, C.; Moure, B., CMRE-FR-2013-004. May 2013

Data fusion and target tracking in underwater wireless sensor networks with port-starboard ambiguity. / Braca, P., Willett, P., LePage, K., Marano, S., Matta, S. CMRE-FR-2013-05. June 2013.

Experimental performance assessment of detection, tracking and fusion procedures applied to multiple HFSW radars for maritime traffic surveillance. / Maresca, S., Braca, P., Horstmann, J., Grasso, R CMRE-FR-2013-006. June 2013.

Reconstruction and analysis of ASW serials conducted during Proud Manta 13 using the Multistatic Tactical Planning Aid (MSTPA). / Strode, C., Oddone, M., CMRE-FR-2013-07. June 2013

Statistical analysis of high frequency surface wave radar measurements aimed at ship detection and tracking. / Bruno, L., Braca, P., Horstmann, J., Vespe, M. CMRE-FR-2013-08. June 2013.



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EDITORIAL BY THE CHIEF SCIENTIST

This month marks the one year anniversary of the Science and Technology Organization, the culmination of the S&T Reform component of NATO's Agency Reform begun in 2011. Since the standup of the STO in July 2012, we continue to bring the value of S&T to the fingertips of NATO and the Nations and their decision makers, implemented unified governance for NATO S&T, achieved a successful transition, and continue to strive for effectiveness, efficiency and continuous improvement.

I'm proud and happy to lead this wonderful organization and to continue to work hard for the best of NATO Science and Technology, in support of the objectives of NATO, our Nations and our Partners.

I'm looking forward to continue on our challenging way forward, with and for you.

**MGen Albert Husniaux,
NATO Chief Scientist**



MGen Albert Husniaux, NATO Chief Scientist

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Making Progress

18 April: Biennial Conference of National Armaments Directors (CNAD)

The Chief Scientist participated in the biennial CNAD which focused on Joint Intelligence, Surveillance and Reconnaissance, Ballistic Missile Defence, the proposed CNAD Strategy and elements of the new CNAD Management Plan, and the Connected Forces Initiative (CFI).

25 April: RPPB meeting.

The NATO Chief Scientist and the Scientific Advisor to SACT jointly presented the report on the Research Vessels study to the Resources Planning & Policy Board on 25th April. The briefing was well received and the proposals were supported by several nations around the table. Nevertheless, the RPPB did not take a formal

position, deciding to produce a formal document to be assessed by nations, to provide advice to the Defence Planning & Police Committee.

17 June STO ESPE Endorsement.

On 17 June the Military Committee endorsed the mission statements of the organisational structure, the ranks and the grades of the military posts and the common funded civil positions of the STO. The endorsed STO ESPE was forwarded to the Private Office of the Secretary General for the final NAC approval. In parallel with the build up of the STO, the OCS started the recruitment process for one A-5 and three A-4 positions. The target is to have the OCS fully staffed shortly after the summer leave.





MGen Albert Husniaux, NATO Chief Scientist

News out of the NATO HQ (Brussels)

S&T Strategy. Based on the action plans provided by a number of stakeholders, the team discussed the structure and content of the coordination plan, as well as the process for completing this plan in time for the fall 2013 STB meeting. Workshop results form a solid basis for a first concrete draft of the coordination plan. This draft will be revised through online collaboration (and one additional workshop in mid-July), with the aim of submitting the final coordination plan to the STB in the second half of August.

12 June NAAG Meeting.

The S&T Coordination & Outreach Officer gave a briefing at the NATO Army Armaments Group (NAAG) in plenary meeting, presenting the S&T activities in support and of interest to NAAG. The following discussion confirmed the good level of coordination, in particular with the Joint and Land Capability Groups under the NAAG with some STO collaborative activities undertaken at their request.

24 June CNAD in Permanent Session.

The S&T Coordination & Outreach Officer gave a briefing to the CNAD in Permanent Session (attended by the NADREPs), focusing on the status of the S&T Strategy, the reinforced STO-CNAD cooperation and also presenting highlights from the Collaborative S&T Program of Work. Nations underlined that S&T reform had turned out to be a success story, welcomed the close linkage between the CNAD and the STO and encouraged the alignment of the S&T and CNAD strategies.

NIAG Meetings

The NATO Chief Scientist attended the NIAG plenary meeting on the 25th of June, giving a briefing on the STO and its links with Industry. The meeting saw the attendance of the Deputy Secretary General and it was a good opportunity for a high level discussion on relations Industry engagement in S&T. On the 7th of June, the S&T Coordination & Outreach Officer participated in the NIAG roundtable which is the annual discussion in which Main Armaments Groups present their proposals for future NIAG studies. The roundtable format is facilitating STO/NIAG activities alignment, in order to exploit synergies and avoid redundancies.

12 April: BENELUX Industry Day

The NATO Chief Scientist attended the BENELUX Industry Day on 12th April, giving a briefing on "Industry involvement in the STO". The meeting saw the attendance of high level speakers from NATO and industrialists from the three BENELUX countries.

15 April: Belgian Royal Military Academy.

The NATO Chief Scientist was invited to present a briefing on Science and Technology in NATO at the Royal Military Academy in Brussels.

19 April: Visit of the Albanian Deputy MOD, Mrs Arta MUSARAJ

Mrs. Arta Musaray Albanian Deputy MOD paid a visit to the Chief Scientist while she was visiting NATO. During a warm conversation, common interests and the national importance of S&T was discussed.

23-24 April: NATO Defence Planning Process

On the 23rd April a meeting of the NDPP '17 Focus Group was held at NATO HQ. The purpose of the meeting was to start the preparations for the next 4-year cycle of the NATO Defence Planning Process (NDPP '17), particularly for its Step 2 (defining requirements). This work is tightly connected to the "enhanced NDPP" initiative which, inter alia, promotes a stronger focus on the long term horizon and therefore on S&T contributions. The following day, a workshop to discuss Lessons Learned for the Step 3 of the current cycle was held at SHAPE. Both events were attended by representatives of the Office of the Chief Scientist.

23-24 April: NATO S&T Strategy – Implementation Workshop

A team of National STB Members and representatives from different NATO staffs gathered at NATO HQ to discuss the way forward for implementing the NATO



Capable Logistician 2013

The NATO Chief Scientist attended the distinguished visitors day of exercise Capable Logistician 2013



Modelling and Simulation Support for Cyber Defence (MSG-121)

11-12 April: MSG-121 Workshop on "Modelling and Simulation Support for Cyber Defence"

Held in conjunction with the Simulation Interoperability Standards Organisation 2013 Spring International Workshop in San Diego, USA, the MSG-121 Workshop gathered more than 40 attendees from NATO and non-NATO Nations. The topics addressed included national overviews of the use of M&S for Cyber Defence, M&S representation of various types of cyber-attacks, M&S for assessing threats and risks on networks

News out of the NATO HQ (ctd)

on the 20th of June. The major objective of the exercise was to turn into practice effective ways of logistic support to multinational military operations by training both commanders and personnel, improving interoperability, upgrading coordination among national logistic services, and increasing standardization. Several technologies were demonstrated in the exercise, inter alia: Smart Energy, Asset Tracking, Infrastructure Engineering, etc.

News out of Neuilly-sur-Seine

and information systems, Integration of cyber-attack representation in existing M&S environments and Cyber defence training and education programmes.

15 Apr 2013: SET-200 on "Electromagnetic scattering prediction of small complex aerial platforms for NCTI purposes" kick-off meeting, NATO CSO

Participants from 6 NATO Nations (FRA, DEU, ITA, NLD, ESP, TUR) have started the SET-200 collaborative activity addressing electromagnetic scattering characterization of aircraft. The SET-200 team continues the work of SET-085 and SET-138 Task Groups to develop better predictions on the effect of configuration, geometry and aircraft material. Prediction of EM scattering off of Unmanned Aerial Vehicles (UAVs) can be addressed by numerical methods more easily. Efficient and accurate calculations related to these issues will be extremely beneficial to a wide range of NATO operations.

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NMSG Business Meeting (Toulon, 22-26 April)

17-19 April: SAS Panel Business Meeting

With outstanding assistance from Lt Col (Prof) Ion BICA and several staff support members from the Romanian Military Technical Academy, the System Analysis and Studies (SAS) Panel held its Panel Business Meeting in Bucharest, ROU at its National Military Palace ("Cercal Militar National"). During this meeting the SAS Panel members, along with several technical activity leads and other invited guests, were able to discuss the panel's Programme of Work (POW) and to learn of the progress being made for each activity. Furthermore, the panel received in-depth mid-term reports from two ongoing task groups, SAS-095 on "Cost/Benefit Analysis of Training" and SAS-096 on "Key Performance Indicators in Measuring Military Outputs." By receiving these two reports, the panel was able to spend a longer amount of time discussing the activity with the team lead and thus helping to shape the progress of these teams as they near completion of their work. Additionally, the panel was able to discuss and deliberate on several new ideas for potential research, coming to agreement on forming five exploratory teams with an eye for solidifying the 2014 and 2015 SAS Paw

22-26 April: NMSG Business Meeting

The NMSG 31st Business Meeting was held in Toulon, FRA from 22-26 April, 2013. In addition to program development and review, members conducted a Technical Visit to the DGA Naval Centre where they were shown examples of simulation-based acquisition and examples of simulation-based training, which included a visit to the ship BPC Dixmude which hosts the CMS' training module. In addition the Australian PoC to the NMGS, Ms Jie HOU, briefed on Australia hosting the Fall BM in Sydney from 14 -16 October 2013. The associated Symposium will address M&S Support to Transitioning Forces: Emerged / Emerging Disruptive M&S Technologies.

News out of Neuilly-sur-Seine (ctd)

13-17 May 31st AVT Panel Spring Meeting 2013, Karlstad, Sweden.

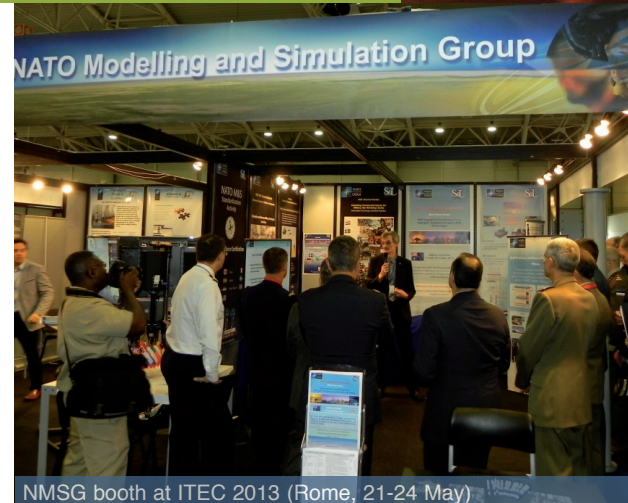
More than 250 engineers, scientists, industry and government representatives from 19 out of 28 NATO Nations, plus three Partner Nations, attended the 2013 Spring Panel Business Week (PBW) of the Applied Vehicle Technology (AVT) Panel. 38 AVT Technical Teams including Task Groups, Program Committees and Exploratory Teams held their team meetings during the week. The 31st Panel Business Week was an overall success and the work of the technical teams once again shows the high value of the NATO Science and Technology environment.

13-17 May: IST Panel Business Week.

ENSICA, one of the prestigious French Aerospace Schools, located in Toulouse (FRA), hosted the IST Panel Business Week last May. After a two-day Symposium (IST-115) on Architectures the Definition & Evaluation Panel held their 31st Business Meeting. During the Business Meeting the Panel discussed the various challenges to be addressed in the near future, the Program of Work, the potential cross-panel activities and reviewed some of the current. Partner Nations (ALB, FIN, SWE) and NATO Bodies (NHQC3S, ACT) Representatives attended the PBM and provided constructive participation which is illustrative of the willingness to synchronize efforts when necessary.

13-17 May 2013 – SET Panel Business Week at the Headquarters Multinational Corps Northeast - Szczecin, Poland

The SET-187 Specialist's Meeting on "Passive radar: challenges concerning theory and practice in military applications", presented contributions from 22 speakers with more than 100 participants. The Specialist's Meeting SET-187 provided a timely and in-depth evaluation of the technical status of passive radar technology. The maturity of passive emitter tracking and passive coherent location systems was shown in several demonstrators both from academia and industry. Very interesting results were presented using illuminators of opportunity ranging from DVB satellites to Early Warning VHF Radars. A Technical Evaluation Report with detailed technical information is being published by CSO. During the 31st SET Panel Business Meeting



NMSG booth at ITEC 2013 (Rome, 21-24 May)

(PBM) more than 50 National Representatives from 20 NATO and PFP Nations acknowledged the guidance from the Science & Technology Board, discussed the advances in the technology and the impact on military activities, reviewed 40 ongoing activities, and proposed 5 new activities for the 2014 SET Program of Work in the field of Sensors and Electronics.

21-24 May: NATO Modelling and Simulation Group at the International Training and Education Conference (ITEC) and Exhibition 2013

Approximately 4,000 visitors, exhibitors and delegates met between 22nd and 24th of May 2013 at the annual International Training and Education Conference (ITEC) 2013 held at Fiera di Roma convention centre, in Rome, Italy. The NATO Modelling and Simulation Group (NMSG) of the STO was one of the 150+ exhibitors and presented M&S related achievements in NATO to the wider M&S community. In a briefing given to the VIP delegates visiting NATO stand, Mr Wim HUISKAMP (NLD, NMSG Chairman) presented the updated NATO M&S Master Plan (NMSMP) and gave examples of how nations and NATO organisations work together within NMSG Task Groups towards the implementation of the NMSMP objectives to exploit M&S for the benefit of the Alliance. This year the NMSG Task Group MSG-085 on "C2-Simulation Interoperation" conducted a cooperative demonstration of Technology (CDT) showing Military Scenario Definition Language (MSDL)-based simulation initialization of the Air/Land vignettes using OneSAF (One Semi-Automated

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Forces) as the simulation driver and the LandBMS (Battle Management System) as the C2I device issuing C-BML orders and receiving reports.

12-14 June: SAS-097 Meeting, NATO CSO

Nearly 20 members from the SAS-097 Task Group on "Robotics Underpinning Future NATO Operations" met in June at the NATO CSO in Neuilly-sur-Seine. Ten presentations were given to highlight the various "virtual strands" of research being done in support of this activity. The SAS-097 team has established a dedicated website for others to gain information on this team's work and areas of research; you can visit this website here: <http://cmp.felk.cvut.cz/projects/natorobot/index.html>.

28-30 May 2013: SET-198 on "Visible Laser Dazzle – Effects and Protection" kick-off meeting, NATO CSO

Participants from 7 NATO Nations (CAN, FRA, DEU, NLD, POR, GBR, USA) participated to the initial meeting of SET-198 Task Group. Current laser protection measures are typically realized using conventional optical filters based on absorption or interference effects. These filters work only for predefined wavelengths, therefore, sophisticated protection concepts against dazzling and damaging are required.

HFM-RSY 228 Symposium

At the symposium on "Force Sustainment: Rehabilitation, Regeneration and Prosthetics for Re-Integration to Duty," 46 presenters gave an overview of their research and work on this important topic. A common statement is that with changing dynamics of military engagements, a shift in military rehabilitation is needed: from an overwhelming focus on reconstructive/restorative rehabilitation moving toward pre-emptive and preventive rehabilitation paradigms that would decrease the soldiers' susceptibility toward injury/disease and increase their fitness and resilience. Detailed conclusions are available on request.

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CMRE engineer Dr. Robert Been showing a prototype hydrophone array for autonomous underwater vehicles to student officers of the Italian Naval Academy

8-12 April 2013: 8th Meeting of STO Task Group IST-096

The 8th Meeting of the STO Task Group IST-096 convened in La Spezia to discuss security of tomorrow's network-enabled battle space, including in the undersea domain. The meeting showcased future solutions to address defence and security needs of the Alliance by using unmanned vehicles connected through the "Internet of Underwater Things". For more information, go to <http://www.cmre.nato.int/index.php/news-room/blog-news-archive/42-rokstories/223-cmre-pursues-future-solutions-to-protect-the-internet-of-underwater-things->

10 April 2013: Submarine officers from the Italian Naval Academy visited CMRE

The focus of the visit of submarine officers from the Italian Naval Academy was to deepen practical knowledge in the most recent cutting-edge scientific innovations in the maritime domain. For more information, go to <http://www.cmre.nato.int/index.php/news-room/blog-news-archive/42-rokstories/222-submarine-officers-from-the-italian-naval-academy-in-livorno-visit-the-cmre->

15-26 April: SP MINEX 2013



During the recently Spanish MINEX off Cartagena, Spain, CMRE staff in the process of recovering the MUSCLE autonomous underwater vehicle equipped with the Synthetic Aperture Sonar with GPU-based real time processing.

The ESP MINEX 2013 was held in Cartagena,

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Spain involving the NRV Alliance and mine warfare vessels from Spain, Turkey, United Kingdom, Italy and France.

25 April 2013: Information Exchange Workshop on Maritime Security

A workshop sponsored by the CMRE, the US Department of Homeland Security, and the Allied Command for Transformation, was held on in Quantico, Virginia. See the following link for the agenda, minutes, attendees, and presentations: <https://transnet.act.nato.int/WISE/Entities/DHSCMREACT>

CMRE Technology used in the KM3Net Project

The Italian Institute for Nuclear Physics (INFN), which leads the KM3NeT-Italia undersea neutrino telescope project, announced in April the successful installation of the first of a number of 400-meter tall underwater towers with optical, acoustic and oceanographic sensors at depth of 3500 meters off the coast of Sicily. In 2009 NURC (now CMRE) deep water low noise hydrophone technology, developed in collaboration with the Italian company SMID, was selected as acoustic sensors for the system.

3-30 May MCM Exercise

The CMRE was invited by Commander, U.S. Naval Forces Central Command, U.S. FIFTH Fleet, Combined Maritime Forces to participate in an International MineCountermeasures (MCM) Exercise to be conducted in the FIFTH Fleet Area of Responsibility. The purpose of this exercise is to foster interoperability, enhance MCM operational capabilities, and strengthen worldwide partnerships.

5-7 Jun 2nd Workshop on Sensing the Ocean with Marine Radar (SOMaR-2)

The CMRE hosted this 2nd workshop from 5 to 7 June 2013 in Lerici (Italy). In 2011, the first workshop on Sensing the Ocean with Marine Radar (SOMaR-1) concentrated on the scientific aspects of marine radar ocean applications and provided a forum for researchers to present and discuss their results, exchange data and algorithms, and identify priorities for future research. SOMaR-2 continued this series of interactive workshops on the state-of-the-art in marine radar development, focusing on



Vice Admiral Bruce GROOMS, Deputy Chief of Staff (Capability Development) at HQ SACT

possible consensus regarding approaches, issues, and validation.

5-7 Jun "Big data from Space" event

This event was organized by the European Space Agency in Frascati (Italy) to address the barriers that limit the use of the large volumes of Earth observation data. From 5 to 7 June international experts discussed contemporary and historical Earth observations, either space-based or from the ground (including ubiquitous information-sensing mobile devices, aerial sensory technologies, wireless sensor networks). CMRE was invited to speak about experiences and lessons learned related to Big Data Challenges in the Maritime Domain.

18-20 Jun Undersea Defence Technology (UDT) Europe, held in Hamburg (Germany)

Dirk Tielbuerger, CMRE Director, was invited to give a keynote talk at the event. He presented the Centre's view on "What does the future hold for the world's most inhospitable environment?" in a plenary session, focusing on new technology, contested areas, emerging challenges, opportunities and their implications for the security of the underwater domain.

23-28 Jun the 1st International Conference and Exhibition on Underwater Acoustic (UAC)

Eight papers were presented by CMRE at this conference held in Corfu (Greece) Scientists at from 23 to 28 June 2013. Innovative technologies for acoustical oceanography observations and autonomous underwater persistent surveillance, solutions for investigation of environmental uncertainties, unique low-frequency mine hunting and seabed characterization sonar, were some of the topics focused during the panels.

27-28 June, ACT visit to the CMRE

The new HQ SACT Deputy Chief of Staff (Capability Development) at HQ SACT, Vice Admiral Bruce

News out of La Spezia (ctd)

GROOMS, visited CMRE in La Spezia. VAdm GROOMS is the senior representative of the Centre's principal customer. The visit programme included orientation briefings and tours on Thursday 27 June. VAdm GROOMS expressed a desire to address the staff and did so to a packed room on Friday 28 June. The Admiral was most impressed by the enthusiasm of the CMRE staff and our focused and requirement-oriented work in support of ACT and NATO in general.

28 Jun to 5 Jul 8th Student Autonomous Underwater Vehicle Challenge – Europe (SAUC-E) competition



A team member for ENSTA Bretagne monitors one of their vehicle.

Eight teams from seven universities were challenged to design and build Autonomous Underwater Vehicles (AUVs) capable of performing realistic missions. For the first time students were also invited to fully include a second autonomous underwater or a surface robots as collaborators to accomplish the assigned mission tasks. The team's AUV named "Barracuda" by University of Cambridge obtained the highest score performing a number of mission tasks and won the competition. The 2nd prize went to the University of the West England while the University of Florence took home the 3rd prize. In eight years, the competition has produced a set of valuable outputs, including ruggedized vehicles currently operative for industrial and scientific applications. In addition, numerous SAUC-E Alumni are employed in the field in world class companies and laboratories, including CMRE, and scientific papers on their achievements have been published.

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