T.C.
YÜKSEKÖĞRETİM KURULU BAŞKANLIĞI
Uluslararası İlişkiler Daire Başkanlığı

Sayı :95916564-720-E.2039
Konu :NATO STO SCI Paneli Toplantı Sonuç Raporu

DAĞITIM YERLERİNE

İlgi : Milli Savunma Bakanlığı'nın 18.12.2018 tarihli ve 24316220 sayılı yazısı.

Milli Savunma Bakanlığı'ndan alınan ilgide kayıtlı yazıda, NATO Bilim ve Teknoloji Organizasyonu (Science and Technology Organization-STO) bünyesinde faaliyet gösteren Sistemler, Konseptler ve Entegrasyon (Systems Concepts and Integration-SCI) Paneli kapsamında 08-12 Ekim 2018 tarihleri arasında yılın sonbahar toplantısının Utrecht/Hollanda'da gerçekleştirildiği belirtilerek, panel bünyesinde yürütülen ve yeni başlatılması planlanan faaliyetlerin gözden geçirildiği ve söz konusu faaliyetlere ilişkin sunumlar yapıldığı bildirilmektedir.

Yazıda devamla, NATO STO bünyesinde teşkil edilmiş olan ve bilimsel içerikli konuların ele alındığı panel faaliyetlerine katılımın, Türkiye'de sürdürülen/planlanan ARGE çalışmalarının yönlendirilmesi bakımından önem arz ettiği ifade edilmektedir. Dolayısıyla, panele katılım sağlanması ile NATO'daki araştırma ve teknoloji faaliyetleri izlenmekte ve bu çalışmalardan elde edilen bilgi ve tecrübenin arge ve modernizasyon projelerinin yürütülmesine katkı sağlamasının hedeflendiği vurgulanmaktadır. Ayrıca, 2018-2019 yılında başlatılan/başlatılması planlanan ön araştırma timi, görev grubu, çalıştay, sempozyum, uzmanlar toplantısı ve ders serisi faaliyetlerine ilişkin bilgilerin ve duyuruların http://scienceconnect.sto.nato.int adresinden takip edilerek, ihtiyaç duyulması halinde kayıt olunmasının ve aktif olarak katılımın faydalı olacağının değerlendirildiği belirtilmektedir.

Bu kapsamda ilgi yazı ile, adı geçen panel faaliyetlerinden daha fazla yararlanabilmek maksadıyla, panele dahil edilmesi gereken teknolojik önceliklere ilişkin görüşler, bilgi ihtiyacı vb. konulardaki teklifler hususunda ilgili Bakanlığın EK-1'de bilgileri yer alan resmi görevlisi ile irtibata geçilmesinin uygun olacağı değerlendirilmektedir. Ayrıca, söz konusu toplantının sonuç raporu ile ilgili bilgiler EK-2'de sunulmaktadır.

Konunun üniversitenizin ilgili birimlerinde duyurulması hususunda gereğini rica ederim.

Prof. Dr. Rahmi ER
Başkan Vekili

Ek :

Not: 5070 sayılı Elektronik İmza Kanunu çerçevesinde güvenli elektronik imzalı aslı ile aynıdır.

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Uzman

1 - İrtibat Kişisi (1 sayfa)

2 - Toplantı Sonuç Raporu (36 sayfa)

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GÖREV SONUÇ RAPORU

1. TOPLANTININ KONUSU : NATO Sistemler, Konseptler ve Entegrasyon (Systems Concepts and Integration, SCI) Panelinin 2018 Yılı Sonbahar Toplantısı

2. TOPLANTININ YERİ : Utrecht/HOLLANDA

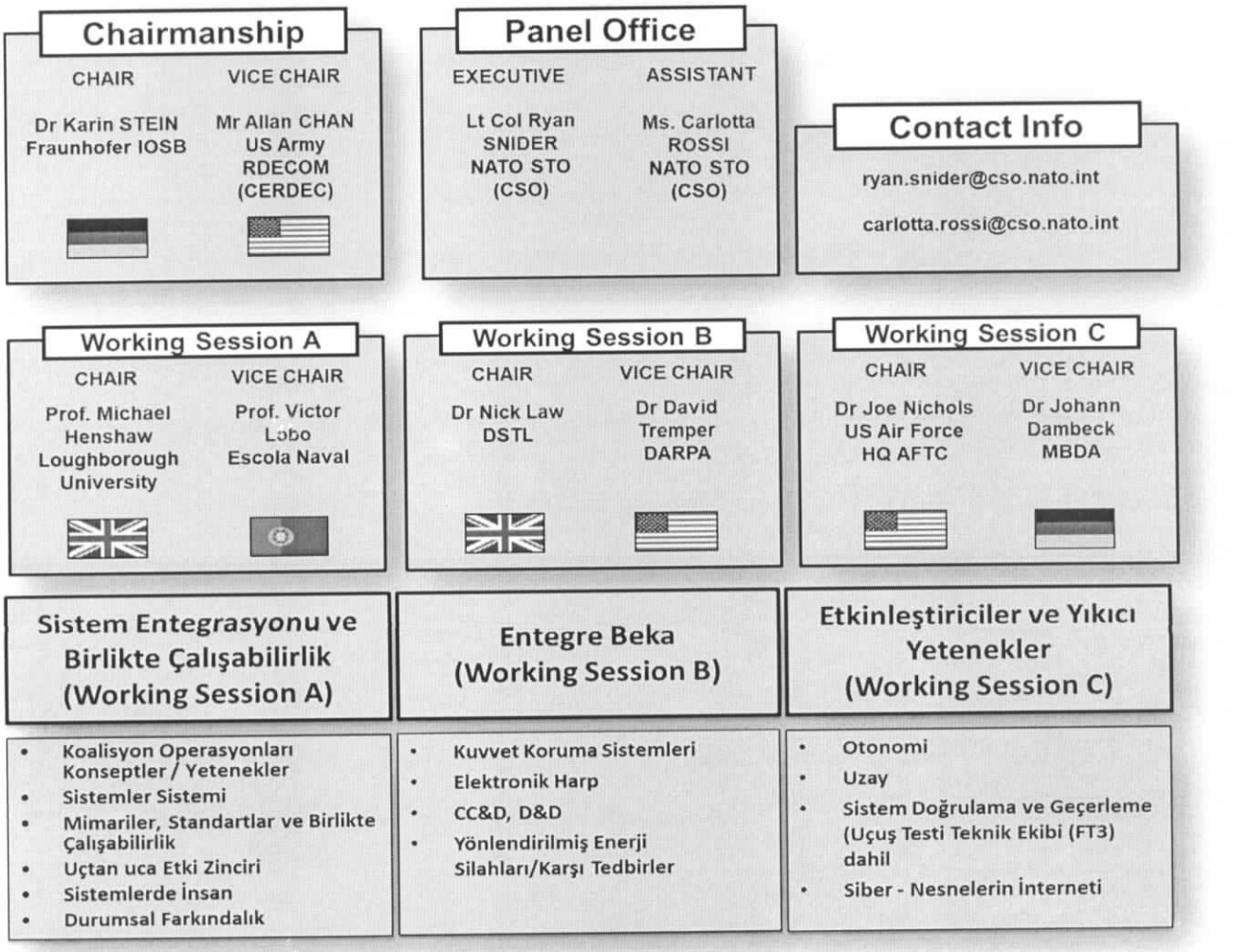
3. TOPLANTININ TARİHİ : 08-12 Ekim 2018

4. TOPLANTIYA KATILANLAR:

NATO Bilim ve Teknoloji Organizasyonu (Science and Technology Organization, STO) Sistemler, Konseptler ve Entegrasyon (Systems Concepts and Integration, SCI) Panelinin 08-12 Ekim 2018 tarihleri arasında Utrecht/HOLLANDA'da düzenlenen 2018 sonbahar toplantısına MSB panel temsilcisi olarak De.Me.Hasan GÜNEŞ, TSK panel temsilcisi olarak Gnkur.Bşk.lığından Yzb.Salih İLASLAN ve Akademi/Sanayi panel temsilcisi olarak SSB'den Dr.Kaan ARDA katılım sağlamıştır.

5. TOPLANTININ CEREYAN TARZI:

SCI Panelinin yapısı ve çalışma gruplarınca takip edilen ana konu başlıkları aşağıda sunulmuştur. Buna göre panel üç çalışma grubu (WS-A, WS-B, WS-C) ile faaliyetlerini yürütmektedir. Panel gündemi çerçevesinde yapılan paralel oturumların tamamına Türkiye temsilcileri katılım sağlamıştır.



a. Toplantının ilk günü olan 08 Ekim 2018 tarihinde;

(1) Panel Başkanı tarafından açılış konuşması yapılmış; gündem konuları hakkında yapılan ön bilgilendirmeyi müteakip panelin görevi ve işleyiş tarzı hakkında bilgilendirme yapılmış,

(2) Katılımcılar tarafından bir önceki (41'inci SCI Panel Toplantısı) sonuç raporunun nihai hali değerlendirilip kabul edilmiş, panel gündem maddeleri ile Çalışma Programı (Program of Work, PoW) görüşülmüş ve panel icra programı uygun bulunmuş,

(3) Panel genel koordinatörü tarafından panel esnasında dikkat edilmesi gereken idari hususlar hakkında bilgi verilmiş,

(4) Alt komitelerin çalışmaları kapsamında; İcra Komitesi (Executive Committee), Stratejik Komite (Strategic Committee), Ödül Komitesi (Awards Committee) ve Program Komitesi (Programme Committee)'nin çalışmaları, panel doküman durumları ve panel faaliyet istatistikleri hakkında bilgi verilmiş,

(5) Strateji Çalışma grubu toplantıları gerçekleştirilmiş, bu kapsamda;

(a) SCI bünyesinde icra edilecek çalışmalarda, "Otonomi" ve "Uzay" alanlarındaki çığır açıcı teknolojiler üzerine odaklanılması,

(b) "Elektronik Harp" ve "Meskûn Mahallerde Sıkışık Bant Genişlikleri İçinde Haberleşme" konularında araştırma yapılması.

(c) Çalışma gruplarının sayısının artırılması ve bu kapsamda yapılabilecek faaliyetler gündeme getirilmiştir.

b. Toplantının ikinci günü olan 09 Ekim 2018 tarihinde;

(1) SET Panelinin çalışmaları hakkında bilgi verilmiş, bu kapsamda;

(a) Panel kapsamında "Optik Teknolojileri", "Radyo Frekans Teknolojileri" ve "Çoklu Sensor ve Elektronik" konularında odak grupları bulunduğu,

(b) 32 çalışma grubu, 4 uzmanlar toplantısı, 1 sempozyum, 3 ders serisi ve 9 keşif takımı olmak üzere toplam 49 aktif/planlanan faaliyet bulunduğu,

(c) Güncel ilgi alanlarının; "Pasif/Aktif Radarlar", "Otomatik Hedef Tanıma", "Tümleşik Algılama", "Lazer Karşı Tedbirler", "Görüntü Kıymetlendirme", "Sensor Ağları" ve "Sürü Sistemleri" olduğu,

(ç) Gelecek ilgi alanlarının; "Fotonik Teknolojileri", "Kuantum Navigasyon" ve "Geniş Alan Gözetleme" konularının olabileceği belirtilerek elektronik savaşla ilgili çalışmalar, sinyal işleme, karşı tedbirler ve sıkışık algılama konularındaki alt çalışma grupları hakkında bilgi verilmiş,

(2) SET Paneliyle ortaklaşa gerçekleştirilecek olan Sonbahar 2019 Panel toplantısı gündemi değerlendirilmiş, ortak ilgi alanı olarak aşağıda yer alan 10 konu belirlenmiş ve bu konularda gruplara başkan/başkan yardımcılığı yapacak kişiler hakkında görüşülmüş,

İnsansız Hava Sistemlerine Karşı Tedbirler (Counter UAS),

Dağıtık Multispektral Multistatik Sensorler (Distributed Multispectral Multistatic Sensors),

Dinamik Parmak İzi (Dynamic Signatures),

Gelecek Nesil Arayıcı Başlıklara Karşı Çoklu Spektral Karşı Tedbirler (Multi-spectral Countermeasures Against Next Generation Seekers),

Otonom Tespit (Autonomous Sensing),

Uzay ve Sensorler (Space and Sensors),

Yönlendirilmiş Enerji Silahları ve Lazer Enerji Silahları(DEW/Laser EW),

Mega-Şehirlerde Tespit (Sensing in Mega-Cities),

Sıkışık EM Spektrumda Operasyon-EH/Haberleşme dâhil (Operation in Congested EM Spectrum-incl. EW/Comms).

(3) SAS Panelinin çalışmalarıyla ilgili bilgi verilmiş;

(a) Panelin 3 ana temasının; "Teknoloji ve Harekât Arasındaki Bağlantı", "Birlik ve Sistemlerde Operasyonel Etkinliği Artırmak İçin Analiz ve Öneri Sağlanması" ve "Karar Verebilmek Amacıyla Bilimsel Yöntemler Geliştirilmesi" konuları olduğu,

(b) Bu temalar kapsamında güncel çalışma konularının; "Risk Analizi ve Yönetimi", "Sosyal Medyanın Operasyonlara Etkileri", "Maliyet Analizi", "Analiz Sistemlerinin Yeni Harekâtlara Adaptasyonu" ve "Personel Ataması ve Kullanımı" konularının olduğu,

(c) Gelecek ilgi alanlarının; "Otonomi", "Çok Seviyeli Analiz" ve "Stratejik ve Operasyonel Değerlendirme ve Planlama" konularının olduğu,

(ç) SCI Paneli kapsamında sürdürülen "SCI-241 Defence Against UAV Attacks", "SCI-313 Human-Machine Trust: Risk-Based Assurance and Licensing of Autonomous Systems" ve "SCI-ET-044 Evaluation of Swarm Systems for Military Application" konularının SAS panelinin de ilgi alanı içerisinde olduğu,

(d) Birlikte yapılabilecek panel toplantısı için potansiyel konuların; "Risk Based Operational Planning in Co-operative Human-Machine Battle Networks", "Developing a Standard Methodology for Assessing Multinational Interoperability", "Coalition Sustainment Interoperability Study", "Autonomy to Accelerate the Intelligence Cycle", "Operations in Contested Urban Environments (OCUE)" ve "Understanding the Cost Related İmplications of Autonomy- a System of Systems Perspective" konuları olabileceği belirtilmiş,

(4) "SCI-302 EO-IR Countermeasures" çalışma grubunun sunumu yapılmış;

(a) Yönlendirilmiş infrared karşı tedbir sistemlerinin artık operasyonel olduğu ancak sistemlerin doğrulama kodlarının karmaşık ve pahalı olduğu,

(b) Çalışmanın ana konseptinin kapalı çevrim sistemlerin açık çevrim sistemlerle karşılaştırması olduğu,

(c) Söz konusu karşılaştırmanın yapılabilmesi için veri setlerine ihtiyaç olduğu ve bunun için de zaman gerektiği belirtilerek iş paketleri ve muhtemel bitirme zamanı hakkında bilgi verilmiştir.

c. Toplantının üçüncü günü olan 10 Ekim 2018 tarihinde;

(1) "SCI-280 System-of-Systems Approach to Task Driven Sensor Resource Management for Maritime Situational Awareness (SoSMSA)" çalışma grubunun sunumu yapılmış;

(a) Amacı denizlerde durumsal farkındalık ve sensor yönetimi olan çalışmanın Haziran 2013 tarihinde SCI-ET-005 keşif takımı çalışmasıyla başladığı ve final raporunun Bahar 2019 döneminde yayınlanmasının planlandığı,

(b) Gözetlenen faaliyetlerin balıkçılık, yarış/sosyal faaliyetler, korsancılık, kaçakçılık, terörist saldırı, askeri aktivite ve diğer aktiviteler olmak üzere sınıflandırıldığı ve sistemin gelen sensor verilerine göre aktivite türlerini belirlemede sorumlulara yardımcı olacağı,

(c) Bu sayede denizcilik ile ilgili faaliyetlerde verimliliğin ve maliyet etkinliğinin artırılmasının planlandığı belirtilmiş,

(2) NATO ACT (Allied Command Transformation) temsilcisi tarafından brifing verilmiş;

(a) ACT kapsamında yürütülen programlarda; "operasyonel isteklerin belirlenmesi - performans kriterlerinin belirlenmesi - alternatiflerin analizi - tedarik etme - iyileştirme programı – kullanım dışına alma" modelinin izlendiği,

(b) SCI panelinin ilgi alanlarından biri olan otonomi ile ilgili bir program yürütüldüğü,

(c) Bu programın "terminoloji, karşı otonomi, bilişsel hesaplama ve analizler, döngüde insanın yeri ve lojistikte otonomi" konularını içerdiği ve bu konuları içeren final raporunun 2022 sonuna kadar hazırlanmasının planlandığı belirtilmiş,

(3) NATO STO KIMC (Knowledge and Information Management Committee) temsilcisi tarafından brifing verilmiş;

(a) Komitenin şu anki fonksiyonunun STO'nun teknik raporlarının ve dokümanlarının dağıtımının koordine edilmesi olduğu,

(b) Ayrıca bilgi yönetimi ile ilgili iyi örneklerin uluslarla paylaşıldığı belirtilmiş ve bu paylaşımın ve iş birliğinin nasıl artırılabileceğine ilişkin müzakereler yapılmış,

(4) "Sistem Entegrasyonu ve Birlikte Çalışabilirlik", "Entegre Beka" ve "Etkinleştiriciler ve Bozucu Yetenekler" çalışma oturumlarına katılım sağlanmıştır.

ç. Toplantının dördüncü günü olan 11 Ekim 2018 tarihinde;

(1) "Sistem Entegrasyonu ve Birlikte Çalışabilirlik" oturumunun sunumu yapılmış;

(a) Söz konusu çalışma oturumunun; "Sistem Entegrasyonu ve Birlikte Çalışabilirlik", "Koalisyon Harekat Konseptleri/Yetenekleri", "Sistemlerin Sistemleri", "Mimariler, Standartlar ve Birlikte Çalışabilirlik", "Uçtan Uca Etki Zincirleri", "Sistemlerde İnsan" ve "Durumsal Farkındalık" konularıyla ilgilendiği,

(b) "Hilaflı Bölgelerde Hassas Hedefleme", "Hibrit Harbe Karşı Koymak" ve "Müşterek Operasyonel Alandan Bağımsız Etki Alanı" konularında yeni aktivite başlatılmasının uygun olacağı belirtilmiş,

(2) "Entegre Beka" oturumunun sunumu yapılmış;

(a) Söz konusu çalışma oturumunun; "Birlik Koruma Sistemleri", "Elektronik Savas", "Kamuflaj, Gizlenme ve Aldatma", "Erişim Engelleme ve Aldatma", "Elektro Mağnetik Savaş Yönetimi", "Yönlendirilmiş Enerjili Silahlar" konularıyla ilgilendiği,

(b) "Ticari Dronlara Karşı Kademeli Savunma İçin Yüksek Hızlı Mermiler", "İstahbarat/Gözetleme/Hedef Belirleme/Keşfe Karşı Gelişmiş Aldatma", "Açık Toplulukta Kamuflaj, Gizlenme ve Aldatma", "Karşı-Hipersonik Tedbirler", "Hilaflı Bölgelerde Konumlandırma, Yön Bulma ve Zamanlama" konularında yeni aktivite başlatılmasının uygun olacağı,

(c) Ayrıca Hipersonik Silahlar konusunda uzman panel üyesine ihtiyaç olduğu belirtilmiş,

(3) "Etkinleştiriciler ve Bozucu Yetenekler" oturumunun sunumu yapılmış;

(a) Söz konusu çalışma oturumunun; "Etkinleştiriciler ve Bozucu Yetenekler", "Otonomi", "Sistem Doğrulama ve Onaylama", "Uzay", "Siber – Nesnelerin İnterneti" konularıyla ilgilendiği,

(b) "Küçük Uydular", "Yapay Zekalı ve Otonom Yeni Kara Araçları", "Yakın Uzay Hava Operasyonları İçin Sistem Konseptleri" ve "Sürü Sistemleri" konularına odaklanmanın uygun olacağı,

(c) Ayrıca Uzay konusunda yeni bir uzman panel üyesine ihtiyaç olduğu belirtilmiş,

(4) Panelin öğleden sonraki bölümünde kültür turu kapsamında yer alan, Hollanda Ulusal Askeri Müze ziyaretine katılım sağlanmıştır.

d. Toplantının beşinci günü olan 12 Ekim 2018 tarihinde;

(1) Yapılan genel oturumda, Çalışma Grupları tarafından ilk dört günde icra edilen faaliyetlerin genel değerlendirmesi yapılmış ve gruplar tarafından elde edilen sonuçlar Yürütme Kurulu Genel Oturumunda sunulmuş,

(2) Yeni panel faaliyetleri onaylanmış,

(3) Panel çalışmalarının geliştirilmesi amacıyla izlenecek yeni yöntem ve öneriler değerlendirilmiş.

(4) İşlem maddeleri gözden geçirilmiş,

(5) Katılımcılara, Çekya'da 06 -10 Mayıs 2019 tarihleri arasında icra edilmesi planlanan 43'üncü panel toplantısı ve Sinyal Yönetimi Sempozyumu hakkında ön bilgilendirme yapılmıştır.

6. TOPLANTIDA ALINAN KARARLAR:

a. 2019 yılı Von Karman ödülü için Dr Jim Wickes (UK)'ın, Bilimsel Başarı Ödülü için "SCI-293-RTG Scientific Support to NNAG Above Water Warfare Capability Group" ve "SCI-296-RSM Autonomy from a System Perspective" çalışma gruplarının, SCI Panel Mükemmeliyet Ödülü için "SCI-277-RLS Store Separation and Trajectory Prediction" çalışma grubunun, Genç Bilim İnsanı Ödülü için "SCI-287-RTG Assessment Methods and Evaluation of Camouflage in an Operational Context)" çalışma grubunda gösterdiği başarı için Dr Alexander Schwegmann'ın aday gösterilmesine karar verilmiştir.

b. "Uzay" ve "Hipersonik Silahlar" konularında uzman panel üyelerine ihtiyaç olduğuna, bu kapsamda ülkelerin panele bu konularda uzman personel atamasının uygun olacağına karar verilmiştir.

c. Teknoloji izleme odak alanlarının bir önceki panel toplantısında belirlenen; "Aykırılık Tespiti", "Hipersonik Sistemlerin Çoklu Kullanımının Etkileri", "Derin Öğrenme" ve "Genel Amaçlı Yapay Zeka" alanları olarak devam etmesine karar verilmişti.

ç. Çapraz panel faaliyetleri kapsamında diğer panellerden gelen ve detayları LAHİKA-1'de yer alan, aşağıdaki çalışma gruplarına katılım sağlanabileceği değerlendirilmiştir.

(1) MSG-XXX-RSM Drone Detectability: Modelling the Relevant Signature,

(2) SET-XXX-ET Advanced Infrared Laser Component Technology,

(3) SET-XXX-ET RF and RF/EO Technology for Space Situational Awareness.

d. Çalışma grupları tarafından oluşturulan ve detayları LAHİKA-2'de bulunan, aşağıdaki 8 adet yeni faaliyete ilişkin Teknik Faaliyet Önerisi uygun bulunmuştur.

(1) SCI-XXX-ET NATO Space Capability Requirements for Operations in Urban and Megacity Environments,

(2) SCI-XXX-ET NATO Space Capability Requirements for Operations in the Arctic,

(3) SCI-XXX-ET Multi-Sensor Fusion Architecture for the Detection of PB-IEDs,

(4) SCI-XXX-ET Design and Impact of Disposable or Attritable Unmanned Autonomous Systems,

(5) SCI-XXX-RTG Scientific Support to NNAG Above Water Warfare Capability Group,

(6) SCI-XXX-ET Future Multi-Sensor Threat Defeat Concepts,

(7) SCI-XXX-RTG UAV Applications for Military Search,

(8) SCI-XXX-RTG Scientific Support to NATO Aerospace Capability Group 3 Sub-Group 2 (ACG3/SG2) on Suppression of Enemy Air Defence (SEAD).

e. 2018 yılının son çeyreğinde tamamlanması planlanan "SCI-288 RTG Autonomy in Communications-Limited Environments" çalışma grubunun faaliyet süresinin 1 yıl uzatılması uygun görülmüştür.

f. "SCI-312 RTG EO-IR Countermeasures" çalışma grubunun faaliyetlerine akademi ve özel sektör katılımının sadece devlet temsilcilerinin de katılmasıyla uygun olacağına karar verilmiştir.

g. "SCI-304-RTG Optimised and Reconfigurable Antennas for Future Vehichle Electronic Counter Measures" çalışma grubunun faaliyetlerine, paydaşlar arasında hassas bilgilerin paylaşılacak olması nedeniyle, sadece devlet temsilcilerinin katılımının uygun olduğuna karar verilmiştir.

ğ. "SCI-ET-039 Metrics for Quantifying Survivability Increases From the Use of Camouflage and Obscurants" çalışma grubunun faaliyetlerinin sürdürülebilmesi için grup lideri/lider ülke belirlenmesi gerektiği değerlendirilmiştir.

h. "SCI-ET-041 Swarms for EW in Urban Operations" çalışma grubunun faaliyetlerinin sürdürülebilmesi için grup lideri/lider ülke belirlenmesi gerektiği, bir sonraki panel toplantısında lider ülke/grup lideri belirlenmesinin yanında alternatif olarak "SCI-044-ET Evaluation of Swarm Systems for Military Application" grubunun faaliyetleriyle birleştirilmesi hususunun incelenmesinin uygun olacağına karar verilmiştir.

ı. "SCI-294 RTG Demonstration and Research of Effects of RF Directed Energy Weapons on Electronically Controlled Vehicles, Vessels and UAVs" çalışma grubunun faaliyet süresinin 1 yıl uzatılması uygun görülmüştür.

i. "SCI-XXX-ET Air Platform Generic Self-Defence" konulu teknik faaliyet önerisinin belirsizlikler içerdiği ve geliştirilmesi gerektiği değerlendirilmiş, bir sonraki panel toplantısında geliştirilmiş önerinin yeniden değerlendirilmesine karar verilmiştir.

j. "Passive Sensor Location Prediction" konusunda teknik faaliyet önerisi hazırlanması hususunun, SET-SCI uzmanlar grubu toplantısından sonra yeniden değerlendirilmesinin uygun olacağına karar verilmiştir.

k. "Human in Systems" konusunda İlkbahar 2019 panel toplantısına yetişecek şekilde teknik faaliyet önerisi hazırlanmasının uygun olacağı değerlendirilmiştir.

l. "Application of Artificial Intelligence in Hybrid Warfare" konusunda Sonbahar 2019 panel toplantısına yetişecek şekilde teknik faaliyet önerisi hazırlanmasının uygun olacağı değerlendirilmiştir.

m. "C-IED" konusunda İlkbahar 2019 panel toplantısına yetişecek şekilde Teknoloji İzleme Kartı (Tech Watch Card) hazırlanmasının uygun olacağı değerlendirilmiştir.

n. 39'uncu panel toplantısında açılması teklif edilen "SCI-XXX-ET NATO Space Capability Requirements for Operations in Urban and Megacity Environments" ve "SCI-XXX-ET NATO Space Capability Requirements for Operations in the Arctic" çalışma gruplarına grup lideri/lider ülke ve yeterli sayıda katılmaya istekli ülke bulunamadığından, söz konusu 2 teklifin yeni teklifler bölümünde kalmasına ve bu hususun bir sonraki panel toplantısında tekrar değerlendirilmesinin uygun olacağına karar verilmiştir.

o. Sonbahar 2019 döneminde yapılacak olan SET-SCI ortak panelinde çalışma grubu liderlerinin de katılım sağlanmasının uygun olacağı değerlendirilmiş, bu kapsamda çalışma grubu liderlerinin panele davet edilmesine karar verilmiştir.

7. SONUÇ VE TEKLİFLER

a. NATO STO bünyesindeki SCI Panelinin 42'nci toplantısı 08-12 Ekim 2018 tarihleri arasında Utrecht/Hollanda'da icra edilmiştir. Toplantıya Türkiye'den MSB, Gnkur.Bşk.lığı ve SSB temsilcileri katılım sağlamıştır.

b. Anılan toplantıda panel bünyesinde yürütülen ve yeni başlatılması planlanan faaliyetler gözden geçirilmiş ve söz konusu faaliyetlere ilişkin sunumlar yapılmıştır. 2019 ve takip eden yıllara ait planlanan faaliyetler gözden geçirilmiştir.

c. Panelde yapılan değerlendirmelerde; "Aykırılık Tespiti", "Hipersonik Sistemlerin Çoklu Kullanımının Etkileri", "Derin Öğrenme" ve "Genel Amaçlı Yapay Zeka" konularında daha fazla efor sarf edilmesi gerektiği öne çıkmıştır.

TEK.HİZ. :54965227-0570- 59657 -18/ARGE ve Teknj.D.Mlz.ve Pltf.Ş. Aralık 2018

ç. Ana Bakım/Bakım Merkezi Komutanlıkları, Tersane Komutanlıkları, Hava İkmal Bakım Merkezi Komutanlıkları tarafından milli olarak yürütülen uzun vadeli teknoloji faaliyetlerinin ve harekat ihtiyaçlarının daha kısa sürede ve maliyet etkin şekilde karşılanabilmesi maksadıyla, SCI Paneli faaliyetlerinin takip edilmesinin uygun olacağı kıymetlendirilmektedir.

d. NATO STO bünyesinde teşkil edilmiş olan ve bilimsel içerikli konuların ele alındığı panel faaliyetlerine katılım Türkiye'de sürdürülen/planlanan ARGE çalışmalarının yönlendirilmesi bakımından önem arz etmektedir. Bu kapsamda panel faaliyetlerinin düzenli olarak takip edilerek, üniversiteler, araştırma merkezleri/enstitüleri, savunma sanayii kurum/kuruluşları ile özel sektör firmalarının bu tür platformlardaki çalışmalara (çalışma grubu, sempozyum, çalıştay, uzmanlar toplantısı, ders serisi vb.) aktif olarak katılımının faydalı olacağı değerlendirilmektedir.

e. Teknik alt çalışmalara katılım, SCI paneline dahil edilmesi gereken teknolojik önceliklere ilişkin kurumsal/kişisel görüşler, bilgi ihtiyacı vb. konulardaki tekliflerin ARGE ve Teknj.D.Bşk.lığından De.Me.Hasan GÜNEŞ (hasan.gunes@msb.gov.tr) ile koordine edilmesinin faydalı olacağı değerlendirilmektedir.

Arz ederim.

(e-İmzalı)

Hasan GÜNEŞ
De.Me.
Mak.Müh.

LAHİKALAR :
LAHİKA-1 (Diğer Panelierden Gelen Teknik Faaliyet Önerileri)
LAHİKA-2 (SCI Paneli Teknik Faaliyet Önerileri)

ACTIVITY REFERENCE NUMBER	MSG-XXX	Drone Detectability: Modelling the Relevant Signature	APPROVAL TBA
TYPE	RSM		START Dec 2018
LOCATION(S) AND DATES		NATO M&S CoE, Rome, March-April 2019	END May 2019
COORDINATION WITH OTHER BODIES		SET, M&S CoE	
NATO CLASSIFICATION OF ACTIVITY		NATO UNCLASSIFIED - NU	Non-NATO Invited YES (PfP, EOP)
KEYWORDS	Drone, Modelling, Signature, Detection, Counter-UAS		

I. BACKGROUND:

The capabilities of detection of small UAS are generally affiliated with one or more of their attributes, which leads to the following grouping:

- Glider UAS made with radar transparent materials – Very small radar cross section, very low thermal signature, potentially camouflaged to visible cameras, low/no acoustic signature, very few metal components.
- Quadcopter UAS – Small radar cross section, commercially prevalent, requires limited and easily acquired knowledge to pilot, mild acoustic signature, newest quadcopter UASs can be automated with limited to no human control.
- Jet turbine based UAS – Small radar cross section, can reach extremely high speeds (compressed response timeline), components readily available for purchase online.

The ability to detect these UASs is strongly related to multiple detection technologies to be integrated or fused into a single detection/classification architecture to ensure higher probability of detection.

II. MILITARY RELEVANCE:

The proliferation of Low, Slow and Small (LSS) flying platforms brings with it a new and rapidly increasing threat for national defence and security agencies. Thus, defence systems must be designed to face such threats. A proper system design should start from an adequate modelling of the context and simulation of the system behaviour. The most challenging aspects is the capability to model the threats, both from signature and behaviour points of view, and let models available for analysis and design of Counter LSS systems.

III. SCIENTIFIC OBJECTIVE(S) AND EXPECTED ACHIEVEMENTS:

The objectives of this specialist meeting will facilitate the information exchange on LSS signature characterisation and related modelling.

Prominent leaders, contributors and representatives from the military, government, academia, and industry will come together to address current and emerging methodologies to define LSS signature in order to be applied in in Counter UAS Systems.

The outcome of this specialist meeting should improve current studies on the subject and suggest areas for further NATO research activities and will re-enforce the links with military bodies in NATO.

IV. SCIENTIFIC TOPICS TO BE COVERED:

Several phenomenologies can be used to detect and identify a LSS UAS. These include:

- Reflectance of UV/Visible/NIR/SWIR/MWIR/LWIR photons
- Reflectance of a particular photon polarization state
- Radar reflectance
- Acoustic emission
- Electromagnetic emission from on board radios, WiFi, altimeters, radar, or other communication links
- Induced magnetic field which are associated to a wide range of technologies:
- Passive visible imaging (UV, visible, NIR)
- Passive thermal imaging (SWIR, MWIR, LWIR)
- Active Time of Flight systems (LIDAR, range gate imaging, etc)
- Acoustic based sensors
- RF emission
- Radar based systems
- Magnetic detection systems
- Human intelligence

The Specialist Meeting is expected to address most of the above topics.

V. SYNERGIES AND COMPLEMENTARITIES:

Several STO Studies are in progress, or just completed, addressing detection capability of LSS and the Specialist Meeting aims to share respective achievements:

- NMSG-154 on "Low Slow Small Threats Modelling and Simulation"
- SET-180 on "Analysis and Recognition of Radar Signatures for Non-Cooperative Identification of UAVs"
- SET-200 on "Electromagnetic scattering prediction of small complex aerial platforms for NCTI purposes"
- SET-245 on "Radar Based Non-Cooperative target Recognition (NCTR) in the Low Airspace and Complex Surface Environments"
- SET-252 on "Development of a validation model of a stealth UCAV".
- SET-260 on "Assessment Of EO/IR Technologies For Detection Of Small UAVs In An Urban Environment"

VI. EXPLOITATION AND IMPACT:

The main exploitation envisioned is related to the capability that modelling will provide for testing, evaluating and experiment new Counter LSS systems to support Nations and NATO that are embarking on a series of programmes for developing and deploying appropriate defensive measures, in terms of detection, classification, tracking and neutralisation of current and future LSS threats in a cost effective manner.

VII. TECHNICAL TEAM LEADER AND LEAD NATION:

- Paolo Proietti (Leonardo) : ITA

VIII. NATIONS/NATO ORGANISATIONS INVITED TO PARTICIPATE:

- NATO Nations and Bodies : All
- PfP Nations : all PfP invited
- MD Nations : none
- ICI Nations : none
- Global Partners : Australia, New Zealand, Republic of Korea
- Contact / Other Nations : none

IX. NATIONAL and/or NATO RESOURCES NEEDED (Physical and non-physical Assets):

Nations are requested to resource:

- Identified relevant speakers
- Travel costs
- Information useful for the meeting

X. CSO RESOURCES NEEDED (e.g. Consultant Funding):

The following CSO resources will be sought:

- Support on Call for Paper distribution among Panels
- Funds for invited speakers (if requested)
- Publication of reports

ACTIVITY REFERENCE NUMBER		ACTIVITY TITLE	APPROVAL
TYPE	ET	Advanced Infrared Laser Component Technology	START TBD Jan 19
LOCATION(S) AND DATES		First Meeting: Mar 2019, Fraunhofer IOSB, Germany	END TBD Dec 19
COORDINATION WITH OTHER BODIES		SET, SCI	
NATO CLASSIFICATION OF ACTIVITY		Up to NR	Non-NATO Invited Australia
KEYWORDS		Lasers, Infrared lasers, Fiber lasers, EO/IR CM/CCM, DIRCM, Active imaging, Self protection	

XI. BACKGROUND:

Mid-infrared laser technology is critical to development of active sources to defeat a growing spectrum of heat seeking missiles, as well as for remote sensing of targets and threats. Devices must tolerate environmental changes, and fit into platforms from ships and large transports to helicopters and ground vehicles. SET-170 and SET-224 have pursued advances in fiber lasers as their optical confinement and inherent geometry are well suited to these applications, especially on smaller platforms. Bulk crystal lasers and quantum cascade lasers offer competing advantages, the former in higher pulse energies, the latter in compact size and efficiency. Despite the variety of options, however laser sources still struggle to provide the power/energy, wavelength coverage, and efficiency required by many military applications, while also meeting size, weight, and power requirements. Results obtained by the RTGs combined with ongoing developments in this rapidly evolving field suggest future directions for research that can address these technology gaps.

XII. MILITARY RELEVANCE:

Addressing persistent shortcomings in available laser technology will directly benefit the many military applications which depend on coherent optical radiation. Chief among these are infrared countermeasures, active imaging, and remote sensing, though such other applications as laser radar and communications may benefit as well, especially as detector technology continues to improve in wavebands where lasers are less mature. Bringing together the expertise and resources of the several NATO nations involved in this research will allow us to make progress in areas that would be difficult to address each on our own, given existing constraints on resources.

XIII. SCIENTIFIC OBJECTIVE(S) AND EXPECTED ACHIEVEMENTS:

The objective of the proposed ET is to identify the best way forward in addressing the fundamental technical challenges that prevent laser systems from fully addressing the needs of military applications. The most readily apparent are power/energy scaling, improving efficiency, wavelength coverage and tunability, and thermal management. This collaboration will build upon results obtained under the earlier TGs, incorporating parallel developments, both published and in-house. The first ET meeting will be held immediately following the Workshop on Advanced Mid-Infrared Laser Technology, endorsed at the last PBM and recently approved. The workshop will serve as a "reality check" on what the current needs and

challenges are, and which approaches in designing laser components show greatest potential for meeting them. Based on this input, the scope of the ET and a future TG may expand beyond fiber lasers to include other approaches.

End-products include a TAP and draft Programme of Work for a new Task Group based on participant consensus.

XIV. SCIENTIFIC TOPICS TO BE COVERED:

1. Power/energy scaling and efficiency in mid-IR lasers
2. Wavelength coverage and tunability
3. Thermal management, damage, and size/geometry considerations

XV. SYNERGIES AND COMPLEMENTARITIES:

Participants in the Advanced Mid-Infrared Laser Technology Workshop (SET-267/RWS) can provide insight into the top-level requirements of countermeasures and other systems, and the main challenges faced by existing laser component approaches. Colleagues in related SET and SCI TGs can advise the ET, and a subsequent TG, on the relevance and suitability of proposed research directions, and the utility of results obtained.

XVI. EXPLOITATION AND IMPACT:

This ET will set the course for future collaborative research within NATO on laser component technology for countermeasures, remote sensing, active imaging, and other military applications. contribute toward the exchange of state-of-the-art knowledge on laser technology for military applications.

XVII. TECHNICAL TEAM LEADER AND LEAD NATION:

Dr. Rita PETERSON, USA

XVIII. NATIONS/NATO ORGANISATIONS WILLING/INVITED TO PARTICIPATE:

Czech Republic, France, Germany, Norway, Poland, United Kingdom, USA, Australia

XIX. NATIONAL AND/OR NATO RESOURCES NEEDED (Physical and non-physical Assets):

Standard ET support.

XX. CSO RESOURCES NEEDED (e.g. Consultant Funding):

Standard ET support.

Notes:

1. Please detach this key from TAP before completing.
2. The TAP needs to remain "Publicly Releasable" even if the activity is classified

KEY TO READING THE TECHNICAL ACTIVITY PROPOSAL FORM

(1) Activity Reference Number: Sponsoring Panel/Group abbreviation (XXX) - Panel/Group serial number (###). The Serial Number is provided by the Panel Office/MSCO. For example: AVT-048.
For Cross-Panel activities, the Activity Reference Number is: Sponsoring Panel/Group abbreviation (XXX) - Main Supporting Panel/Group abbreviation (YYY) – Sponsoring Panel/Group serial number (###). For example: SAS-HFM-112.

For Exploratory Teams, the Activity Reference Number is: Sponsoring Panel/Group abbreviation (XXX) - ET - Panel/Group serial number (###). For example: AVT-ET-060.

(2) State the type of proposed activity: **Exploratory Team (ET), AGARDograph (AG), Long-Term Scientific Study (LTSS), Military Application Study (MAS), Multi-National Exercise (MNE), Research Lecture Series (RLS), Research Specialists' Meeting (RSM), Research Symposium (RSY), Research Technical Course (RTC), Research Task Group (RTG), Specialist Team (ST) and Research Workshop (RWS).**

(3) Subject title of the proposal.

(4) Activity approval status: "**TBA**" (for "To Be Approved" - the Panel Office/MSCO will change it to year (####) when approved by the STB, or by the CSO Director for STs and Panel/Group for ETs).

(5) Activity start date: day, month and year (## / ## / ####).

(6) Activity finish date: day, month and year (## / ## / ####).

(7) Location(s) and dates where the activity will be held. Mandatory for RLSs and RTCs. For RTGs, LTSSs, STs and MASs, initial meetings should be held preferably at CSO.

(8) Abbreviation(s) of any other Panel/Group and/or any other NATO body whose involvement is desired in the activity. For example, for other NATO Bodies, one could think of the Main Armaments Groups (NAAG, NNAG & NAFAG), the NATO Industrial Advisory Group (NIAG), the NCI Community (NC3B Sub-Committees and NCIA), the Centre for Maritime Research and Experimentation (CMRE), etc.

(9) Security Classification level of the activity: RELEASABLE TO THE PUBLIC (previously marked as UU), NATO UNCLASSIFIED - NU, NATO RESTRICTED - NR, NATO CONFIDENTIAL - NC, or NATO SECRET - NS. This classification should be determined in conjunction with the definition of the expected partnership with non-NATO nations.

(10) State whether **non-NATO nations** are invited **(YES)** or not invited **(NO)** to participate in the activity. State YES if at least **one non-NATO nation** (see list hereunder) is invited to participate. If stating YES, please carefully fill in TAP Paragraph VI. In this paragraph, be especially clear if the invitation includes all PfP and/or all Mediterranean Dialogue nations, or only certain PfP nations (MD nations must be invited as a group).
PfP Nations: Armenia, Austria, Azerbaijan, Belarus, Bosnia & Herzegovina, Finland (EOP Nation), FYROM (Macedonia), Georgia, Ireland, Kazakhstan, Kyrgyzstan, Malta, Moldova, Montenegro, Russia, Serbia, Sweden (EOP Nation), Switzerland, Tajikistan, Turkmenistan, Ukraine, Uzbekistan.

MD Nations: Algeria, Egypt, Israel, Jordan, Mauritania, Morocco, Tunisia

Istanbul Cooperation Initiative (ICI) Nations: Bahrain, Qatar, Kuwait and the United Arab Emirates; Saudi Arabia and Oman have also shown an interest in the Initiative.

Global Partners: Afghanistan, Australia (EOP Nation), Iraq, Japan, South Korea, New Zealand and Pakistan

(11) Keywords: give some generic keywords.

ACTIVITY REFERENCE NUMBER	SET-XXX	RF and RF/EO Technology for Space Situational Awareness	APPROVAL TBA
TYPE	ET		START 01/02/2019
LOCATION(S) AND DATES		CSO	END 31/01/2019
COORDINATION WITH OTHER BODIES		SCI	
NATO CLASSIFICATION OF ACTIVITY		NR	Non-NATO Invited YES
KEYWORDS		SSA, SST, Sensors, Radar, EO, RSO	

XXI. BACKGROUND:

Space Situational Awareness is fundamental to picture all activities in space that may help or endanger NATO missions. Effort has been made within CSO in the direction of coordinating actions from NATO members to create a common picture. Specifically, SCI-279 and SCI-311 have been working in that direction and have started producing interesting results. While SCI activities work at a system level and aim at improving system concepts and bridging state of the art limitations and user needs, more work should be done to liaise NATO members to work at a sensor level. Many technologies, especially RF ones are dated and algorithm development is often constrained by the hardware that is employed in Space Situation Awareness (SSA) / Space Surveillance and Tracking (SST) operations. New sensor and sensor networks may be envisioned that would drastically improve NATO SST and therefore SSA capabilities. Moreover, novel algorithms that exploit new sensor concepts may be developed that would in turn push SST performances. Last but not least, data fusion from RF and optical system may be the key to significantly enhance performances and guarantee high quality RSO cataloguing.

XXII. MILITARY RELEVANCE:

Although NATO does not own space assets, NATO operations heavily depend on space. Therefore, it is in NATO interest to ensure that space-based infrastructures are preserved, maintained and even improved. A key element in this scenario is represented by SST, which ensures that Resident Space Objects (RSOs) are continuously detected and tracked. Correct RSO localization ensure that collision avoidance is performed effectively with minimum risk of loss of system functionality. Moreover, an accurate localization along with geometric and attitude parameter estimation allows for behavioral information retrieval, which is of fundamental importance in military/intelligence operations. The proposed activity and its potential outcome in terms of result could positively impact SSA operations and significantly improve the NATO Space Domain Awareness (SDA).

XXIII. SCIENTIFIC OBJECTIVE(S) AND EXPECTED ACHIEVEMENTS:

The goal of this ET is to investigate whether there is enough interest in SST/SSA at a sensor level and eventually to write a TAP for an RTG activity. The specific objectives are

- *understand which are the main interests of Nations relatively to SSA/SST related activities and more specifically at a sensor level*
- *Understand whether there are gaps to be filled in terms of sensors/algorithms capabilities that are in the interest of Nations*
- *Identify potential solutions and roadmaps to fill the identified gaps*
- *Identify specific objectives to be achieved in a three-year span through a RTG*
- *Form a solid group of experts from the interest Nations to undertake a three-year RTG activity*
- *Write a TAP for a RTG to be submitted to the SET Panel*

XXIV. SCIENTIFIC TOPICS TO BE COVERED:

A list of topics follows:

- *Novel/improved algorithms for detection and tracking of RSO*
- *New concepts for SST sensors (EO, Radar/RF)*
  - *Passive RF*
  - *Space-based sensors*
  - *others*
- *Sensor networks*
  - *Radar/RF*
  - *Optical*
  - *Mixed*
- *Optical/RF data fusion*
- *others*

XXV. SYNERGIES AND COMPLEMENTARITIES:

There are synergies with the SCI Panel, specifically with SCI-311, which focuses on an exercise of exchanging and fusing data and information from multiple sensors and catalogues. While SCI-311 concentrates at a system level, the proposed ET aims at developing new and/or improving existing capabilities at a sensor level, both in terms of technology and algorithms.

XXVI. EXPLOITATION AND IMPACT:

Novel or improved sensor and/or algorithms will directly affect the performance of SSA systems as they will be able to provide better RSO detection, tracking and parameter estimation, which will result in an improved picture for Space Domain Awareness (SDA).

XXVII. TECHNICAL TEAM LEADER AND LEAD NATION:

Marco Martorella (IT) and Peter Knott (DE)

XXVIII. NATIONS/NATO ORGANISATIONS WILLING/INVITED TO PARTICIPATE:

- *NATO nations and organisation that are willing to participate: CNIT (IT), Fraunhofer Institute (DE), others?*
- *NATO nations and organisations which are invited to participate: MIT (US), ONERA (FR), INDRA/INTA (ES),*
- *Non-NATO nations that are invited to participate: Sweden, Australia, Switzerland, Finland, others?*

XXIX. NATIONAL AND/OR NATO RESOURCES NEEDED (Physical and non-physical Assets):

National sensors may be used if available.

XXX. CSO RESOURCES NEEDED (e.g. Consultant Funding):

NATO funding for trials may be requested if trials will be organised.

ACTIVITY REFERENCE NUMBER	P39-01	**NATO Space Capability Requirements for Operations in Urban and Megacity Environments**	APPROVAL (4)
TYPE	ET for WS		START (5)
LOCATION(S) AND DATES		CSO, Q3/Q4 2017	END (6)
COORDINATION WITH OTHER BODIES		NATO ACT, BiSC Space Working Group, NCIA, JAPCC, ACC	
NATO CLASSIFICATION OF ACTIVITY		NU	Non-NATO Invited AUS, FIN, SWE
KEYWORDS	Space, Satellite, Urban Warfare, Megacities, Future, PNT, SATCOM, C4ISR, IMINT, SIGINT, Navigation, Communication, Weather, Command and Control		

XXXI. BACKGROUND:

There are currently 31 Cities whose urban area exceeds 10 million people, with a growth to more than 40 cities by 2030. Projections indicate that growth in megacities, and the contest for resources within them implies that increasingly, Western militaries will be operating in these megacities. In addition to the "megacities", there are several cities with population between 5-10 million where urban combat operations are possible. Combat operations in a contested urban environment offer a unique set of challenges that the militaries of NATO need to plan. The urban environment of the future will be characterized by populations where combatants and non-combatants are in close proximity, the combatants will have enormous options for hiding, maneuver will likely be restricted due to inadequacy / congestion. Additionally, the opportunity for concealed, remotely detonated explosive devices will be enhanced.

The role of space and space capabilities available to NATO forces will be critical to successful operations in such challenging large scale urban environments. Current space capabilities of NATO member nations are currently not particularly designed nor planned to be operated the intention of providing support to urban combat operations; particularly in very large population aggregations, e.g., greater than 5 million inhabitants.

For NATO it will be imperative that space capabilities made available to the Alliance are fully capable of supporting combat and other NATO operations in dense urban environments including current and future megacities. The anticipated requirements of the future functional capabilities and associated resiliency of such space capabilities need to be explored and assessed to appropriately inform Alliance member nations' space acquisition plans, architectures and programs. Perspectives and input from NATO air, land, maritime and cyber domains on their anticipated requirements, operational art, tactics and strategy for urban operations are necessary to ensure the development of relevant and effective Alliance space capabilities.

XXXII. MILITARY RELEVANCE:

For LTSSs, MASs, STs and RTGs only, this section should include a brief statement on the need to undertake a cooperative research effort in this field, supported by a summary of the main objectives in terms of future military relevance and operational applications for the Alliance. Think along the lines of DOTMLPFI (Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel, Facilities, Interoperability) (pick and choose, not necessary to address all). Ask yourself why leadership should be interested in your work and approve this effort.

For other activities such as Symposia or Lecture Series, this section only needs to include a brief statement on the need to undertake a cooperative event in this field.

XXXIII. SCIENTIFIC OBJECTIVE(S) AND EXPECTED ACHIEVEMENTS:

The objective of this exploratory team is to establish the scope of and organize a NATO STO workshop on the topic of anticipated future NATO requirements for space capabilities to effectively support combat and other NATO operations in dense urban environments including megacities.

XXXIV. SCIENTIFIC TOPICS TO BE COVERED:

The following major topic areas will be addressed by this activity:

NATO urban combat capability requirements enabled by space systems and/or capabilities

Unique contributions that space capabilities can provide to urban combat environments

Unique or particularly stressing combat conditions that may impair traditional space capabilities

Innovative applications of space capabilities to urban combat missions

Innovative technical solutions potentially enabling support from space to urban combat missions

Major shortcomings of current space capabilities to support urban combat and related missions

XXXV. SYNERGIES AND COMPLEMENTARITIES:

Think of synergies and complementarities across NATO S&T. For example: Stakeholder X may provide the results of an activity (e.g. a model or a database), Stakeholder Y may provide a test range, and Stakeholder Z may provide hardware to experiment.

XXXVI. EXPLOITATION AND IMPACT:

This exploratory team will deliver the following:

A refined Technical Activity Proposal (TAP) for a NATO STO SCI Panel workshop on the topic of NATO space capabilities and urban / megacity combat

A draft workshop agenda to include proposed presentations and activities consistent with the objectives of this activity

A list of identified key participants and organizations

Any identified key note speaker or presenter

A recommended workshop venue and sponsor (host country and organization)

A list of the workshop organizing committee members

XXXVII. TECHNICAL TEAM LEADER AND LEAD NATION:

This is a mandatory section (No TBD permitted).

XXXVIII. NATIONS/NATO ORGANISATIONS WILLING/INVITED TO PARTICIPATE:

This section should list:

- *The NATO nations and organisations which are willing to participate;*
- *Invited to participate: NATO, EOP*
- *The non-NATO nations which are invited to participate as groups (e.g. EOP nations, all PfP nations, all Mediterranean Dialogue nations) and/or individually (e.g. Sweden and/or Australia).*

XXXIX. NATIONAL AND/OR NATO RESOURCES NEEDED (Physical and non-physical Assets):

The kick-off of this exploratory team will be held at the NATO CSO offices in Paris, France and will require standard exploratory team administrative support for an anticipated 1.5 – 2 day initial meeting. Subsequent meetings will be held as necessary under the direction of the Exploratory Team lead. Actual workshop resources needed will be determined by the Exploratory Team but are not expected to require more than the standard NATO / CSO administrative level of effort.

XL. CSO RESOURCES NEEDED (e.g. Consultant Funding):

See above. No consultant resources are needed for the Exploratory Team. Resources for a workshop rapporteur may be required and along with standard NATO STO publication support.

Notes:

1. Please detach this key from TAP before completing.
2. The TAP needs to remain "Publicly Releasable" even if the activity is classified

KEY TO READING THE TECHNICAL ACTIVITY PROPOSAL FORM

(12) Activity Reference Number: Sponsoring Panel/Group abbreviation (XXX) - Panel/Group serial number (###). The Serial Number is provided by the Panel Office/MSCO. For example: AVT-048.
For Cross-Panel activities, the Activity Reference Number is: Sponsoring Panel/Group abbreviation (XXX) - Main Supporting Panel/Group abbreviation (YYY) – Sponsoring Panel/Group serial number (###). For example: SAS-HFM-112.

For Exploratory Teams, the Activity Reference Number is: Sponsoring Panel/Group abbreviation (XXX) - ET - Panel/Group serial number (###). For example: AVT-ET-060.

(13) State the type of proposed activity: **Exploratory Team (ET), AGARDograph (AG), Long-Term Scientific Study (LTSS), Military Application Study (MAS), Multi-National Exercise (MNE), Research Lecture Series (RLS), Research Specialists' Meeting (RSM), Research Symposium (RSY), Research Technical Course (RTC), Research Task Group (RTG), Specialist Team (ST) and Research Workshop (RWS).**

(14) Subject title of the proposal.

(15) Activity approval status: "**TBA**" (for "To Be Approved" - the Panel Office/MSCO will change it to year (####) when approved by the STB, or by the CSO Director for STs and Panel/Group for ETs).

(16) Activity start date: day, month and year (## / ## / ####).

(17) Activity finish date: day, month and year (## / ## / ####).

(18) Location(s) and dates where the activity will be held. Mandatory for RLSs and RTCs. For RTGs, LTSSs, STs and MASs, initial meetings should be held preferably at CSO.

(19) Abbreviation(s) of any other Panel/Group and/or any other NATO body whose involvement is desired in the activity. For example, for other NATO Bodies, one could think of the Main Armaments Groups (NAAG, NNAG & NAFAG), the NATO Industrial Advisory Group (NIAG), the NCI Community (NC3B Sub-Committees and NCIA), the Centre for Maritime Research and Experimentation (CMRE), etc.

(20) Security Classification level of the activity: RELEASABLE TO THE PUBLIC (previously marked as UU), NATO UNCLASSIFIED - NU, NATO RESTRICTED - NR, NATO CONFIDENTIAL - NC, or NATO SECRET - NS. This classification should be determined in conjunction with the definition of the expected partnership with non-NATO nations.

(21) State whether **non-NATO nations** are invited **(YES)** or not invited **(NO)** to participate in the activity. State YES if at least **one non-NATO nation** (see list hereunder) is invited to participate. If stating YES, please carefully fill in TAP Paragraph VI. In this paragraph, be especially clear if the invitation includes all PfP and/or all Mediterranean Dialogue nations, or only certain PfP nations (MD nations must be invited as a group).
PfP Nations: Armenia, Austria, Azerbaijan, Belarus, Bosnia & Herzegovina, Finland (EOP Nation), FYROM (Macedonia), Georgia, Ireland, Kazakhstan, Kyrgyzstan, Malta, Moldova, Montenegro, Russia, Serbia, Sweden (EOP Nation), Switzerland, Tajikistan, Turkmenistan, Ukraine, Uzbekistan.

MD Nations: Algeria, Egypt, Israel, Jordan, Mauritania, Morocco, Tunisia

Istanbul Cooperation Initiative (ICI) Nations: Bahrain, Qatar, Kuwait and the United Arab Emirates; Saudi Arabia and Oman have also shown an interest in the Initiative.

Global Partners: Afghanistan, Australia (EOP Nation), Iraq, Japan, South Korea, New Zealand and Pakistan

(22) Keywords: give some generic keywords.

ACTIVITY REFERENCE NUMBER	(1)	ACTIVITY TITLE	APPROVAL (4)
TYPE	ET for WS	**NATO Space Capability Requirements for Operations in the Arctic**	START (5)
LOCATION(S) AND DATES		CSO, Q3/Q4 2017	END (6)
COORDINATION WITH OTHER BODIES		NATO ACT, BiSC Space Working Group, NCIA, JAPCC, ACC	
NATO CLASSIFICATION OF ACTIVITY		NATO UNCLASSIFIED	Non-NATO Invited SWE, AUS, FIN
KEYWORDS	Space, Satellite, Arctic, Future, PNT, Navigation, SATCOM, ISR, C4ISR, IMINT, SIGINT, Communication, Weather, Command and Control, Jamming, Denial and Deception, Radio Frequency Interference, Polar Region, Operations		

XLI. BACKGROUND:

The warming of the Arctic region is resulting in greater access opportunities due decreasing ice coverage on key sea lanes. Sea lanes once only accessible during a short summer seasonal window are now becoming ice-free an increasing percentage of the year. Although a region that historically has had a low conflict potential, the Arctic is becoming considered a global strategic domain by an increasing number of nations. It has untapped oil and mineral resources that have been inaccessible due to the harsh climate. The opening of the Arctic region now provides opportunities for exploitation of those resources along with competition for access and control. Arctic sea lanes permit transit and access for military personnel and materiel that was heretofore extremely difficult. The once relatively uncontested Arctic region is now subject to aggressive steps by several nations to establish strategic presence with the ultimate intent to maximize strategic control. Militarization of the Arctic is becoming a reality. Preservation of the Arctic as a global common and free from threats will become an increasingly important area of concern for the NATO Alliance.

The role of space and space capabilities available to NATO forces will be critical to successful operations in the Arctic region. The core space mission functions (communications, navigation, ISR, environmental sensing and weather) will be essential to support any Arctic operations conducted by the Alliance. However, the space capabilities and services provided to NATO by its member nations are not currently optimized nor architected to particularly support such operations. Those systems were designed to support the anticipated operational theaters at much lower latitudes. It will be critical for the Alliance to understand how space capabilities and services will need to be developed and adapted to support Arctic operations so that appropriate and effective requirements are identified and included in future NATO capability plans.

XLII. MILITARY RELEVANCE:

For NATO, it will be imperative that space capabilities made available to the Alliance are fully capable of supporting combat and other operations in the Arctic region. The anticipated requirements of the future functional capabilities and associated resiliency of such space capabilities need to be explored and assessed to appropriately inform Alliance member nations'

space acquisition plans, architectures and programs. Perspectives and input from NATO air, land, maritime and cyber domains on their anticipated requirements, operational art, tactics and strategy for operations in the Arctic are necessary to ensure the development of relevant and effective space capabilities. The special operational requirements for operating in the harsh Arctic environment as well as the challenging geographical location of the region must be taken into consideration for future space architectures. For example, geostationary satellites, the foundational backbone of NATO satellite communications, have inherent geometric limitations to their visibility to the polar regions, and thus require different satellite architectures to ensure essential command and control links.

XLIII. SCIENTIFIC OBJECTIVE(S) AND EXPECTED ACHIEVEMENTS:

The objective of this exploratory team is to establish the scope of and organize a NATO STO workshop on the topic of anticipated future NATO requirements for space capabilities to effectively support combat and other NATO operations in the Arctic region. Those operational requirements must be translated into scientific, technology and engineering developmental and acquisition requirements. Thus, the scientific objective of the workshop is to identify inherent scientific and technical challenges and potential opportunities associated with those Arctic operational requirements.

This exploratory team will deliver the following:

- *A refined Technical Activity Proposal (TAP) for a NATO STO SCI Panel workshop on the topic of NATO space capabilities associated with combat and operations in the Arctic.*
- *A draft workshop agenda to include proposed presentations and activities consistent with the objectives of this activity*
- *A list of identified key participants and organizations*
- *Any identified key note speaker or presenter*
- *A recommended workshop venue and sponsor (host country and organization)*
- *A list of the workshop organizing committee members*

XLIV. SCIENTIFIC TOPICS TO BE COVERED:

The following major topic areas will be addressed by this activity:

- *NATO Arctic combat capability requirements enabled by space systems and/or capabilities*
- *Unique contributions that space capabilities can provide to Arctic environments*
- *Unique or particularly stressing combat conditions in the Arctic that may impair traditional space capabilities*
- *Innovative applications of space capabilities to Arctic combat missions*
- *Innovative technical solutions that potentially enable space support to Arctic combat missions*
- *Major shortcomings of current space capabilities to support Arctic combat and related missions*

XLV. SYNERGIES AND COMPLEMENTARITIES:

This activity is expected to have synergy with prior NATO SCI Panel activities related to the preservation of NATO space capabilities (e.g., SCI-238-SM), application of commercial space capabilities to NATO operations (e.g., SCI-ET-037), resiliency of NATO space capabilities (e.g., SCI-ET-034) and potential future SCI Panel activities associated with space support to urban and megacity operations.

XLVI. EXPLOITATION AND IMPACT:

The results of this activity can reasonably be expected to provide new, heretofore unaddressed, considerations to the NATO future requirements planning functions of NATO ACT and other NATO bodies / activities (e.g., the NATO BiSC Space Working Group, Joint Air Power Competency Centre, and NATO Air Force Armaments Group). These inputs would inform not only requirements directly concerning the development of future space capabilities by NATO member nations but also the enabling DOTMLPFI considerations for Arctic operations.

XLVII. TECHNICAL TEAM LEADER AND LEAD NATION:

The technical team leader and lead nation for the initial Exploratory Team: _____

XLVIII. NATIONS/NATO ORGANISATIONS WILLING/INVITED TO PARTICIPATE:

The NATO nations and organisations which are willing to participate:

The NATO nations and organisations which are invited to participate:

- *Joint Air Power Competency Centre (JAPCC)*
- *NATO BiSC Space Working Group*
- *NATO Air Force Armaments Group (NAFAG)*
- *NATO ACT*

The non-NATO nations which are invited to participate:

- *Sweden, Finland, Australia*

XLIX. NATIONAL AND/OR NATO RESOURCES NEEDED (Physical and non-physical Assets):

An effective Exploratory Team and subsequent workshop will require a balanced mix of participant experience comprised of experts on space systems, urban operations, military planning and military space effects coordination. An appropriate venue for the workshop will also be required.

L. CSO RESOURCES NEEDED (e.g. Consultant Funding):

The exploratory team kick-off will be held at the NATO CSO offices in Paris, France and will require standard exploratory team administrative support for an anticipated 1.5 – 2-day initial meeting. Subsequent meetings will be held as necessary under the direction of the Exploratory Team lead. Actual workshop resources needed will be determined by the Exploratory Team but are not expected to require more than the standard NATO / CSO administrative level of effort.

ACTIVITY REFERENCE NUMBER	SCI-ET-###	ACTIVITY TITLE	APPROVAL TBA
TYPE	ET	Multi-sensor fusion architecture for the detection of PB-IEDs	START (5)
LOCATION(S) AND DATES		Fall '18, TNO, The Hague, NLD	END (6)
COORDINATION WITH OTHER BODIES		(8)	
NATO CLASSIFICATION OF ACTIVITY		NU (for ET)	Non-NATO Invited SWE, FIN
KEYWORDS	Sensor-fusion, detection, PB-IEDs		

LI. BACKGROUND:

The employment of Person Borne IEDs (PB-IEDs) is one of the key factors in granting the success of the asymmetric warfare model of terrorist attacks. PB-IEDs can be easily fabricated, they can be easily concealed on the human body, they allow to perpetrate various types of attacks at times and places that are opportunely chosen.

The recent events have shown the spreading of this types of attacks not only in conflict areas, but also and mainly in urban areas far away from the war zones. As a consequence, worldwide, governments are taking countermeasures and preparing for the future threat.

Detection of PB-IEDs can be carried out with various techniques and technologies and at various levels. Aviation security is an example of multi-level, multi-sensor detection of an IED threat. Military forces protect sensitive locations by means of various technologies. Scenarios that involve compound protection or event protection are common.

The diversification of technologies is important in order to increase the probability of success in the detection of a PB-IED. This is due to the fact that there is no single sensor that can detect any explosive threat.

The various sensors can be employed in parallel or in cascade. Usually each sensor carries out its own decision algorithm and the outputs are combined in a post-detection sensor fusion in order to improve the detection performances. This type of sensor fusion is relatively easy to employ, since the sensors are considered as black boxes.

On the other end, multi-sensor fusion techniques applied before detection by the individual sensors can exploit maximally the capabilities of the single sensors and mitigate the limitations, therefore improving the total system capabilities. This is however possible only if the raw data produced by each sensor is made available.

Several national research campaigns have focused on the detection of PB-IEDs in various military relevant scenarios. Tests were usually carried out in collaboration with the industry and research institutes, and sensor fusion techniques were applied to the output data (post-detection).

There are few cases of pre-detection sensor fusion techniques carried out in laboratory, at a low system architecture TRL.

LII. MILITARY RELEVANCE:

The design of a multi-sensor fusion architecture made with the combination of different, complementary sensor technologies is necessary in order to significantly improve the capabilities to detect PB-IEDs. Probably this effort will not be made by the industry alone and an RTG can represent a good catalysator for this novel concept.

The collaboration between different research institutes will aim at building a system architecture which is independent on the available sensors. As a consequence, the preparation for a PB-IED

detection capability in a military operation can focus on the exploitation of the *means that are* available.

LIII. SCIENTIFIC OBJECTIVE(S) AND EXPECTED ACHIEVEMENTS:

The ET will determine whether it is feasible to constitute an RTG. During the ET a Statement of Work (SoW) for the RTG will be defined.

The main goal of the RTG consists in setting the steps in building up a novel sensor fusion architecture that improves the detection capabilities of single sensors and that is independent on the available sensors. The architecture is meant to carry out sensor fusion techniques at different levels, but preferably at pre-detection level. The expected TRL of the sensor-fusion system architecture is 5.

The architecture will be designed in several stages, made of a combination of technical activities, including one or two demonstrations (if possible a CDT): the first demonstration will aim at collecting data from multiple sensors and use it to design the architecture; the second demonstration will aim at assessing the capabilities of the system architecture.

The knowledge and the algorithms built during the RTG will be commonly shared amongst the partners.

LIV. SCIENTIFIC TOPICS TO BE COVERED:

The ET will define the Statement of Work (SoW) for the RTG. It is foreseen that the main activities of the RTG will be:

1. Definition of military scenarios, test targets and detection technologies to be used in the demonstration;
2. Organization of a training trial where the sensors will be tested in preparation for sensor fusion;
3. Design of a software/hardware sensor fusion system architecture. This is the main activity of the RTG.
4. Organization of a demo or CDT in order to assess the capabilities of the sensor fusion architecture.

LV. SYNERGIES AND COMPLEMENTARITIES:

The SoW defined during the ET will indicate the commitments each participating land intends to respect in order to achieve the common goal.

The main tasks include, but are not limited to:

- the identification of a suitable test facility and the available state-of-the-art detection technologies,
- the organization of the collaboration for the software design.

LVI. EXPLOITATION AND IMPACT:

The knowledge acquired during the RTG will help in understanding better how to optimize the currently operational resources and consequently facilitate the decision making process (which combination of sensors to use in each specific case). The RTG will set the steps to create a system architecture which is independent of the types of detection sensors available. This flexibility will allow to use the system architecture in different trainings and operations. Furthermore, the knowledge gained during the RTG can be exploited to fill the capability gaps by purchasing new sensors that can effectively improve the system's detection performances.

LVII. TECHNICAL TEAM LEADER AND LEAD NATION:

Ir. Daniela Deiana, TNO, NLD

LVIII. NATIONS/NATO ORGANISATIONS WILLING/INVITED TO PARTICIPATE:

The NATO nations and organisations which are willing to participate are:

The NATO nations and organisations which are invited to participate are:

The non-NATO nations which are invited to participate as groups are:

LIX. NATIONAL AND/OR NATO RESOURCES NEEDED (Physical and non-physical Assets):

The ET meeting will be hosted by the lead nation (NLD). No other national or NATO resources are foreseen for the ET.

LX. CSO RESOURCES NEEDED (e.g. Consultant Funding):

ACTIVITY REFERENCE NUMBER	SCI-ET-XXX	ACTIVITY TITLE	APPROVAL (4)
TYPE	Exploratory Team (ET)	Design and impact of disposable or attritable unmanned autonomous systems	START (5)
LOCATION(S) AND DATES		(7)	END (6)
COORDINATION WITH OTHER BODIES		ACT, SCI	
NATO CLASSIFICATION OF ACTIVITY		(9)	Non-NATO Invited (10)
KEYWORDS		(11)	

LXI. BACKGROUND:

Disposable items are intended to be used once and then discarded; attritable items are those whose gradual loss is acceptable or expected. Both types of items often provide additional flexibility in warfare, and both disposability and attritability can be implemented in a wide variety of unmanned and autonomous system.

The design trade-space that contributes to disposability or attritability of an unmanned system is not trivial; it includes component-level factors (e.g., capability, cost, reliability, robustness, etc.) and system-level factors (e.g., inventory in hand, ease of resupply, ease of recovery, criticality of mission, etc.).

While militaries routinely employ disposable weapons (e.g., missiles, torpedoes, etc.) and sensing system (e.g., sonobuoys, profiling floats, etc.), it is not fully understood how intentionally designing for disposability or attritability may either enable new concepts of operations for existing missions or enable new missions not possible today.

Potentially relevant efforts include:

- SAS-P40-01 "Understanding the cost related implications of autonomy: a system of systems perspective" (Approved, starts Oct 2018)
- SCI-ET-012, "Cost drivers for unmanned systems"
- SCI-ET-022, "Novel applications of unmanned systems"
- SCI-ET-016, "Design for Limited Life Cycle Systems/Subsystems" (Disbanded in 2015 for lack of participation)
- And an interesting paper: J. Colombi, et al, "Attritable design trades: Reliability and cost implications for unmanned aircraft," IEEE SysCon, 2017.

LXII. MILITARY RELEVANCE:

This is an ET, and understanding the impact on military utility will be an explicit objective of this effort

LXIII. SCIENTIFIC OBJECTIVE(S) AND EXPECTED ACHIEVEMENTS:

Objectives:

- Develop a principled understand of the design trade-space that causes unmanned systems to be treated as either disposable or attritable
    - Characterize existing examples—especially of attritable systems

- Explore ways to optimize this design trade-space to maximize the military utility of the resulting systems
- Determine how disposability and attirtability affect ConOps, ConEmps, tactics, etc. [Note this objective substantially expands the scope of the ET, and the ET may decide this is beyond its scope]
    - Does this enable missions or capabilities that are not otherwise possible?

LXIV. SCIENTIFIC TOPICS TO BE COVERED:

To be defined by ET team

LXV. SYNERGIES AND COMPLEMENTARITIES:

To be defined by ET team

LXVI. EXPLOITATION AND IMPACT:

To be defined by ET team

LXVII. TECHNICAL TEAM LEADER AND LEAD NATION:

[Need lead nation and chair]

LXVIII. NATIONS/NATO ORGANISATIONS WILLING/INVITED TO PARTICIPATE:

ACT, USA

LXIX. NATIONAL AND/OR NATO RESOURCES NEEDED (Physical and non-physical Assets):

None expected

LXX. CSO RESOURCES NEEDED (e.g. Consultant Funding):

None expected

ACTIVITY REFERENCE NUMBER	SCI-xxx	ACTIVITY TITLE	APPROVAL TBA
TYPE	RTG	Scientific Support to NNAG Above Water Warfare Capability Group	START 1 January 2019
LOCATION(S) AND DATES		Maritime Warfare Centre, GBR, March 2019	END 31 December 2021
COORDINATION WITH OTHER BODIES		JEWCS, NNAG AWWCG, NAFAG Air Group 3, NAAG Land Group 6, NIAG and relevant CSO Groups (SCI-251, SCI-310)	
NATO CLASSIFICATION OF ACTIVITY		NATO Secret	Non-NATO Invited Yes
KEYWORDS		Electronic Warfare, Situation Awareness, Sensors, Command and Control, Interoperability, Countermeasures, SIGINT, ESM, ECM, EPM, IR, EO, Littoral, Data Links, Databases, Counter Terrorism, Navigational Warfare, Joint Operations, EOB	

LXXI. BACKGROUND:

Control and exploitation of the electromagnetic spectrum has become as much a part of modern warfare as air superiority or dominance of the sea lanes. Electronic Warfare (EW) is the mission area responsible for establishing and maintaining a favourable 'position' of own military entities in the electromagnetic domain (ESM, ECM and EA), a domain in which the applications and systems utilizing it are increasing with accelerating speed. This TG follows from the work of SCI-258.

LXXII. MILITARY RELEVANCE:

Test and evaluation of EW techniques and tactics used on or by military platforms is needed to assure users of their EW systems' principal readiness to meet the challenges of their mission – may it be simple surveillance tasks or combat. In addition it has become essential to evaluate coordinated 'system of systems' approaches (multiple platforms working together) with enhanced command and control capability, shared information, more efficient (threat) target designation and to examine and reduce the danger of blue-on-blue engagements. The EW subgroup of the NNAG´s Above Water Warfare Capability Group (AWWCG) conducts annual trials to develop NATO´s maritime electromagnetic capabilities, called NEMO trials since 2013 and being conducted in different NATO structures since 1987.

This TAP supports continuation of the work performed under Task Groups SCI-258, which was established on request of a predecessor group of the AWWCG to ensure a fuller exploitation of these trials, addressing the establishment of objectives as well as planning and analysis tasks. Consultation with the AWWCG concluded that the activities of the study group have been and will continue to be highly valuable for applications in the maritime EW evaluation efforts of NATO and its partner nations and should therefore be continued.

LXXIII. SCIENTIFIC OBJECTIVE(S) AND EXPECTED ACHIEVEMENTS:

The objective of the projected TG is to couple and interface with the AWWCG by providing a visible assessment of capabilities, shortfalls and resolution paths. The TG will provide scientific support for the NEMO trials, developing continuity in those trial activities from year to year. The TG will adopt elements of the scientific method (techniques for investigating phenomena, acquiring new knowledge, or correcting and integrating previous knowledge) to permit more control over objectives and trial activity from year to year, making it easier for the TG to publish progress to the AWWCG.

LXXIV. SCIENTIFIC TOPICS TO BE COVERED:

- Force ASMD simulation and modelling: model validation across the NATO nations.
- Force EW tactical decision aid validation during field trials.
- EW command and control issues: ESM and radar data association, concept development.
- Anti-ship cruise missile seeker discrimination: identifying options and mechanisms.
- Set platform signature requirements in association with other relevant STO study groups, and validate signature management system concepts.
- Provide technical or scientific advice for specific related topics, e.g. NASMDEF (NATO Anti-Ship Missile Defence Evaluation Facility), a facility that is being procured by NATO.
- Identify areas of research for study groups (STO studies) e.g. Force ASMD.

LXXV. SYNERGIES AND COMPLEMENTARIES:

NEMO trials are carried on a synergistic basis with contributions of assets, facilities and intellectual effort across the nations. Options remain for collaborative trial activity with the NAFAG Air Group 3 e.g. trial MACE. SCI-310 and SCI-251 are expected to use the NEMO trial as an opportunity to leverage trials and minimise scale of effort.

LXXVI. EXPLOITATION AND IMPACT:

The output from NEMO activity feeds direct into creating the potential for joint procurement activity and in illustrating how emerging capability gaps may be closed. Experimentation of new and novel decision aids helps to inform the joint requirement and acts as a base for higher-functioning command and control algorithms at a future time.

LXXVII. TECHNICAL TEAM LEADER AND LEAD NATION:

The lead nation is the United Kingdom (Mr David Symmonds as chair).

LXXVIII. NATIONS/NATO ORGANISATIONS WILLING/INVITED TO PARTICIPATE:

- NATO nations and organisations which are willing to participate: Canada, Denmark, Germany, Netherlands, Turkey, United Kingdom.
- NATO nations and organisations which are invited to participate: France, Norway, Spain, United States.
- Non-NATO nations which are invited or willing to participate: Australia, Finland, Sweden, New Zealand.

LXXIX. NATIONAL AND/OR NATO RESOURCES NEEDED (Physical and non-physical Assets):

- Members must be scientific and technical experts in the subject matter, or military users, and be nationally appointed and supported, preferably people with links with the AWWCG community.
- Participating nations are expected to provide (some) national resources (e.g. digital simulations).
- It is assumed that a minimum effort of one month per year will be required.
- People and facilities for the TG need to be cleared up to NATO SECRET.

LXXX. CSO RESOURCES NEEDED (e.g. Consultant Funding):

Minimal CSO resources are needed (chiefly an occasional meeting at the CSO and distribution of calling notices).

ACTIVITY REFERENCE NUMBER	(1)	ACTIVITY TITLE	APPROVAL TBA
TYPE	Exploratory Team (ET)	Future Multi-Sensor Threat Defeat Concepts	START (5)
LOCATION(S) AND DATES		(7)	END (6)
COORDINATION WITH OTHER BODIES		NATO ACG3 SG/2, SCI-282, SCI-260	
NATO CLASSIFICATION OF ACTIVITY		NS	Non-NATO Invited Yes
KEYWORDS	Multi-Sensor Data Fusion (MSDF), EO/IR Countermeasures, RF Countermeasures, Counter-countermeasures (CCM), Surface-to-Air Missile (SAM), Air-to-Air Missile (AAM), Anti-Ship Cruise Missile (ASCM)		

LXXXI. BACKGROUND:

Multi-sensor threat systems have been in service since the 1960s and add a level of complexity to any techniques that try to defeat them. Moore's Law has increased the processing power of these threat systems exponentially over the past six decades to the point where fusing the information from each sensor to provide an enhanced target tracking capability is becoming computationally inexpensive and therefore more achievable. By fusing the information from multiple sensors using various wavelengths and frequencies, more sophisticated and multifaceted counter-countermeasures (CCMs) can be implemented to increase the probability of a successful target engagement.

The rapidly evolving threat space requires new defeat mechanisms to be developed at an ever-increasing rate; therefore, this exploratory team aims to anticipate possible CCMs of future multi-sensor threats and identify possible approaches to defeating future multi-sensor threats.

LXXXII. MILITARY RELEVANCE:

This exploratory team will gather experts in both EO/IR & RF sensing and countermeasure technologies, with the aim of developing methods to improve the protection of air, maritime & land platforms against multi-sensor threats.

LXXXIII. SCIENTIFIC OBJECTIVE(S) AND EXPECTED ACHIEVEMENTS:

The scientific objective of this exploratory team is to identify possible approaches to defeating multi-sensor threat systems that utilise the fusion of RF and EO/IR sensors to provide an enhanced target tracking capability, covering the air, maritime & land domains.

In order to address the future multi-sensor threat, advanced sensor-fusion-based tracking algorithms will have to be conceptualised before any viable defeat concepts can be discussed. This will allow the exploratory team to get ahead of the current weapons development cycle and gain a significant advantage by anticipating possible CCMs of future multi-sensor threats. The exploratory team will then be able to develop a number of potential defeat concepts and look towards developing a way forward for simulating those concepts in operationally relevant scenarios.

A key milestone of the exploratory team will be a report detailing a future approach to the development and evaluation of various potentially viable multi-sensor threat defeat concepts.

LXXXIV. SCIENTIFIC TOPICS TO BE COVERED:

This activity will explore a broad range of potential solutions and will not be limited to the use of conventional countermeasure approaches. It is expected that existing, or developmental, EO/IR and RF countermeasure techniques will form a portion of the concept space; however other areas may also provide some utility. These include, but are not limited to: sensor damage; signature control; or modification and amendments to Tactics, Techniques & Procedures (TTPs). It is likely that the exploratory team will require a series of modelling tools that may include modifications to existing EO/IR and RF capabilities or look towards the development of a new model(s).

LXXXV. SYNERGIES AND COMPLEMENTARITIES:

NATO ACG3 SG/2 trials activities could provide an opportunity for evaluating future multi-sensor threat defeat concepts in the future.

SCI-282 aims to address the Imaging Infrared (IIR) threat to air platforms; any techniques they develop could form part of the multi-sensor threat solution.

SCI-260 is developing the NATO Defensive Aids System (NDAS) that provides the integrated open architecture 'backbone' to enable enhanced sensor integration and optimised countermeasure responses.

LXXXVI. EXPLOITATION AND IMPACT:

If the exploratory team makes substantial advances in this area, a follow-on 3-year research task group will be proposed to look into developing any viable defeat concepts further. One potential route may be through the development of an advanced multi-sensor threat surrogate and subsequent testing of selected defeat concepts in a trials environment.

LXXXVII. TECHNICAL TEAM LEADER AND LEAD NATION:

Lead Nation: United Kingdom

Technical Team Leader: Matthew Cook, Electromagnetic Protection Group, Dstl Porton Down

LXXXVIII. NATIONS/NATO ORGANISATIONS WILLING/INVITED TO PARTICIPATE:

The NATO nations and organisations which are willing to participate:

- *Canada, Italy, Netherlands, Turkey, USA*
- *Aselsan, MBDA, Meon Technology, Rheinmetall, SAAB*

The NATO nations and organisations which are invited to participate:

- *Belgium, Bulgaria, Czech Republic, Denmark, France, Germany, Greece, Norway, Poland, Portugal, Slovakia, Slovenia, Spain*
- *BAES, Leonardo, Mass, Textron, Thales*

The non-NATO nations which are invited to participate:

- *Australia, Finland, New Zealand, Sweden & Switzerland.*

LXXXIX. NATIONAL AND/OR NATO RESOURCES NEEDED (Physical and non-physical Assets):

XC. CSO RESOURCES NEEDED (e.g. Consultant Funding):

ACTIVITY REFERENCE NUMBER	SCI-###	UAV applications for Military Search	APPROVAL: TBA
TYPE	TG		START Tbd: April '19
LOCATION(S) AND DATES		Hosted by participants	END Tbd: April '22
COORDINATION WITH OTHER BODIES		MilEngCoE, CoE C-IED	
NATO CLASSIFICATION OF ACTIVITY		NS	Non-NATO Invited EOPs
KEYWORDS	Military search, C-IED, detection, UAV, UAS, metal detector, GPR, electronics detector, command wire detector, vapour detector, EO/IR		

XCI. BACKGROUND:

Military Search (MS) is defined as the management and application of systematic procedures and appropriate tools to detect and locate specific targets, in support of a military operation. MS was developed by the British troops in their fight against the Irish Republican Army in the seventies, and was adopted by most western armed forces during their involvement in the peace keeping and peace enforcing operations in the Balkans, Iraq and Afghanistan as an capability of their military engineers.

The objective of MS can be either offensive or defensive. For offensive MS the objectives are to collect information and material for exploitation, to deprive the resources (such as weapons and explosives) of the adversary and secure material for forensic evidence. Offensive MS can be regarded as an 'Attack-the-Networks' C-IED capability. The objective of defensive MS is to protect potential targets: force protection, protection of pre-planned events and protection of critical infrastructure, and can in general be regarded as a 'Defeat-the-Device' C-IED capability.

In MS several levels can be defined. The lowest level is Basic Search for overall force protection as a basic skill for trained soldiers. Intermediate MS is for situations with no or a low threat of explosive hazards, or when a lower level of assurance is accepted. The highest level, Advanced MS, is meant for situations with a high threat, when only the highest level of assurance is accepted, or when a hazardous environment exists. Advanced MS is conducted by specialists with a special tool set.

Although MS is often regarded as a procedure to find weapons and explosive hazards, such as landmines, Improvised Explosive Devices, explosive materials (that can be used of manufacturing IEDs), (Advanced) MS is more and more applied to locate other, non-explosive targets in both military and civil (police, customs, tax authorities) operations. Examples are non-explosive components that are used in IEDs (e.g. electronic remote control units), electronic information carriers (SD-card, USB stick), valuables used by the adversary to finance its operations (money, jewels, drugs), documents (that may contain information of the adversaries network), etc.

XCII. MILITARY RELEVANCE:

Military search operations are in most cases conducted by dismounted soldiers (although mounted search operations, such as mounted route clearance, are also possible). In their search operations these dismounted soldiers use a set of sensors, e.g. magnetometers, metal detectors, ground penetrating radars, that have, in most cases, a rather limited stand-off capability. The application of a small Unmanned Aerial Vehicle (UAV) as carrying platform for sensors for military search will increase the distance of the soldier to potential threats and, thus, increase the safety of the soldier. It is expected that also the rate of advance of military search operations will increase by the use of UAVs. The recent (and still ongoing) rapid development of UAVs with respect to endurance, pay-load, ease of operation, autonomy, obstacle avoidance, etc., makes these platforms more and more suitable for this application. However, still challenges remain, such as the dependency of the detection performance of the sensors on the distance to the target, expected electromagnetic interference between the sensor, the UAV, and the communication and data links, accurate position data and availability of suitable methods for data processing and representation.

XCIII. SCIENTIFIC OBJECTIVE(S) AND EXPECTED ACHIEVEMENTS:

The objectives of this TG will be the assessment of the potential, limitations and challenges of the use of UAVs for the detection of targets in Military Search operations. A Cooperative Demonstration of Technology (CDT) in which defence R&D agencies, academia and industry will be invited to participate, can be foreseen as part of the assessment. The findings of the assessment will be documented in a report by the TG.

XCIV. SCIENTIFIC TOPICS TO BE COVERED:

The Program of Work for the TG will include the following aspects:

- Definition of Military Search scenarios, including the targets;
- Identification of sensors and platforms to include in the trial;
- Establishment of a methodology for the assessment of the performance of the sensors and platforms, and a test plan;
- Select and prepare a suitable site for the assessment;
- Set-up and conduct the trial;
- Analyse the results of the trial and draft the end report of the TG with conclusions on the potential, limitations and challenges of the use of UAV-mounted sensors in Military Search.

XCV. SYNERGIES AND COMPLEMENTARITIES:

The assessment gives academia and industry the opportunity to demonstrate their developments in a military relevant environment. Moreover, the defence R&D agencies will be able to assess these developments for their military customers in relevant scenarios.

XCVI. EXPLOITATION AND IMPACT:

The availability of low-cost UAVs on the consumers market has resulted in many ideas with respect to new applications. One of these ideas is the use of small UAVs equipped with detection sensors for Military Search. The advantages, including increased safety for the military operators and increased rate of advance, are perceived, but the preconditions, limitations and challenges in both the technology development and the adaptation of standing TTPs for Military Search are often given too little attention. The results of the assessment by the TG can be used to guide the technology development and the development of TTPs for the use of UAVs for Military Search.

XCVII. TECHNICAL TEAM LEADER AND LEAD NATION:

Dr. Arnold Schoolderman, TNO, NLD

XCVIII. NATIONS/NATO ORGANISATIONS WILLING/INVITED TO PARTICIPATE:

The NATO nations and organisations which are willing to participate: CAN, DEU, ESP, FRA, GBR, NLD, SWE, USA

The NATO nations and organisations which are invited to participate: all NATO nations, MilEngCoE, CoE C-IED

The non-NATO nations which are invited to participate: EOP nations.

XCIX. NATIONAL AND/OR NATO RESOURCES NEEDED (Physical and non-physical Assets):

The TG meetings will be hosted by participants (or, if desirable, CSO in Neuilly/s/S, FRA). No other national or NATO resources are foreseen.

C. CSO RESOURCES NEEDED (e.g. Consultant Funding):

The TG will consider requesting CSO resources for the organization of the trial (or CDT).

Please refer to the notes referenced in parenthesis; then remove the numbers within parenthesis and the text in italics when completing the TAP.

Please note that, for LTSSs, MASs and RTGs, the TAP may be expanded in the Terms of Reference (ToR) and the resulting TAP should not be longer than a two-pager.

<table>
<tr><td>ACTIVITY REFERENCE NUMBER</td><td>SCI-ET-028</td><td rowspan="2">ACTIVITY TITLE

"Scientific Support to NATO Aerospace Capability Group 3 Sub-Group 2 (ACG3/SG2) on Suppression of Enemy Air Defence (SEAD)"</td><td>APPROVAL
XXX</td></tr>
<tr><td>TYPE</td><td>RTG</td><td>START
Jan 2019</td></tr>
<tr><td colspan="2">LOCATION(S) AND DATES</td><td>ET #1 at Thun, Switzerland, 5 Dec 2016
ET #2 at NATO HQ, 5-8 Nov 2018
TG #1 TBD</td><td>END
Dec 2021</td></tr>
<tr><td colspan="2">COORDINATION WITH OTHER BODIES</td><td colspan="2">NATO SET, IST, SEAD COP, ACG3/SG2, ESDWG, DI.</td></tr>
<tr><td colspan="2">NATO CLASSIFICATION OF ACTIVITY</td><td>NS</td><td>Non-NATO Invited
Yes</td></tr>
<tr><td>KEYWORDS</td><td colspan="3">Airborne Electronic Attack, AEA, Electronic Warfare, Cognitive EW, Spectrum Operations, Suppression of Enemy Air Defence, SEAD, Electronic Attack, RF Countermeasures</td></tr>
</table>

CI. BACKGROUND:

NATO Aerospace Capability Group 3 Sub-Group 2 (ACG3/SG2) are supporting the development of a joint NATO Suppression of Enemy Air Defence (SEAD), and associated Airborne Electronic Attack (AEA) capability. SG2 have requested scientific support from the SCI Panel.

CII. MILITARY RELEVANCE:

SEAD is an essential capability to enable NATO operations in non-permissive environments. Currently NATO SEAD is delivered primarily by the US with support of limited capabilities from the rest of the alliance resulting in an imbalance in the force mix and significant interoperability challenges. Under direction from the 2014 Wales Summit, Defence Investments (DI) is leading the task to establish a new, and balanced capability with a Full Operating Capability (FOC) ready by 2030. This RTG will provide the scientific support to ACG3/SG2, including co-ordination of STO SEAD related activities and support delivery of the SEAD roadmap and resulting operational capability.

CIII. SCIENTIFIC OBJECTIVE(S) AND EXPECTED ACHIEVEMENTS:

The establishment of the RTG is seen as providing the coordination function for the various strands of research being conducted across STO. This research activity will support DI, building on the NATO SEAD Vision and CONEMP, with direction to the development of the Master Question List, Capability Audit and Gap Analysis which in turn will underpin procurement decisions and identify future research goals for the RTG.

It is expected that future SEAD capabilities will be reliant on S&T developments and concepts combining the effects of: interoperability, command and control, miniaturisation of AEA payloads, Cyber and Electromagnetic Activities (CEMA), swarming for effect, cognitive Electronic Warfare (EW), real time targeting including passive, or non-emitting, systems and novel delivery platforms.

CIV. SCIENTIFIC TOPICS TO BE COVERED:

- **Audit of STO activities that have application to the SEAD challenge;**
- **Development, co-ordination and prioritisation of STO SEAD related activities;**
- **Knowledge integration to pull together the activities led from DI and ACG3/SG2 to support the delivery of the NATO Programme Plan;**
- **Technology Watch on both threat and SEAD capability axis to identify requirements and opportunities;**
- **Lead research tasks as defined in the Programme Plan.**

CV. SYNERGIES AND COMPLEMENTARITIES:

This RTG will be expected to pull together a wide range of STO activities which have application to the SEAD challenge space in order to deliver S&T options as informed by the audit. In addition, it is expected that this RTG would focus, co-ordinate and potentially prioritise existing STO activities and establish new research requirements.

CVI. EXPLOITATION AND IMPACT:

NATO SEAD Vision calls for Initial Operating Capability (IOC) in 2023. This in essence this is the establishment of a command structure to control existing capabilities declared by the nations. Building on this, S&T will be required to bridge any capability gaps and stand up the Full Operating Capability (FOC) based on NATO defined requirements from 2030. The output of this RTG will support the 'understanding' of the existing capabilities at IOC and drive forward research to deliver the S&T required by FOC.

CVII. TECHNICAL TEAM LEADER AND LEAD NATION:

James Stewart (NSWC Crane, US)

CVIII. NATIONS/NATO ORGANISATIONS WILLING/INVITED TO PARTICIPATE:

- *Nations in the SEAD COI….. Alex or Mark T (CZ, DE, FR, IT, GE, NL. NO, TU, UK and US);*
- *ACG3/SG2 and ESDWG*
- *Partner Nations AUS, CHE, FIN, SWE, and NZL.*

CIX. NATIONAL AND/OR NATO RESOURCES NEEDED (Physical and non-physical Assets):

The Master Question List and Capability Audit will be reliant on support from DI to liaise with nations in order to secure information and answer clarification questions.

Gap Analysis will be reliant on support from technical expertise from ACG3/SG2 and ESDWG.

Demonstration of concepts and technologies will be dependent on access to, and influence of, the ACG3/SG2 Programme of Work.

CX. CSO RESOURCES NEEDED (e.g. Consultant Funding):

This section should list CSO resources needed (e.g. Consultant funding, Seed money, facilities).

İrtibat Kişisi:

Milli Savunma Bakanlığı
Tek.Hiz.ARGE ve Teknj.D.Başkanlığı
De. Me. Hasan GÜNEŞ
hasan.gunes@msb.gov.tr)