NATO Research and Technology Organisation
www.rto.nato.int
newsletter

A word from the Chairman . . .

It is my pleasure to present, within this newsletter, a representative sampling of the more than 140 technical activities NATO, the Nations and partner Nations conduct together currently within the Research and Technology Organisation. The RTO Programme of Work includes a broad spectrum of R&T activities addressing research in System Analysis and Studies, Sensors and Electronics Technology, Human Factors and Medicine, Information Systems Technology, Systems Concepts and Integration, Modelling and Simulation, and Applied Vehicle Technology.

R&T collaboration in the NATO framework is important for the Nations and for NATO. By facilitating knowledge exchange and collaboration between the Nations in a NATO context, hereby injecting military relevance, R&T can be a critical "force multiplier" for Nations and NATO, influencing, enabling and levering R&T investments to achieve a higher ambition at a reduced cost, thereby helping to ensure operational success and saving lives. This cooperative R&T augments the Nation's investments, helps NATO assist Nations' capability-building efforts, and helps NATO develop NATO-owned capabilities.

Research and Technology, appropriately harnessed, is a strategic enabler of the knowledge and technology advantage for the defence and security posture of NATO, the Nations and partner Nations. R&T is a critical engine of innovation, decreases the probability of exposure to technology shock and provides the art of the possible in future military capabilities to address a broadening conflict space from traditional military and irregular warfare into the complexities inherent in national and public security.

Issue Number 7
September 2010

Covered in this issue:

I am extremely pleased to see that NATO cooperative R&T continues to strengthen amidst global financial pressures. This sustained commitment and high level of participation in activities conducted and supported by the Nations, partner Nations and NATO, under the RTO umbrella, testify to the value provided.

The RTO and its executive body, the RTA, will continue to address NATO's agenda for change as an opportunity to build NATO's 21st century collaborative R&T, to the benefit of the security and defence posture of the Nations and NATO.

I encourage the Nations, partners and NATO to be part of this transformation journey and am looking forward to leading the RTO into this new environment where we will continue to enhance the contributions of cooperative R&T.

Dr. Robert Walker
Chairman, NATO Research & Technology Board

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The System Analysis and Studies Panel
SAS-091 Allied Information Sharing Capability

Tom Allen, USA, Jim Bexfield, USA and Allen Murashige, USA, SAS-091

While conducting its Spring 2010 Business Meeting in Sofia, Bulgaria, the System Analysis and Studies Panel received a request for assistance from the NATO International Security Assistance Force, which needed help in developing, refining and implementing a data strategy for Afghanistan that would enable improved assessment of the ISAF mission and of key conditions within the country. Immediately following the meeting, a SAS representative visited the Joint Forces Command Brunssum headquarters to gain a better understanding of the ISAF requirement. With this information, the US took the lead in quickly drafting a technical activity plan which was then circulated among the Panel members. By mid-July, the plan for the Specialist Team SAS-091 was approved by the SAS Panel and the RTA Director with the US as Lead Nation and seven Nations (US, Canada, United Kingdom, France, Norway, Germany and Sweden) plus NATO ACT and NC3A on the core planning team. In spite of their tight operating schedule, JFC Brunssum enthusiastically volunteered to host and co-sponsor the initial 150 -person workshop during the week of 30 Aug-3 Sep 2010.

This exciting new project bridges the research and operational communities, creating an opportunity for RTO scientists to work with NATO ISAF, NATO Joint Forces Command (JFC), non-military government agencies, and non-governmental organisations (NGOs) operating in theater to address critical ISAF needs. Although many, if not most, of these organisations have data collection efforts underway in Afghanistan, the information tends to be fragmented and incomplete with little standardisation or sharing, making integrated and consistent assessments extremely difficult.

One goal of this initiative is to provide direct assistance to NATO JFC and ISAF in refining and implementing the INTEQAL ("Transition") plan for Afghanistan, which will strengthen Afghan sovereign ownership and leadership across all the functions of the government and throughout its sovereign territory. The plan includes a framework for the transfer of responsibilities, such as security, governance, and development, from the international community, including NATO ISAF, to the Government of the Islamic Republic of Afghanistan. Data collection, metrics and information sharing are critical tools for understanding when regions are ready to execute various aspects of INTEQAL.

More generally, the goals for the Specialist Team, which plans to complete work by September 2011, are:

- Develop and help implement a data plan that encourages consistent data collection, management, and analysis among the nations.
- Develop mechanisms for sharing data among the stakeholders (ISAF, Host Nation, NGOs, International Organisations) in easy-to-use formats.
- Develop a metrics, data collection, and data sharing framework for the initial phase of INTEQAL that will be useful to senior decision makers.

Building a high school in Kabul (source: USAID)

The team just held its first workshop from 30 August to 3 September, hosted and co-sponsored by JFC Brunssum. After tutorials Monday morning and plenary sessions Monday afternoon and part of Tuesday, including a keynote by Royal Australian Army Brigadier Wayne Goodman, the Director of Assessments at ISAF, the workshop broke into syndicates to review the "as is," formulate a "to be" (or "can be"), and identify actions needed to attain the "can be." Four of the six syndicates directly supported the INTEQAL effort: governance, rule of law, security and economic development. The other two syndicates focused on the general problems of data collection and data sharing. All syndicates included polling results, demographic information, development projects and other activities and measures in their deliberations.

By September 2011, the team plans to produce a report that summarizes the core metrics for measuring counterinsurgency and transition progress, a description of the population data that is currently being collected by each Nation (including the processes used to collect the data, and the associated storage and collection media), and a best practices guideline for the consistent collection, sharing, and analysis of data.

activities and a Group specialising in Modelling and Simulation. The following provides some highlights of their recent work

The team will also compare the data collection, storage, and management activities of each Nation along with challenges faced by the individual nations.

Recommendations will also be made regarding the management and resourcing of data registries / repositories and procedures for data verification and validation (V&V).

The second workshop, to be held in December 2010 in The Hague, NLD, will continue the focus on key gaps and potential solutions. The remaining workshops will track progress and update plans for developing an integrated metric and information architecture to help assess the INTEQAL transition framework and enhancements to processes associated with the collection d sharing of data.

Job Fair at Afghan Technical Vocational Institute (ATVI) (source: USAID)

The Sensors and Electronics Technology Panel Countering the Improvised Explosive Device

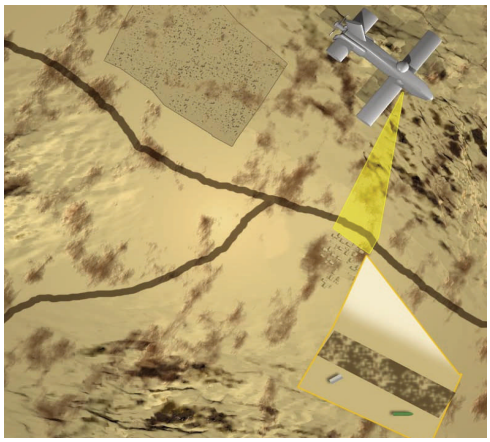
Steven Bishop, Ph.D., US Army RDECOM CERDEC NVESD and Chairman of the Leading Body for the C-IED LTCR

Landmines, booby-traps and Improvised Explosive Devices (IEDs) are envisioned to be the weapon of choice in future low-intensity conflicts. Their sphere of influence spans land, air and sea. Targets of opportunity include dismounted military operations, convoys, sea faring and aircraft, direct attacks on the civilian population, commercial enterprises and infrastructure resulting in pain, death, anguish and destruction.

IEDs have evolved to include a variety of low-cost novel triggering devices, explosive fills, emplacements and support networks. How these weapons and networks will operate, look to our instruments and sensors are likely to change in the years to come. Technology used to counter IEDs must be cost - effective, efficient and accurate.

The RTO is examining how the IED and Counter-IED (C-IED) technologies advance. SET-161 is the Leading Body for the C-IED Long Term Capability Requirement (LTCR). The group's three-year charter is to develop and maintain a technology roadmap reaching out to the year 2030. This is a challenging task requiring cooperation in many forms and forums. Interaction with NATO bodies and participating nations is very important and forms the Community of Interest (CoI). Obtaining perspectives from the respective parties will shape the technology roadmap. This includes the views and requirements from the military and intelligence communities along with technical inputs and plans from relevant defense department's or ministry's R&D programmes. The group wants the roadmap to influence and shape C-IED R&D programmes, foster collaboration dialogue within the CoI and the exchange of technical information.

The first meeting was at the RTA, Paris, France in June 2010. The second meeting will be at the C-IED Center of Excellence, Madrid, Spain in December 2010. Subsequently the third meeting is tentative scheduled for June 2011 in Copenhagen, Denmark.



Future aerial sensor platform scanning open terrain and routes for activities and signs related to IED emplacements

The Human Factors and Medicine Panel
Use of Advanced Technologies and New Procedures in Medical Field Operations

Colonel Knut Ole Sundnes, Joint Medical Command, Norway

The HFM-RSY 182 Symposium on "Use of Advanced Technology and New Procedures in Medical Field Operations" brought together international experts in the development and fielding of advanced medical technologies, with the general goal of gaining a greater understanding of soon-to-be fielded technologies, and to determine how they can best be applied within the multinational NATO environment.

Combat Application Tourniquet

The NATO leadership has mandated that to the maximum extent possible, the medical care provided to deployed military personnel will be of the same standard as they could receive in their home countries. Experience in recent wars has shown that the judicious application of advanced medical technologies to combat casualty care has played a significant role in reducing combat-related mortality to the lowest level which has ever been seen. The new NATO expeditionary strategic concept, with its emphasis on multinational shared responsibility for medical care, reduced deployed medical footprints and early evacuation, cannot be implemented from a medical point of view without effective use of all available advanced medical technologies in the multinational setting. Future NATO operations will be mobile and flexible, and will take place in remote and austere environments, providing new challenges to deployable medical services. In the past, RTO activities have investigated certain specific new technologies, such as telemedicine, and a current Task Group is developing a test and evaluation concept for advanced medical technologies in the multinational setting which can be incorporated into the ACT scientific program of work and exercise programme. There is a need to gain an understanding on the part of NATO as to what new medically-relevant technologies are on the horizon, and to be able to advise the Military Committee and COMEDS as to effective integration of these technologies into our armamentarium.

By improving Combat Casualty Care and reducing the medical "foot print" NATO faces several challenges. Some of these challenges can be met by:

- modification of treatment,
- new equipment/technology,
- by operational development, both tactically & strategically and
- with a combination of the three.

Lack of manpower may be compensated for by telecommunicated systems and robotics, if proven in tests. A NATO Trauma Registry could be a key, as has been emphasized by the COMEDS.

The way how wars are waged has also changed during the last decades by shifting from dominating symmetric to asymmetric warfare. The new technologies presented and demonstrated seem feasible for this asymmetric warfare, as well as for civilian peace time challenges. However the limiting obstacles must be identified and overcome. The development of medical technologies, as well as the strategic and operational concepts for medical support has forced a rethinking of all levels of medical treatment and medical operations. We also have acquired a better insight into trauma care and the patho-physiology of trauma and witnessed as well as the narrowing of the medical specialities from "omnipotent" physician to the "sub-specialized" physician. The number of such health care personnel is also limited.

Evacuation of casualties

activities and a Group specialising in Modelling and Simulation. The following provides some highlights of their recent work

The question remains whether new techniques and new ways of treatment can compensate for these developments.

The symposium has presented valuable and promising possibilities. It also provided lessons learned especially from Operation Enduring Freedom and Operation Iraqi Freedom. The unexpected volcanic eruption on Iceland served as a pertinent reminder of our own vulnerability in addition to the need to identify all other limiting factors. To fully evaluate all possibilities and weaknesses, more emphasis must be put on robust and relevant indicators.

Another issue that needs to be addressed is how to enhance information interchange between researchers, to reduce unnecessary duplication of effort and to introduce to the NATO leadership the current state-of-the art medical technologies and procedures. Evaluation of the potential ability of various new modalities to support the NATO goals and objectives must be carried out. The new technologies to be evaluated are not limited solely to direct patient care devices, but may include other types of equipment, such as that used in evacuation, telemedicine, medical CIS, medical situational awareness, robotics, bionics, genomics and remote medical monitoring.

The Information Systems Technology Panel IST-077-RTG on Cognitive Radio in NATO

Major Vincent Maestri, FRAF, Information Systems Technology Panel Executive

Today secure and reliable communications are of prime importance especially for multinational military operations; and yet, Frequency Assignment/Management is becoming more and more difficult and complex. VHF-UHF bands, which account for ¾ of the assigned frequencies, are heavily crowded and therefore interference is increasing.

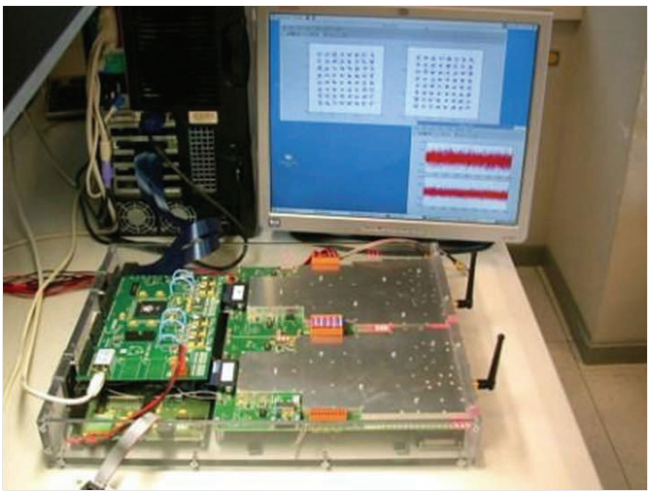
A solution to this issue is Cognitive Radio (CR). Cognitive Radio is an intelligent system able to modify its transceiver parameters based on the user's requirements and on the conditions of the surrounding environment. More precisely, CR is a futuristic radio system able to survey its radio environment, understand the radio propagation conditions and transmit according to user demands in momentarily free spectrum gaps. Essentially, a CR node must be capable of locating itself, sniffing its surroundings, analyzing the usage of the captured spectrum through a cognitive process, and transmitting data without interfering with other transmissions, while satisfying the user's Quality of Services requirements. To ensure non-interference, the cognitive radio node must exploit holes in the frequency, time, spatial and/or code dimensions where no transmission is detected. In the simplest case, the node may just identify a particular free frequency channel / time slot / spatial direction for its transmission to the destination. In the extreme case, the node may transmit to its destination by relaying its data through a network of cognitive radio nodes where each hop may consume a different frequency channel / time slot / spatial direction.

In the light of the increasing role of communications in future Net Centric Operations, a Cognitive Radio integrated in a consistent Networking and Information Infrastructure (NII) appears to be a promising technology justifying RTO IST involvement.

Based on these observations and since one of the key feature of CR remains interference management, the objective of IST-077 is to focus on scenarios and performance evaluation.

To that purpose, the group is working on simulation scenarios where different entities (coalition) deploy on the same theater. Such simulations aim at defining CR mechanisms that will mitigate interference and make 2 entities' communications continue to work. The goal is also to discuss a common methodology and common metrics in order to assess the performance of these solutions.

Thus, in addition to addressing Interoperability and Flexibility requirements, Cognitive Radio – able to configure itself to best exploit the available spectrum in VHF/UHF band – will have added value by reducing the complexity of Frequency Management in operations, by avoiding interference (unintentionally / deliberately) and hence will improve the reliability of Communications. Finally, other key anticipated benefits may include: increased effective use of spectrum resources, autonomous frequency coordination and coexistence with uncoordinated wireless networks.



Integrated Spectrum Scan for Cognitive Radio

The Systems Concepts and Integration Panel
Adaptive Camouflage

Lieutenant Colonel Jim Zink, US Army, Systems Concepts and Integration Panel Executive

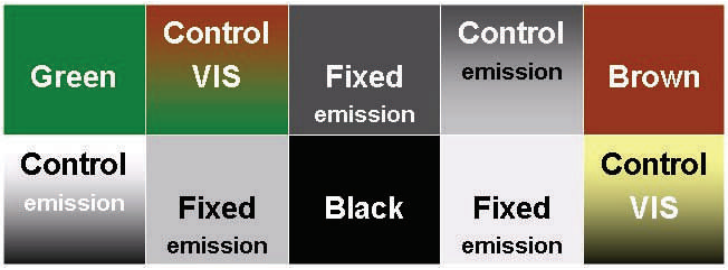
As a result of the enormous developments in sensor technology and image processing techniques, the probability of detection has increased considerably over the past decade. To reduce the detection probability and increase the survivability of NATO personnel and platforms, CCDO ("Camouflage, Concealment, Deception and Obscurants") countermeasures are being researched to reduce the contrast in the spectral band of interest between the platform and its background environment. While today's CCDO measures are based on materials with fixed (constant) physical properties for optimal performance against a predefined background, the advent of adaptive (controllable), spectral camouflage materials would give enormous advantages.

Led by the Dutch senior scientist Dr. Pieter Jacobs of TNO and comprising 12 NATO and partner nations, the SCI-179 Task Group recently completed an investigation of one approach to the use of adaptive materials for camouflage purposes. This investigation primarily involved a woodland background and applications in the visible spectrum, but did include other wavelengths such as the InfraRed (IR) wavelength band (8 – 12 µm). Simulation techniques were used to determine the adaptation requirements for colour and brightness.

NATO research support funds made it possible to design and actually build hardware (fabricated textile samples) that could be tested in the visible and IR spectrums. In the tests the hardware textiles nicely demonstrated the functioning of a controllable pattern generator, in effect showing that adaptive camouflage is an area well-worth pursuing for the protection and benefit of NATO forces.

Committed to the goal of enhancing soldiers and vehicles survivability in all NATO operations through new CC&D measures is also the SCI-230 Task Group on Advanced Materials, Systems and Evaluation Methods for Adaptive Camouflage. The Task Group is open to the invited Partner countries of Austria, Sweden and Switzerland and is led by Swedish Dr. Hans Kariis.

Adaptive camouflage could be produced by mixing fixed and controllable cells, making it difficult for threat systems to acquire and target NATO platforms.



In principle

In practice during initial concept testing

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The NATO Modelling and Simulation Group MSG-063: Getting your hands dirty!

Dr. Juan J. Ruiz, Commander Spanish Navy, Head Modelling & Simulation Coordination Office

MSG Task Group 063 has made a significant move from paper theory to practical application. MSG-063 focuses on the uses and applications of Modelling & Simulation to Urban Combat Advanced Training Technology a.k.a. UCATT.

Under the NMSG mandate, the UCATT Task Group will conduct a Technical Interoperabilty Demonstration. The demo will show live training system interoperability between various technologies and vendors. It will take place in The Marnehuizen Training Village, a real urban training village of the Royal Dutch Army in Marnehuizen, Netherlands. The military facility includes 120 objects designed for military training in an urban environment.

The NATO Modeling and Simulation Group has identified the need for common open standards and technical frameworks to promote the interoperability and reuse of models and simulations across the Alliance. Included in this requirement is the need for a common technical framework for “Live” training among members of the Alliance. Urban warfare is arguably the most deadly type of warfare and tends to neutralise the technical superiority of modern militaries. Nation's investments in the first generation of Military Operations on Urban Terrain (MOUT) training facilities began in the early 1990s. Much has been learned over the past decade but there is minimal effort in the area of formal standardisation and interoperability.

The UCATT approach was initiated to accelerate the process of defining training requirements, systems’ functional capabilities, and technology specifications leading towards an interoperable set of product solutions to be developed and delivered by industry in order to meet the complex training needs in a very challenging urban environment.

UCATT, through its unique mix of government, military, scientific and industry partners has continued the accelerated development of the future interoperability model for all NATO urban training instrumentation.

Based on a military requirement for future urban operations, a generic functional architecture has been developed with functions and interfaces identified and prioritized.

UCATT will provide a set of military recommendations to achieve interoperability in live simulation as well as a set of candidates (functions and interfaces) to be standardized. The most important interfaces will be standardized in cooperation with the Simulation Interoperability Standards Organization (SISO).

In 2010 UCATT will show in a practical interoperability demonstration the first results of the future standards.

The demonstration includes Simulation Interoperability Scenarios for:

- Small Arms
- Combat Vehicles
- RPGS/ Heavy Weapons
- Indoor/Outdoor Tracking
- Shoot through the wall
- Excercise Conduct (EXCON)
- Exercise Evaluation (AAR)

The interop-Scenarios will be put into a military context. Soldiers from The Netherlands, Germany, Sweden and Switzerland will participate in the demonstration on behalf of NATO and the PfP-Nations. First technical implementations of the UCATT-concept will be provided by 6 industry-partners of UCATT (Cubic, NSC, RDE, RUAG, SAAB and Tenetec).

The goal of the demonstration is to prove the validity of the UCATT vision of an interoperable, multi national, industry independent urban training.

Military Training in the Marnehuizen Training Village (NLD)

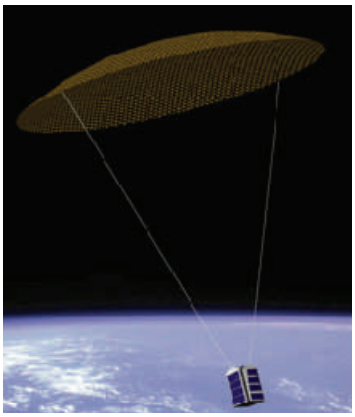
The Applied Vehicle Technology Panel
"Multi-Functional Structures and Systems Technologies for Small Spacecraft (AVT-171)"

Dipl.-Ing. Andreas Schütte, Applied Vehicle Technology Panel Executive

A Workshop on "Multi-Functional Structures and Systems Technologies for Small Spacecraft (AVT-171)" was held in conjunction with the Applied Vehicle Technology (AVT) Panel Business Week in Antalya, Turkey, April 12 – 16, 2010. The Workshop was supported by 21 presentations from 8 NATO member Nations including overviews from two other RTO space related Technical Teams. Overall, a total of 53 expert delegates from 11 NATO Nations participated in the Workshop.

The objective of the Workshop was to assess the state-of-the-art in small satellite component and system technologies that can provide a breakthrough in cost and performance of future small satellite systems particularly for potential military applications. Small satellites are significantly cheaper than larger platforms and can be launched with low cost, rapid response launch systems. Moreover, small satellite technology enables the deployment of constellations or formations of space assets that can perform military surveillance or other tasks with increased resolution, repeat cycle and performance. The topics of the Workshop included technologies of multifunctional and modular structures, guidance, navigation and control, thermal management, power generation and storage, onboard intelligence and autonomy, and assembly, integration and test.

The Workshop concluded that there were no "show stoppers" in small satellite technologies that would prevent the fulfillment of planned NATO missions. However, the area of verification of performance capability (simulation vs test) and the associated documentation was noted as one that should be rationalized to obtain the best possible savings in cost and time for a small satellite program. Also, an impediment in achieving small satellite projects is the inaccessibility and cost of current launch vehicles. Cost of launch remains a major impact on programme cost, and impacts the level of risk that might be incurred to save cost or time. Easier launch access was seen as a way to enhance revolutionary developments in the field while high cost promoted evolutionary developments for lower risk. Other important issues discussed included coordination of individual small satellites to operate as a constellation and the decommissioning and de-orbit of satellites from active orbit locations at the end of useful live to reduce Orbital Debris.



NATO R&T Related Meetings in 2010

RTB			MAGs and NIAG		
21-24 September 2010		Tallinn EST	NAFAG	11-12 January 2011	Brussels BEL
RTCG			NAAG	6-8 December 2010	Brussels BEL
27 October 2010		Brussels BEL	NNAG	1-2 December 2010	Brussels BEL
CNAD			NIAG	13-14 October 2010	Brussels BEL
28-29 October 2010		Brussels BEL			
Fall 2010 RTO PBMs					
AVT	4-8 October 2010	Bucharest ROM	SAS	27-29 October 2010	Brdo SLV
IST	30 Sep –1 October 2010	Wroclaw POL	SET	13-15 October 2010	Athens, GRE
HFM	18-22 October 2010	Amsterdam, NLD	SCI	11-15 October 2010	Antalya, TUR
MSG	13-14 September 2010	Soesterberg (Utrecht), NLD			
RTO Fall 2010 Symposia and Specialists' Meetings (see **www.rto.nato.int** for further details of these events and other technical activities**)**					
AVT	Specialists Meeting on "System Level Thermal Management for Enhanced Platform Efficiency"		Romania	4-7 October 2010	
IST	Symposium on "Military Communications and Networks in conjunction with the MCIS Week in Wroclaw"		Poland	28-29 September 2010	
HFM	Symposium on "Human Modelling for Military Application"		The Netherlands	18-20 October 2010	
MSG	Symposium on "Blending Live-Virtual-Constructive (LVC) Simulation to Better Support Training & Experimentation"		The Netherlands	16-17 September 2010	
SET	Symposium on "NCI/ATR in Air-Ground and Maritime Applications based on Radar and Acoustics"		Greece	11-12 October 2010	