

EDITORIAL BY THE CHIEF SCIENTIST

Dear all,

This is our first newsletter of 2014, which promises to be yet another landmark year in our young existence.

Looking forward to 2014, several major NATO events are on the horizon. September 2014 will see a NATO Summit and the change of NATO leadership, with a new Secretary-General taking office also during the fall of this year. 2014 also marks the end-phase of NATO operations in Afghanistan and the shift in focus of NATO from the shorter term to the longer term. The latter is an opportunity for our S&T community; S&T being a natural player in defining and addressing the longer term.

For our organisation and for its wider community of stakeholders, 2014 will be a year of progress in implementing change and in moving towards a steady state. It is my expectation that the balance of our efforts will start to tip from a transition phase to the steady state, from a focus on process to a renewed focus on content and from reviewing our legacy roles to implementing our new roles.

As we speak, preparations for the upcoming STB meetings are in the end-phase. I'm looking forward to meeting with all of you this spring, either in Neuilly-sur-Seine or in Brussels, to work with you towards achieving success in 2014.

Nations have entrusted to us NATO S&T and the STO. Let us, together, build their bright future to the benefit of NATO, its member Nations and its Partners.

Yours,

**MGen Albert Husniaux,
NATO Chief Scientist**

Science & Technology Organization

Monthly Newsletter



In this issue

Editorial

Making Progress

News out of Brussels

News out of Neuilly-sur-Seine

News out of La Spezia

Publications

Making Progress

13-16 January 2014: NATO Defence Planning Symposium

At this year's Defence Planning Symposium (DPS) in Oberammergau, with a focus on 'Meeting Future Defence & Security Challenges Together' and an entire session dedicated to the role of S&T in defence planning, the NATO Chief Scientist, MGen Albert Husniaux, was invited to give a NATO S&T perspective on defence planning. The NATO Chief Scientist delivered a talk on 'Science & Technology: Supporting Defence Planning' alongside Dr. Bryan Wells, UK MOD and STB member, who provided a national perspective. The S&T session was very fruitful, best summed up by Mr. Heiner Brauss, Assistant Secretary General for Defence Planning and Policy in his concluding remarks for the symposium; "The briefings on the role of Science and Technology as a planning domain in defence planning and their involvement in all steps of the NDPP, as well as the subsequent discussion, were an eye-opener for me. It also brought us back once again to the importance of the long-term perspective."

22-23 January: Military Committee/Chefs of Staff – NATO HQ

The Chief Scientist participated in the Military Committee at Chiefs of Staff-level, which focused on NATO's Transformation and the preparation of the NATO Summit planned later this year on 4 and 5

September 2014 in Wales.

24 January: Follow on meeting with Russia

On the 24th of January 2014, Mr. Yuri MIKHAILOV (Deputy Chairman of the Military Industrial Commission of the Russian Federation) visited MGen Albert Husniaux (NATO Chief Scientist). NATO and Russia look back at a very constructive, fruitful, and open exchange of views on how to further develop Defence and Security Science & Technology (S&T) cooperation. It was noticed that promising similarities between the respective organizations exist, in particular their three levels of structure and their respective broad scopes of related S&T activities. It is expected that these similarities should serve further interactions well. Mr. MIKHAILOV cordially invited MGen Husniaux to provide a key note address to the Science and Technology Committee of Military Industrial Commission of the Russian Federation in Moscow in the autumn of this year. MGen Husniaux cordially accepted the invitation.

27 January: ECSA Seminar

On 27 January the European Corporate Security Association organized an Academic Session to review of the key developments that will shape the security environment in the forthcoming year. The NATO Chief Scientist was invited and participated in this event.

News out of NATO HQ (Brussels)



7 January 2014 - Defence Policy and Planning Committee

On 7 January the Defence Policy and Planning Committee met to discuss the final version of the framework on NATO's Green Defence. The contributions of the STO and the Chief Scientist, in his advisory role, are mentioned as important contributors to achieve the objectives. The agreed framework will now be forwarded to the NATO Council for approval.

13-16 January 2014: NATO Defence Planning Symposium

At the beginning of the year, the Office of the Chief Scientist participated in the NATO Defence Planning Symposium. In addition to being an opportunity to raise the visibility and awareness of NATO S&T during the dedicated S&T session in which the Chief Scientist participated, it was also facilitated valuable interactions between the S&T and defence planning communities. One of the principle discussion themes of the symposium was

how best to move into the long term. Gen Palomeros, Supreme Allied Commander Transformation, gave a plenary talk that highlighted his emphasis on developing effective, pragmatic, efficient innovation such as through "a strong strategic partnership with the NATO Science and Technology Organization" as a means to ensure the Alliance is positioned to address the long term. Similarly, discussions between participants throughout the symposium echoed the sentiment that S&T will be a key enabler for the long term of the Alliance. This further reinforces the message that, with an Enhanced NATO Defence Planning Process that will have a stronger focus on the long term, the role of NATO S&T has the potential to have even more impact. In that light, the Office of the Chief Scientist is continuing to work to ensure that the appropriate exploitation paths for NATO S&T are identified.

28-29 January 2014: NAFAG meeting

The Chief Scientist addressed the NATO Air Forces Armaments Group (NAFAG), providing an overview of NATO S&T and specifically presented the many links between the NAFAG Capability Groups and the STO Collaborative Network. The briefing was well received and the following discussion confirmed the high connectivity amongst the STO and the Main Armaments Groups.



Operations Research/Operations Analysis (OR/OA) Orientation Course Curriculum for NATO Nations

31 Jan - System and Analysis Studies (SAS) Task Group on Operations Research/Operations Analysis (OR/OA) Orientation Course Curriculum for NATO Nations

This task group has recently completed their work, and their final report has been released to the CSO website in Pre-Release format.

This team's focus was to design instructional modules to demonstrate the value of OR and OA for decision making, with a goal of making the course available for NATO continuing education curriculums and for national military staffs. The intended audience for this course is NATO and national Executive, Flag, and senior officer decision makers.

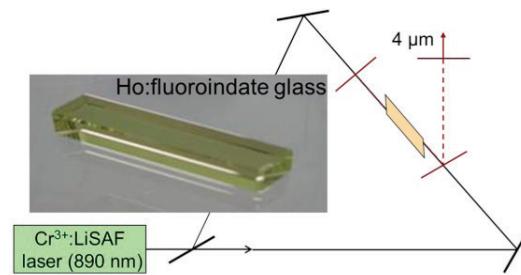
The team took an executive case study approach, whereby each case study in its description would be 10-20 minutes in length, and in a standard format to demonstrate topic relevancy to decision maker early in its presentation. Thus, the team generated 18 case studies, categorized by type of operation, NATO staff, and analytical tools, and posted these case studies on the ACT OA website (<https://transnet.act.nato.int/WISE/NATOAnalys/Links/Operational>) for download and for future additions. With this information now at hand, the team has reconvened with a plan to execute a STO-approved Technical Course, entitled "Executive Seminar for Decision Makers in the Application of Operational Analysis." Team members and selected presenters plan on taking their information "on the road" beginning in fall 2014 to places like HQ Allied Command Transformation (USA), NATO SHAPE (BEL), and the Netherlands Defence Academy (NLD). Further details regarding the execution of this Technical Course will be made available on the STO and CSO websites as soon as they are available.

27 Jan - NATO SET-170 RTG Mid-Infrared Fiber Lasers Demonstrates 4 μm Lasing in Novel Glass Material

The RTG was formed to advance the state-of-the-art in fiber-based coherent sources operating at wavelengths longer than 3 μm. Fiber lasers have distinct advantages over bulk solid state lasers for

News out of Neuilly-sur-Seine

applications such as countermeasures and remote sensing. As part of its three-year Programme of Work, SET-170 considered rare-earth-doped fibers, most specifically trivalent holmium (Ho^{3+}) in novel fluoroindate fiber. The Ho^{3+} active ion lases on the $5\text{I}5 \rightarrow 5\text{I}6$ transition at approximately 4 μm. The fluoroindate host material offers a broader mid-IR transparency and even longer lifetime than the more mature ZBLAN fiber, improving its potential for room-temperature operation.



NATO SET-170 RTG Mid-Infrared Fiber Lasers Demonstrates 4 μm Lasing in Novel Glass Material

Experiments made use of novel Ho^{3+} -doped glass samples fabricated by Le Verre Fluoré (France), due to their substantially lower cost relative to pulled fiber. A companion sample with cubic dimensions was fabricated for a variety of spectroscopic studies, to identify absorption, emission, and fluorescence lifetime properties of the material. The Ho^{3+} system suffers from an unfavorable lifetime ratio, with the upper laser level lifetime typically two orders of magnitude shorter than that of the lower level, resulting in significant bottlenecking. Spectroscopic results were therefore critical as inputs to a model to evaluate the possibility of developing a viable Ho^{3+} :fiber laser, and to identify a suitable fiber specification. Modelling results indicate that, despite the short lifetime, efficient lasing is possible in a double-clad fiber given the correct choice of concentration, taking advantage of upconversion processes to help recirculate the active ions.

In lasing experiments, a flashlamp-pumped Cr^{3+} :LiSAF laser operating at 890 nm pumped Brewster-cut sample, in a cavity set up for a crystal of the better-known $\text{Ho}:BYF$. Results were modest: just over 5 mJ of output, and a slope efficiency of 1.3%. This is the first demonstration of lasing in this material, however, and given the nature of the sample and the far from optimal resonator conditions, bodes well for the performance of a Ho^{3+} :fluoroindate fiber. A journal paper on these results is in preparation.

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18 Dec - Interservice Industry Training Simulation and Education Conference (I/ITSEC), Orlando, 2-5 December 2013

During the I/ITSEC held from December 2-5th 2013 at the Orange Country Convention Center in Orlando Florida, the NATO presence included representation from the Allied Command Transformation (ACT), the NATO Modelling & Simulation Coordination Office (MSCO) and the NATO Modelling & Simulation Centre of Excellence (M&S CoE). In particular, demonstrations were performed that highlighted the benefits of simulation interoperability to the Warfighter. The Modeling and Simulation Group 085 (MSG-085) executed several such demonstrations involving operational command & control systems connected to simulations for the purposes of Distributed, Collaborative Brigade and Battalion Mission Planning.

Also, MSG-085 unveiled the Scenario INitialization and EXecution (SINEX) initiative; SINEX is an innovative systems engineering, model-driven approach to developing and maintaining interoperability standards products that leverages the interoperability products of the Multilateral Interoperability Programme (MIP) that already are utilized by many NATO nations to share military information across C2 systems. SINEX facilitates the sharing of military information to a larger number of systems that also includes simulations and potentially autonomous systems and thus can help to more easily perform military enterprise activities. Other activities also highlighted during the week included: the MSG-099 – Urban Combat Advanced Training Technology (UCATT), MSG-068 NATO Education and Training Network (NETN) and the NATO e-learning capability.

09 Dec - 31st Technical Advisory Committee Meeting 2013 at the von Karman Institute

The 31st meeting of the STO Technical Advisory Committee (TAC) of the von Karman Institute for Fluid Dynamics (VKI) was held at the Institute in Rhode St. Genèse, Belgium, on 5th and 6th December 2013. Experts in the field of fluid dynamics, who represent NATO nations, reviewed the achievements of the Institute of the past

News out of Neuilly-sur-Seine (ctd)

academic year.

The review included an assessment of the importance of VKI's programs and activities to NATO, a review of the Institute's achievements over the past academic year and a review of plans for the following and subsequent years.



31st Technical Advisory Committee Meeting 2013 at the von Karman Institute

Due to the very close relationship between the Collaborative Support Office as a part of the STO and the VKI, a CSO representative (AVT Executive Officer) is member of the TAC as permanent secretary of the committee. The three different departments of the VKI, namely the Aeronautics & Aerospace, Turbomachinery & Propulsion and the Environmental & Applied Fluid Dynamics presented projects and trends within their research fields. The VKI provides a unique environment where the scientific research promotes and facilitates cooperative international partnerships. Furthermore the VKI is a center of knowledge where Lecture Series on specialized topics are organized to disseminate state-of-the-art scientific knowledge among junior and mid-level specialists, scientists and engineers to meet the needs of Research Institutes, Industry and NATO. For this purpose the VKI maintains a close relationship with the Applied Vehicle Technology (AVT). The results generated by the VKI are used in national, international and NATO projects, which support and maintain military capabilities with technical solutions for specific problems.

The Committee was pleased to report that the VKI clearly continues to successfully complete its mission and objectives while maintaining its status as an institute providing training and research results of high quality and value to NATO.



1st Meeting of the ASRM Smart Defence Project

News out of La Spezia

29 – 30 January - 1st Meeting of the ASRM Smart Defence Project

From 29 to 30 January, CMRE hosted the 1st Meeting of the Active Sonar Risk Mitigation (ASRM) Smart Defence (SD) Project, organized by the Allied Command Transformation (ACT). The purpose of SD is to identify Nations and parts of NATO that are interested in working together on a common issue. This workshop successfully identified a number of items of common interest in the area of ASRM, these will be further developed in the near future.

CMRE has been conducting scientific research on active sonar risk mitigation for more than 13 years, as NATO's focal point for scientific expertise in this area. The emerging results from CMRE studies indicate that the impact of active sonar on marine mammals is very much context dependent.

29 – 31 January - Robocademy project kick-off

The Robocademy project, supported by the EU Marie Curie Initial Training Network fund, started in Bremen on 29-31 January 2014. CMRE is part of the partners' consortium and will host for three years a PhD candidate on Optical Mapping & Disturbance Rejection.

The Robocademy project aims at establishing a European training and research network to develop key skills and enabling technologies in underwater robotics for the scientific and economic exploration of the oceans (e.g. offshore oilfield of the future). Through the close collaboration of leading research institutes, academia, industry, and SMEs in robotics, marine technology, marine science, and offshore industry, Robocademy will provide first-class training and research opportunities for Early Stage Researchers (ESR). CMRE will welcome one PhD candidate working on the topics of Optical Mapping & Disturbance Rejection to develop new algorithms for optical mapping in dynamic environments. A call for candidates will be opened in Summer 2014. Updates will be posted on CMRE website www.cmre.nato.int.

SAUC-Europe and euRathlon

CMRE recently announced the dates for the 9th edition of the Student Autonomous Underwater Vehicle Challenge - Europe (SAUC-Europe) competition and the new euRathlon Underwater Robotics Challenge.

SAUC-Europe moves to autumn and will be hosted again at CMRE from 20 to 26 September 2014. For the fifth time in a row, in La Spezia, SAUC-E challenges multidisciplinary University teams to design and build Autonomous Underwater Vehicles (AUVs) capable of performing realistic missions. The student AUVs must perform a series of tasks autonomously in a sheltered sea harbour, with no control, guidance or communication from a person or from any off-board computer including GPS systems. See www.sauc-europe.org for more.

This year the SAUC-E competition will be followed by the euRathlon 2014 Underwater Robotics Challenge which is part of a three-year project, funded by the European Commission, demanding teams to test the intelligence and autonomy of their robots in realistic mock emergency-response scenarios, inspired for example by the Fukushima accident in 2011. From 29 September to 3 October 2014 CMRE is hosting the underwater contest; the last step before the Grand Challenge featuring in 2015 all three elements: land, sea and air. The call for participants is open at <http://www.eurathlon.eu>.

28 January - SWOT analysis at CMRE

On 28 January a SWOT analysis meeting was held at CMRE. The Centre's Management took part in it along with some external stakeholders. The brainstorming session led to positive conclusions that will be used to shape the 2014 and 2015 way-ahead. In general, CMRE is seen in a strong position to seize the opportunities coming from successful networking efforts with NATO, multinational entities (including EU) and Nations. A new portfolio of products aligned to new NATO priorities snapshot in the NATO initiatives (Smart Defence and Connected Forces) could give the extra drive needed in this phase. The new positive line of action is meant to present its first mark at the forthcoming STB meeting to be held in Spring.

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Robocademy Project kick-off

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Contact Us

Houben Bart

houben.bart@hq.nato.int