

**Technical Activity Proposal (TAP)**

<b>Activity reference number</b>	SET-233	<b>Activity Title</b>  Acoustic Transient Threat Detection Sensors & Signal Processing for Battlefield Situational Awareness	<b>Approval</b> 2015
<b>Type and serial number</b>	RTG-132		<b>Start</b> January 2016
<b>Location(s) and Dates</b>			<b>End</b> December 2018
<b>Coordination with other bodies</b>	IST, SET-189, SET-218, IST-106		
<b>NATO Classification of activity</b>	NATO Unclassified		<b>Non NATO Invited</b> Yes
<b>Publication Data</b>	TR		PR
<b>Keywords</b>	Acoustic, sensors, processing, transient, array, vector sensor, particle velocity, network, fusion		

**I. Background and Justification (Relevance to NATO):**

NATO and coalition forces from around the world are regularly threatened with hostile fire from rifles, rocket propelled grenades (RPGs), mortars, rockets, artillery, and from improvised explosive devices (IEDs). There is a need for international cooperation to advance the current technology of acoustic transient threat detection, localization, and classification in complex battlefields. Better performing systems on mobile soldiers, vehicles and airborne platforms such as aerostats and unmanned aerial systems (UAS), as well as fixed sites, are needed to protect our Soldiers during coalition operations such as patrols, force protection (e.g., base protection), main supply route (MSR) monitoring and border control. The coalition missions and operational environments are constantly changing, and the threats and tactics are adapting quickly. As such, there is a strong need within NATO and partnering Nations to better understand, leverage, and to work collectively to develop advanced acoustic sensors, signal processing, propagation modeling, and distributed fusion techniques to ensure robust performance in harsh environments that include wind/flow noise, platform vibrations/noise, reverberant and diffractive urban areas, and complex propagation channels effected by meteorological (MET), ground impedance, vegetation and terrain. The RSM has strong links to Defence Against Terrorism (DAT) such as DAT#3, DAT#7, DAT#9, DAT#10, and NATO's Long-Term Capability Requirements (LTCR) such as LTCR #7 and LTCR #8.

**II. Objective(s):**

The proposed task group seeks to achieve significant improvements in acoustic transient event detection, localization, classification, propagation effects mitigation, and multimodal sensor fusion through joint and collaborative research, field experimentation in diverse environments, data exchange and algorithm development.

**III. Topic To Be Covered:**

Topical areas and applications include, but are not limited to the following:

- Unattended acoustic and multimodal sensors systems for wide area persistent situational awareness
- Acoustic sensors & array geometries tailored for Soldier-worn, ground- and air-platforms, and base/perimeter defense
- Small aperture arrays and acoustic particle velocity (vector intensity) sensing
- Wind, flow, and noise mitigation strategies, hardware, and processing
- Advanced algorithms for detection, tracking and classification of acoustic threats
- Multi-modal sensing and fusion
- Predictive tools for sensor implementation and optimization of performance, to include modeling and simulation
- Enabling network methodologies to merge and fuse homogeneous & heterogeneous sensor system solutions
- Field experimentation, threat detection exercises, demonstrations and lessons learned

**IV. Deliverable (e.g. S/W Engage Model, Database,...) and/or end product (e.g. Final Report):**

Technical Report, other deliverable(s) : none

**V. Technical Team Leader And Lead Nation:**

Chair : Mr. Michael V SCANLON United States

Co-Chair : Mr. William Clyde Kirkpatrick, II ALBERTS United States

Lead Nation: United States



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### **VI. Nations Willing/Invited to Participate:**

NATO Nations and Bodies : Canada, Estonia, Germany, Norway, Turkey, United Kingdom, United States

PfP Nations : all PfP invited

MD Nations : all MD invited

ICI Nations : Bahrain, Kuwait, Qatar, Saudi Arabia, United Arab Emirates

Global Partners : Afghanistan, Australia, Iraq, Japan, New Zealand, Pakistan, Republic of Korea

Contact / Other Nations : none

### **VII. National And/Or NATO Resources Needed (Physical and non-physical Assets):**

Field experiment opportunities, data exchange server, TG meeting venues, and assistance in drafting joint publications.

### **VIII. STO/CSO Resources Needed:**

It is not anticipated that CSO funding or resources will be used, other than assistance with the exchange of information, and the coordination of meetings and management milestones. Research group members will be informed of the availability of some limited NATO funding for field experiment assistance.