



# NATO Science and Technology Organization

## COLLABORATIVE PROGRAMME OF WORK AND BUDGET FOR YEAR 2019



20 February 2019



---

# North Atlantic Treaty Organization

NATO SCIENCE & TECHNOLOGY ORGANIZATION  
COLLABORATION SUPPORT OFFICE  
BP 25, F 92201 NEUILLY-SUR-SEINE – FRANCE

---

*STO*

*COLLABORATIVE  
PROGRAMME OF WORK AND BUDGET  
FOR YEAR 2019*

**20 FEBRUARY 2019**

This document constitutes the entire STB  
approved 2019 Collaborative Programme of  
Work (CPoW) and Budget.

*Preface:*

**Dr. Pavel ZUNA**  
Director, STO Collaboration Support Office

*Action Officer:*

**Lt Col Olgierd Wiczorek, PhD (POL)**  
Executive Officer  
Operations and Coordination Division

*Supervising*

**Col Robert Kraus, PhD (USA)**  
Head, Operations and Coordination Division

ISBN: 978-92-837-2217-5

## PREFACE

I am pleased to present the NATO Science & Technology Organization's (STO) Collaborative Program of Work (CPoW) for 2019. The CPoW is the effort of our network of about 5,000 scientists, engineers, and analysts coming from NATO and partner nations. The Collaboration Support Office (CSO) continues to operate this collaborative network for the STO—our job is to support the ability of the NATO nations to work together to conduct military and security relevant scientific research and technology development leading to operational military capability. I am grateful to have the opportunity to work with the professionals in the CSO and the greater network of scientists and engineers to deliver the most relevant, technically sound program as possible.

My first objective for the CSO is to continue to strengthen the Collaborative Program of work and the vision that we are the forum nations come to for collaboration. We have grown to the point where we have 247 activities (task groups, workshops, symposia, etc.) planned for 2019. We are making the information available more rapidly to the nations, publishing 57 reports in 2018. The network has responded to our call to increase military relevance and technical quality. My hope is that this trajectory continues. It remains all of our responsibility to provide our war-fighters the very best possible military capabilities. Application of technology has been a strength of the Alliance and must remain so in the future—the STO CPoW enables that strength.

To meet externally driven conditions, we have made structural changes to the way the CPoW is defined and built. Historically, the program of work had been built from technology opportunities emerging from the nations—the bottom-up approach. This will continue. But, we have focused this approach through the implementation of the NATO Science and Technology Strategy. We continue to shape the CPoW with the “themes”. The three themes the network is addressing are: autonomy; military decision making using big data and artificial intelligence; and operations in a contested urban environment. In collaboration with the Science and Technology Board, each of these themes has a mentor and is moving ahead to provide structure and oversight to the investments. For each of the three, we have seen a strong response—roughly 30% of our CPoW is directly aligned with one of these themes, and we now have 44 discrete autonomy activities, 40 decision making activities, and 22 urban environment activities (including Exploratory Teams to assist and advise the Panel/Group on scope and technical merit).

In addition, the CPoW has a much more extensive set of demonstrations and field trials planned for 2019. Historically, we conducted one to two of these events annually. In 2017, this grew to 8 demonstrations, and in 2018 exceeded 20. With more than 20 planned for 2019, this appears to be a sustainable number based on funding and personnel availability. Together, we are making the technology more accessible and relevant for our military customers—the NATO nations and partners. We are also seeking to increase the involvement and contribution to NATO exercises, training events, and high-level scenarios. Even if it seems that the CPoW is a collection of disparate scientific activities, the truth is that each of them brings some original and new ideas which may be implemented in future systems' capabilities. We can confirm that our communities of experts participating in CPoW activities represent NATO member state's governmental bodies, academia, and industry. Each year the number of experts from other NATO organizations is increasing, which confirms the relevance of our research.

The core of the resulting CPoW remains the Technical Committees of the STO (Applied Vehicle Technologies, Human Factors and Medicine, Information Systems Technology, NATO Modelling and Simulation Group, Systems Analysis and Studies, Systems Concepts and Integration, and Sensors and Electronics Technology). These seven Level-II Committees are led, on a part-time basis, by voluntary national contributions and supported by full-time international military officers and NATO civilian staff from the CSO, all of whom do a great job. Through this structure, we strive to “lead the future” through activities like Technology Watch and Collaborative Demonstrations of Technology, under which the network has identified a number of technologies that could change the security landscape—these include: hypersonic vehicles, quantum sciences, additive manufacturing, and synthetic biology.

As I finish the first year in my tenure, I wish to thank the CSO staff and network for their dedication to improving the military capabilities resident in our nations. The network has responded, and will continue to do so.

Pavel R. Zuna  
Director, STO Collaboration Support Office

## Table of Contents

Preface.....	3
2019 Panel Business Meetings.....	6
2019 Technical Programme Observations.....	6
2019 Budget Generalities.....	8
Lecture Series / Technical Courses / Symposia / Workshops / Specialists’ Meetings for 2019.....	9
Applied Vehicle Technology Panel.....	12
Human Factors and Medicine Panel.....	16
Information Systems Technology Panel.....	19
NATO Modelling and Simulation Group (NMSG).....	22
System Analysis and Studies Panel.....	25
Systems Concepts and Integration Panel.....	28
Sensors & Electronics Technology Panel.....	30
Thematic Approach.....	33
New 2019 Activities By Type.....	38
New 2020 Activities By Type.....	43

## List of Tables

Table 1: 2019 Panel Business Meetings.....	6
Table 2: CPoW Composition.....	6
Table 3: 2019 CSO Budget Projections per Category *.....	8
Table 4: Lecture Series / Technical Courses / Symposia Forecast for 2019.....	9
Table 5: AVT Activities Continuing in 2019.....	13
Table 6: AVT Activities Starting in 2019.....	14
Table 7: AVT Activities Starting in 2020.....	15
Table 8: HFM Activities Continuing in 2019.....	17
Table 9: HFM Activities Starting in 2019.....	18
Table 10: IST Activities Continuing in 2019.....	20
Table 11: IST Activities Starting in 2019.....	21
Table 12: MSG Activities Continuing in 2019.....	23
Table 13: MSG Activities Starting in 2019.....	23
Table 14: MSG Activities Starting in 2020.....	24
Table 15: SAS Activities Continuing in 2019.....	25
Table 16: SAS Activities Starting in 2019.....	27
Table 17: SCI Activities Continuing in 2019.....	28
Table 18: SCI Activities Starting in 2019.....	29
Table 19: SET Activities Continuing in 2019.....	31
Table 20: SET Activities Starting in 2019.....	32
Table 21: Autonomy.....	33
Table 22: Autonomy – Exploratory Teams.....	34

Table 23: Big Data and Artificial Intelligence for Military Decision Making.....	35
Table 24: Big Data and Artificial Intelligence for Military Decision Making – Exploratory Teams .....	36
Table 25: Operations in a Contested Urban Environments .....	36
Table 26: Operations in a Contested Urban Environment – Exploratory Teams .....	37
Table 27: Lecture Series.....	38
Table 28: Task Groups .....	38
Table 29: Specialists’ Meetings .....	40
Table 30: Workshops.....	41
Table 31: Technical Course.....	41
Table 32: Symposia .....	41
Table 33: Agardograph.....	41
Table 34: Support Programme .....	42
Table 35: Specialist Team .....	42
Table 36: Task Groups 2020 .....	43
Table 37: Symposium 2020.....	43
Table 38: LTSS 2020 .....	43

## 2019 PANEL BUSINESS MEETINGS

**Table 1: 2019 Panel Business Meetings**

ACTIVITY		MEETING DATES	MEETING LOCATIONS
AVT	Spring	20-24 May	Liptovsky Mikulas, SVK
	Fall	7-11 October	Trondheim, Norway
HFM	Spring	8-11 April	Berlin, Germany
	Fall	14-17 October	Portugal
IST	Spring	13-17 May	Budva, Montenegro
	Fall	14-18 October	Budapest?, Hungary
MSG	Spring	8-12 April	Copenhagen, Denmark
	Fall	21-25 October	Vienna, Austria
SAS	Spring	9-12 April	Warsaw, Poland
	Fall	9-11 October	Ottawa, Canada
SCI	Spring	6-10 May	Brno?, Czech Republic
	Fall	7-11 October	Stockholm, Sweden
SET	Spring	6-10 May	Salamanca, Spain
	Fall	7-11 October	Stockholm, Sweden

## 2019 TECHNICAL PROGRAMME OBSERVATIONS (as of January 2019)

The STO Collaborative Programme of Work (CPoW) for 2019 includes 247 activities shown in Table 2.

**Table 2: CPoW Composition**

Task Groups	RTG	<b>188</b>
Symposia	RSY	9
Specialists' Meetings	RSM	11
Specialist Team	ST	8
Workshops	RWS	5
Lectures Series	RLS	12
Technical Course	RTC	3
Agardograph	AG	5
Long-Term Scientific Study	LTSS	1
Committee	COM	1
Support Programme	SP	4
	<b>TOTAL</b>	<b>247</b>

The 2019 STO Collaborative Programme of Work continues to enhance the linkage between STO activities and the priorities/requirements from our customers and the nations. There are 57 new activities for 2019 and 6 new activities already approved and prepared for 2020. The projected on-going program also includes activities from previous years therefore, during 2019 the Panels/Group will be managing a total program



of 247 technical activities. Additionally, the Panels/Group will execute 76 Exploratory Teams (ETs) to assist and advise on the technical merit or feasibility of a specific proposal for a technical activity, bringing the total number of technical activities to 323. With the intent of sharing the developing knowledge, a majority of the new activities will be open to non-NATO nations in 2019; including Partnership for Peace (PfP) Nations, Mediterranean Dialogue (MD) Nations, Global Partners (GP), and Contact Nations.

## 2019 BUDGET GENERALITIES

(Indicative – For Information Only)

In accordance with the 2019 Medium-Term-Resource Plan, the S&T Collaboration Support Office (CSO) has projected a funding requirement of EUR 6,060,000 for 2019. This represents an increase of EUR 210,000 over the 2018 budget (EUR 5,850,000) and is necessary to meet increased personnel and CIS cost as well as increased demand in support of collaborative activities. The North Atlantic Council approved the requested budget in December 2018.

**Table 3: 2019 CSO Budget Projections per Category\***

Budget Categories	Projected 2019
Personnel	€ 3 530 000
Facility Management	€ 390 000
Operations and Mission Support	€ 360 000
Publications	€ 240 000
CIS	€ 460 000
Collaborative Program of Work	€ 1 080 000
Total NATO Funded Effort	€6 060 000

\* **Note:** Allocations to categories may vary pending operational requirements.

The majority of the STO CPoW activities are open for NATO Partners under the PfP and MD programs. Funding for Partner-related activities within the STO CPoW is provided through the Outreach Budget of the International Military Staff (IMS). The CSO acts as an agent between the Nations and the IMS for Outreach activities.

## LECTURE SERIES / TECHNICAL COURSES / SYMPOSIA / WORKSHOPS / SPECIALISTS' MEETINGS FOR 2019

The following table provides a forecast of STO Collaborative Program Lecture Series, Technical Course, Symposia and Workshop activities for 2019 for which the broadest possible participation is desired and highly encouraged. To aid in participation planning, the dates and locations for the activities have been included.

**Table 4: Lecture Series/Technical Courses/Symposia Forecast for 2019**

ACTIVITY	TITLE	MEETING DATES	MEETING LOCATIONS	DISTRIBUTION and PARTNER PARTICIPATION
AVT-274-LS	Unmanned Air Vehicles – Technological Challenges, Concepts of Operations and Regulatory Issues	Spring 2019	University of Michigan, Ann Arbor, USA	NATO UNCLASSIFIED Non-NATO Invited
AVT-304-SM	Graphene Technologies and Applications for Defence	Fall 2019	Trondheim, NOR	NATO UNCLASSIFIED +EOP
AVT-307-SY	Separated Flow Symposium	Fall 2019	Trondheim, NOR	NATO UNCLASSIFIED + EOP +Japan
AVT-321-TC	User Outreach and Promotion for the Unified Generic Model of a Missile Propulsion Subsystem	04 – 06 Sep	Oberammergau, DEU	NATO UNCLASSIFIED STOEOP
		27 – 28 Aug	Stavanger, NOR	
		10 – 12 Sep	Washington D.C, USA	
		17 – 19 Sep	Lancaster, CA, USA	
AVT-322-SM	Combustion Products, Exposure and Related Risks	Spring 2019	Liptovsky Mikulas, SVK	NATO UNCLASSIFIED +EOP+PfP+Brazil
AVT-324-SM	Multi-Disciplinary Design Approaches and Performance Assessment of Future Combat Aircraft	27 – 29 April 2020	Quebec City, CAN	NATO UNCLASSIFIED +AUS+SWE
AVT-326-LS	(VKI) 3rd Lecture Series on Uncertainty Quantification in Computational Fluid Dynamics	TBD	Stanford, USA	Public Release
AVT-328-TC	Impact and Advanced Implementation of Cryogenics in Aerodynamic Testing	14 – 16 May	Cologne, DEU	NATO UNCLASSIFIED STOEOP+ JPN
		24 – 26 Jun	Hampton, VI, USA	
AVT-335-SM	Range Design and Management for Sustainable Live Fire Training Ranges	20 – 24 May	Slovakia	NATO UNCLASSIFIED STOEOP+ PfP+JPN+NZL
AVT-336-SM	Enabling Platform Technologies for Resilient Small Satellite Constellations for NATO Missions	20 – 24 May	Slovakia	NATO UNCLASSIFIED STOEOP+ NZL

ACTIVITY	TITLE	MEETING DATES	MEETING LOCATIONS	DISTRIBUTION and PARTNER PARTICIPATION
AVT-337-WS	Anti-tamper Protective Systems for NATO Operations	20 – 24 May	Slovakia	NATO UNCLASSIFIED + STOEOP
AVT-338-SM	Advanced Wind Tunnel Boundary Simulation II	20 – 24 May	Liptovsky Mikulas, SVK	NATO UNCLASSIFIED STOEOP
HFM-240-LS	Mild Traumatic Brain Injury: Post Concussive Symptoms in a Deployed Setting	TBD	TBD	Public Release
HFM-284-LS	Moral Decisions and Military Mental Health	Jun	Leiden, NDL	Public Release
		Oct	Budapest, HUN	
HFM-302-SY	Evidence-based Leader Interventions for Health and Wellness	09 – 14 Apr	Berlin, DEU	Public Release
HFM-314-LS	Aircrew Neck Pain Prevention and Management Lecture Series	May 2019	CAN, BEL, GBR	Public Release
HFM-315-LS	Medical Unexplained Physical Symptoms	May 2019	TBD	Public Release
IST-167-SM	IST Participation in ICMCIS Conference	13-17 May	Budva, MNE	Public Release
IST-170-LS	Cyber Security Science and Engineering 2.0 (IWA)	TBD	Neuilly-sur-Seine FRA	NATO UNCLASSIFIED STOEOP
IST-178-WS	Big Data Challenges: Situation Awareness and Decision Support (AI2S)	TBD	HUN	Public Release
MSG-166-SY	MSG/MSCO Support to International Training & Education Reference Number MSG-166 Conferences ITEC, I/ITSEC and CAX Forum 2019	ITEC: 14-16 May	Stockholm, SWE	Public Release
		CAX: 23-27 Sept	Paris, FRA	
		I/ITSEC: 2-5 Dec	Orlando, FL, USA	
MSG-168-LS	Modelling and Simulation as a Service (MSaaS)	Fall 2019 (TBD)	FRA, GBR, USA	Public Release
MSG-171-SY	NMSG Annual Symposium 2019	24-25 Oct 2019	Vienna, AUT	Public Release
MSG-175-WS	Commercial Technologies and Games for Use in NATO and Nations – 16th WSh	Sept 2019 (in conjunction with CAX Forum)	Paris, FRA	Public Release
SAS-137-SY	Integration of Women into Ground Combat Units	05-07 Feb	Quantico, USA	NATO Unclassified, +Pfp +ARG +IND +JPN +NZL +SGP
SAS-141-SY	Deterrence and Assurance Within an Alliance Framework	17-18 Jan	London, GBR	NATO Unclassified, +STOEOP
SAS-149-TC	Basics of complex modern urban functions and characteristics	Fall 2019	Rome, ITA (TBC)	NATO Unclassified, Pfp, +AUS, +NZL

ACTIVITY	TITLE	MEETING DATES	MEETING LOCATIONS	DISTRIBUTION and PARTNER PARTICIPATION
SCI-309-WS	Opportunities/Implications of Large Scale Commercial Small Satellite Constellations to NATO Operations	4-7 Feb	Salisbury, GBR	NATO UNCLASSIFIED EOP + SGP
SCI-317-LS	Hands-on with JANUS: Understanding, Implementing and Using the first Digital Underwater Communications Standard	TBD	Lisbon, PRT	NATO UNCLASSIFIED Non-NATO Invited
		TBD	San Diego, USA	
		TBD	Livorno, Italy	
SCI-318-SM	The Space Domain and NATO Operations: A Critical S&T Review	June	Torino, ITA	NATO UNCLASSIFIED EOP + SGP
SCI-319-SY	Signature Management	7-8 May	Brno, CZE	NATO RESTRICTED EOP + NZL+ CHE
SET-243-LS	Passive Radar Technology	20-21 May	Lisbon, PRT	NATO UNCLASSIFIED Non-NATO Invited
		23-24 May	Athens, GRE	
		TBD	Boston, USA	
SET-257-LS	Compressive Sensing Techniques for Radar and ESM Applications	11-12 March	Birmingham, GBR	NATO UNCLASSIFIED Non-NATO Invited
		14-15 March	Athens, GRE	
		11-12 September	Dayton, OHI, USA	
SET-264-SY	Quantum Position Navigation and Timing for NATO platforms	TBD	TBD	NATO UNCLASSIFIED Non-NATO Invited
SET-265-SM	Compressive Sensing Applications for Radar, ESM and EO/IR imaging	06-07 May	Salamanca, ESP	NATO UNCLASSIFIED Non-NATO Invited
SET-267-WS	Advanced Mid-Infrared Laser Technology	October	Ettlingen, DEU	NATO Secret AUS
SET-273-SM	Multidimensional Radar Imaging and ATR	12-13 October 2020	CHE	NATO Restricted ZAF

\* **Note:** For activities designated “Non-NATO Invited” – The activity may not be open to Non-NATO members in its entirety. Final determination is contingent on publication of the final agenda for each activity.

This table shows the detailed events that will be executed in 2019 (or already planned for 2020).

## APPLIED VEHICLE TECHNOLOGY PANEL

**Panel Chairman: Mr. Hans-Ludwig BESSER (DEU)**

**Dr. David LECOMPTE (BEL) (from Spring 2019)**

**Vice Chair: Dr. David LECOMPTE (BEL)**

**Mr. Stanley COLE (USA) (from Spring 2019)**

**Panel Executive: Mr. Christopher MULLER (DEU)**

**Panel Assistant: Dr. Veronika GUMPINGER(NATO)**

### Terms of Reference

#### MISSION

The mission of the Applied Vehicle Technology (AVT) Panel is to improve the performance, affordability, and safety of vehicle, platform, propulsion and power systems through the advancement of appropriate technologies.

#### SCOPE

The scope of activity of AVT is to address technology issues related to vehicle, platform, propulsion and power systems operating in all environments (land, sea, air, and space), for both new and ageing systems.

The activities of AVT may be grouped into two broad areas:

#### **Vehicle and platform technologies**, including:

- Vehicle and platform design
- Configurational fluid dynamics
- Fluid mechanics
- Stability and control
- Noise and vibration control
- Structural loads and dynamics
- Smart structures
- Structural materials
- Manufacturing processes
- Non-structural materials
- Environmental effects
- Affordability, availability, survivability and supportability
- Reliability, maintenance and repair
- Test facilities, techniques, and instrumentation

#### **Propulsion and power technologies**, including:

- Air breathing engine design (piston, gas turbine, ramjet/scramjet)
- Rocket motors and rocket based combined cycles
- Electric propulsion including hybrid systems
- Engine control and thrust vectoring
- Power generation and storage
- Fuels and combustion
- Power plant materials and structures
- Propellants and explosives
- Operation, condition monitoring, reliability, maintenance and affordability
- Environmental impact
- Test facilities, techniques, and instrumentation

**Table 5: AVT Activities Continuing in 2019**

ACTIVITY	TYPE	TITLE
AVT-255	RTG	Unmanned Systems Mission Performance Potential for Autonomous Operations
AVT-274	RLS	Unmanned Air Vehicles – Technological Challenges, Concepts of Operations and Regulatory Issues
AVT-275	RTG	Continuous Airworthiness of Aging Systems
AVT-277	RTG	Hazard Assessment of Exposure to Ammunition-Related Constituents and Combustion Products
AVT-278	RTG	Risk-Based Safety Assessment of Operational Airworthiness and Certification Requirements
AVT-279	RTG	Formation Flying for Efficient Operations
AVT-280	RTG	Evaluation of Prediction Methods for Ship Performance in Heavy Weather
AVT-281	RTG	Cross Domain Platform EO Signature Prediction
AVT-282	RTG	Unsteady Aerodynamic Response of Rigid Wings in Gust Encounters
AVT-283	AG	Advances in Wind Tunnel Boundary Correction and Simulation
AVT-290	RTG	Standardization of Augmented Reality for Land Platforms in Combat Environments
AVT-291	RTG	Range Design and Management for Reduced Environmental Impact
AVT-292	RTG	Munition Health Management Technologies: Effects on Operational Capability, Interoperability, Life-Cycle Cost and Acquisition of Missile Stockpiles of NATO Nations
AVT-293	RTG	Effect of Environmental Regulation on Energetic Systems and the Management of Critical Munitions Materials and Capability
AVT-294	RTG	Towards Improved Computational Tools for Electric Propulsion
AVT-295	RTG/ CDT	Demonstration of Innovative Control Effectors for Maneuvering of Air Vehicles
AVT-296	RTG	Rotorcraft Flight Simulation Model Fidelity Improvement and Assessment
AVT-297	RTG	Development of a Framework for Validation of Computational Tools for Analysis of Air and Sea Vehicles
AVT-298	RTG	Reynolds Number Scaling Effects on Swept Wing Flows
AVT-299	RTG	Assessment of Anti-Icing and De-Icing Technologies for Air and Sea Vehicles
AVT-300	RTG	Naval Ship Maneuverability in Ice
AVT-301	RTG	Flowfield Prediction for Maneuvering Underwater Vehicles
AVT-304	RSM	Graphene Technologies and Applications for Defence
AVT-307	RSY	Separated Flow Symposium
AVT-308	RTG	Cooperative Demonstration of Technology (CDT) for Next-Generation NATO Reference Mobility Model (NG-NRMM)
AVT-321	RTC	User Outreach and Promotion for the Unified Generic Model of a Missile Propulsion Subsystem

ACTIVITY	TYPE	TITLE
AVT-322	RSM	Combustion Products, Exposure and Related Risks
AVT-323	RSY	Hybrid/Electric Aero-Propulsion Systems for Military Applications
AVT-324	RSM	Multi-Disciplinary Design Approaches and Performance Assessment of Future Combat Aircraft
AVT-325	RLS	(VKI) Flow Characterization and Modelling of Hypersonic Wind Tunnels
AVT-326	RLS	(VKI) 3rd Lecture Series on Uncertainty Quantification in Computational Fluid Dynamics
AVT-328	RTC	Impact and Advanced Implementation of Cryogenics in Aerodynamic Testing
AVT-ST-008	ST	Hypersonic Operational Threats
AVT-SP-001	SP	Development and Evaluation of an Advanced PACVD TiN/TiCN Coating for Military Vehicle Bearing Applications
AVT-SP-002	SP	Turbulence and the Aerodynamic Optimisation of Nonplanar Lifting Systems
AVT-SP-003	SP	Investigation of Sub-Idle Gas Turbine Performance

**Table 6: AVT Activities Starting in 2019**

ACTIVITY	TYPE	TITLE
AVT-309	RTG	Implication of Synthetic Fuels on Land Systems and on NATO Single Fuel Policy
AVT-310	RTG	Hybrid/Electric Aircraft Design and STAndards, Research and Technology (HEADSTART)
AVT-311	RTG	Availability and Quality Issues with Raw Materials for Rocket Propulsion Systems and Potential Consequences for NATO
AVT-312	RTG	Airworthiness Tools and Processes for Complex Rotorcraft Systems Safety
AVT-313	RTG	Incompressible Laminar-to-Turbulent Flow Transition Study
AVT-314	RTG	Assessment and Reduction of Installed Propeller and Rotor Noise from Unmanned Aircraft
AVT-315	RTG	Comparative Assessment of Modelling and Simulation Methods of Shipboard Launch and Recovery of Helicopters
AVT-316	RTG	Vortex Interaction Effects Relevant to Military Air Vehicle Performance
AVT-317	RTG	Trade-Space Exploration to Support the Early Stage Design of Effective & Affordable (Fleets) of Warships
AVT-318	RTG	Low Noise Aeroacoustics Design for Turbofan Powered NATO Air Vehicles
AVT-319	RTG	High Speed Rotorcraft Analysis and Evaluation
AVT-320	RTG	Assessments of Numerical Simulation Methods for Turbulent Cavitating Flows
AVT-327	RTG	Standardization Recommendation (STANREC) Development for Next-Generation NATO Reference Mobility Model (NRMM)
AVT-332	RTG	In-flight Demonstration of Icephobic Coating and Ice Detection Sensor Technologies
AVT-334	RTG	CDT on Augmented Reality (AR) to Enhance Situational Awareness for Armoured Fighting Vehicle Crew



ACTIVITY	TYPE	TITLE
AVT-335	RSM	Range Design and Management for Sustainable Live Fire Training Ranges
AVT-336	RSM	Enabling Platform Technologies for Resilient Small Satellite Constellations for NATO Missions
AVT-337	RWS	Anti-Tamper Protective Systems for NATO Operations
AVT-338	RSM	Advanced Wind Tunnel Boundary Simulation Ii
AVT-SP-004	SP	Assessment Of Environmental and Toxicological Impacts Associated With Ammunition: Life-cycle Approach to Assist the Reach Regulation

**Table 7: AVT Activities Starting in 2020**

ACTIVITY	TYPE	TITLE
AVT-329	LTSS	Nexgen Rotorcraft Impact on Military Operations
AVT-330	RTG	Impact of Underwater Dumped Munitions and Maritime Safety, Security and Sustainable Remediation
AVT-331	RTG	Goal-driven, Multi-fidelity Approaches for Military Vehicle System-level Design
AVT-333	RTG	Best Practices for Modelling Integrated Propulsion, Power, and Thermal Subsystems for Air Vehicle Conceptual Design

## HUMAN FACTORS AND MEDICINE PANEL

**Panel Chairman: BGen Rafael SCHICK (DEU)**  
**Mrs Alison ROGERS (from Spring 2019)**  
**Vice Chair: Mrs Alison ROGERS (GBR)**  
**Ms Janet BLATNY (from Spring 2019)**  
**Panel Executive: Lt Col Erik LAENEN (NLD)**  
**Panel Assistant: Ms. Marie-Agnès LINET (NATO)**

### Terms of Reference

#### MISSION

The mission of the Human Factors and Medicine (HFM) Panel is to provide the science and technology base for optimizing health, human protection, well-being and performance of the human in operational environments with consideration of mission effectiveness and affordability. This involves understanding and ensuring the physical, physiological, psychological and cognitive compatibility among military personnel, technological systems, missions, and environments. This is accomplished by exchange of information, collaborative experiments and shared field trials.

#### SCOPE

The scope of the HFM Panel is multi-disciplinary and encompasses a wide range of theory, data, models, knowledge and practice pertaining to Health, Medicine and Protection (HMP) and Human Systems and Behaviour (HSB). These two domains are complementary and represent the two 'Area' Committees of the HFM Panel:

1. The Health, Medicine and Protection Area provides the scientific basis for establishing an operationally fit and healthy force, restoring health, minimizing disease and injury, optimizing human protection, sustainability and survivability. This encompasses research in the field of military medicine, physiology, psychology and human protection technology. Areas of interest include, among others, medical diagnosis, prevention, treatment and evacuation. HMP also focuses on enhancing human protection research on physiological and physical influences, e.g., of cold, heat, air pressure, noise, vibration, ionizing and non-ionizing radiation, acceleration, motion, biological and chemical effects on the human body, and developing appropriate countermeasures.
2. The Human Systems and Behaviour Area provides the scientific basis and explores new technology for optimizing the performance of individuals, teams and organizations and their interaction with socio-technical systems to achieve highly effective mission performance. This encompasses research in the fields of human factors, human systems integration as well as cognitive, psycho-social, organizational and cultural aspects in military action. Contributions on Human Systems Integration cover complexity, total life-cycle affordability, human error and fatigue management, intelligent agents, human cognitive and physical resources management, anthropometry, human-machine interfaces, communication and teamwork, performance assessment, enhancement and aiding, training and function allocation in (semi)automated systems. Contributions on individual and team readiness cover values and ethics, leadership, multi-national operations, human enhancement and coping with mental, cognitive and physical demands on the individual. Contributions on organizational effectiveness encompass human resource management, training, interoperability, shared decision making, synchronized situational awareness, resilience, understanding terrorism, psychological operations and coping with new demands on military organizations.

**Table 8: HFM Activities Continuing in 2019**

ACTIVITY	TYPE	TITLE
HFM-240	RLS	Mild Traumatic Brain Injury: Post Concussive Symptoms in a Deployed Setting
HFM-242	RTG	Technology Alternatives for Medical Training: Minimizing Live Tissue Use
HFM-257	RTG	Modelling and Simulation Technologies for Training Medical/Healthcare Professionals
HFM-259	RTG	Human Systems Integration Approach to Cyber Security
HFM-260	RTG	Enhancing Warfighter Effectiveness with Wearable Bio Sensors and Physiological Models
HFM-262	RTG	Health Risk Assessment for Chemical Exposures of Military Interest
HFM-263	RTG	The Transition of Military Veterans from Active Service to Civilian Life
HFM-266	RTG	3D Scanning for Clothing Fit and Logistics
HFM-269	RTG	Combat Integration: Implications for Physical Employment Standards
HFM-270	RTG	Framework for Modelling and Simulation of Human Lethality, Injury, and Impairment from Blast-Related Threats
HFM-271	RTG	Injury Assessment Methods for Vehicle Occupants in Blast-Related Events
HFM-273	LTSS	Chemical, Biological and Radiological Defence
HFM-274	RTG	The Impact of Hypobaric Exposure on Aviators and High-Altitude Special Operations Personnel
HFM-276	RTG	Human Factors and ISR Concept Development and Evaluation
HFM-277	RTG	Leadership Tools for Suicide Prevention
HFM-278	RTG	How to Prevent and Counter Radicalisation and Violent Extremism: Responding to the Threat of Western Foreign Terrorist Fighters
HFM-279	RTG	Leveraging Technology in Military Mental Health
HFM-281	RTG	Personalized Medicine in Mental Health and Performance
HFM-283	RTG	Reducing Musculo-Skeletal Injuries
HFM-284	RLS	Moral Decisions and Military Mental Health
HFM-285	RTG	Speech Understanding of English language in Native and Non-Native Speakers/Listeners in NATO with and without Hearing Deficits
HFM-286	RTG	Leader Development for NATO Multi-national Military Operations
HFM-287	RTG	Developing a Culture and Gender Inclusive Model of Military Professionalism
HFM-290	RTG	Advances In Military Personnel Selection
HFM-291	RTG	Ionizing Radiation Bioeffects and Countermeasures
HFM-292	RTG	Understanding and Reducing Skill Decay
HFM-293	RTG	Digital and Social Media Assessment for Effective Communication and Cyber Diplomacy
HFM-294	RTG	Big Data in the Military: Integrating Genomics Into the Pipeline of Standard-Care Testing and Treatment

ACTIVITY	TYPE	TITLE
HFM-295	RTG	Sexual Violence In Military
HFM-297	RTG	Assessment of Augmentation Technologies for Improving Human Performance
HFM-298	RTG	Injury Thresholds of High Power Pulsed Radio-Frequency Emissions
HFM-299	RTG	Pulmonary Screening and Care in Aviators
HFM-301	RTG	Military Diversity: Ethnic Tolerance and Intolerance
HFM-302	RSY	Evidence-based Leader Interventions for Health and Wellness
HFM-303	RTG	Impact of Gender Variation on Casualty Treatment and Training
HFM-304	RTG	Factors Impacting Ethical Leadership
HFM-305	RTG	Synthetic Biology in Defence: Opportunities and Threats
HFM-306	RTG	Translating Medical Chemical Defence Research Into Operational Medical Capabilities Against Chemical Warfare Agent Threats
HFM-307	RTG	Integrating Gender and Cultural Perspectives in Professional Military Education Programmes
HFM-308	RTG	Optimizing Human Performance in NATO SOF Personnel Through Evidence-Based Mental Performance Programming
HFM-309	RTG	Aerospace Medicine: Forward – Together RAMS USAF/NATO STO HFM

**Table 9: HFM Activities Starting in 2019**

ACTIVITY	TYPE	TITLE
HFM-310	RTG	Human Performance and Medical Treatment and Support During Cold Weather Operations
HFM-311	RTG	Cognitive Neuroenhancement: Techniques and Technology
HFM-312	RTG	Unexplained Physiologic Events in High-Performance Aircraft
HFM-313	RTG	Re-Introduction of Phage Therapy in Military Medicine
HFM-314	RLS	Aircrew Neck Pain Prevention and Management Lecture Series
HFM-315	RLS	Medical Unexplained Physical Symptoms

## INFORMATION SYSTEMS TECHNOLOGY PANEL

**Panel Chairman: Dr.-Ing Michael WUNDER (DEU)**

**Vice Chair: Dr. Eli WINJUM (NOR)**

**Nikolai STOIANOV (BUL) (from Spring 2019)**

**Panel Executive Acting: Mr Philippe SOÈTE (NATO)**

**Panel Assistant: Mrs. Aysegül APAYDIN (NATO)**

### Terms of Reference

#### MISSION

The mission of the Information Systems Technology (IST) Panel is to advance and exchange techniques and technologies in order to:

1. Improve C3I systems, with a special focus on Interoperability and Cyber Security; and
2. Provide timely, affordable, dependable, secure and relevant information to war-fighters, planners and strategists.

#### SCOPE

The scope of responsibility of IST shall include the following domains and disciplines:

##### Information Warfare and Assurance

- INFOSEC
- COMPUSEC
- COMSEC
- TRANSEC
- Information Assurance
- System Assurance

##### Information and Knowledge Management

- Decision Support Architectures
- Data Mining
- Data Warehousing
- Information Fusion
- Information Filtering
- Visualization
- Knowledge-based Systems
- Artificial Intelligence

##### Communications and Networks

- Voice Data and Video over disadvantaged links
- Network Management
- Network Security
- Mobile Communications
- Satellite Communications

**Architectures and Enabling Technologies**

- Software Engineering Technologies
- Computing Technologies
- Requirements Capture
- Modelling and Simulation Technologies
- Modelling and Simulation Architectures and Standards
- Speech and Natural Language Processing
- Groupware and Collaboration Tools

**Table 10: IST Activities Continuing in 2019**

ACTIVITY	TYPE	TITLE
IST-141	RTG	Exploratory Visual Analytics
IST-142	RTG	Software Defined Network Architectures for the Federated Mission Networks
IST-144	RTG	Content-Based Multi-Media Analytics (CBMA)
IST-146	RTG	Electromagnetic Environment Situational Awareness for NATO
IST-147	RTG	Military Applications of Internet of Things
IST-149	RTG	Capability Concept Demonstrator for Interoperability Within Unmanned Ground Systems and C2
IST-150	RTG	NATO Core Services Profiling for Hybrid Tactical Networks
IST-151	RTG	Cyber Security of Military Systems
IST-152	RTG	Intelligent, Autonomous and Trusted Agents for Cyber Defence and Resilience
IST-157	RTG	Human in the Loop Considerations for Artificial Intelligence
IST-159	RTG	Exploitation of Cyberspace for Intelligence
IST-161	RTG	Efficient Group and Information Centric Communications in Mobile Military Heterogeneous Networks (COM)
IST-162	RTG	Cyber Monitoring and Detection Capability for Military Systems (IWA)
IST-163	RTG	Deep Machine Learning for Cyber Defence (IWA)
IST-164	RTG	Securing Unmanned and Autonomous Vehicles for Mission Assurance (IWA)
IST-165	RTG	High-level Fusion of Hard and Soft Information for Intelligence (AI2S)
IST-168	RTG	Adaptive Information Processing and Distribution to Support Command and Control (AI2S)
IST-171	RTG	FMN Cloud-Based Coalition Security Architecture (IWA)
IST-173	ST	Mission-Oriented Research for AI and Big Data for Military Decision Making (AI2S)

**Table 11: IST Activities Starting in 2019**

ACTIVITY	TYPE	TITLE
IST-167	RSM	IST Participation in ICMCIS Conference
IST-169	RTG	Robustness and Accountability in Machine Learning Systems (AI2S)
IST-170	RLS	Cyber Security Science and Engineering 2.0 (IWA)
IST-172	RTG	Airborne Beyond Line of Sight Communication Network (COM)
IST-175	RTG	Full Duplex Radio Technology for Military Applications (COM)
IST-176	RTG	Federated Interoperability of Military C2 and IoT Systems (COM)
IST-177	RTG	Social Media Exploitation for Operations in the Information Environment (IWA)
IST-178	RWS	Big Data Challenges: Situation Awareness and Decision Support (AI2S)

## NATO MODELLING AND SIMULATION GROUP (NMSG)

**Group Chairman: Ing. Agatino MURSIA (ITA)**

**Vice Chair: Dr Robert SIEGFRIED (DEU)**

**Group Head: CDR Santiago FERNANDE-DAPENA (ESP)**

**Deputy Head and Scientific Advisor: VACANT**

**Technical Officer: Mr Adrian VOICULET (NATO)**

**Assistant: Ms Ileana GANZ (NATO)**

### Terms of Reference

#### MISSION

The mission of the NATO Modelling and Simulation (M&S) Group (NMSG) is to:

1. Promote cooperation among Alliance bodies, NATO member nations and Partner nations to maximize the effective utilization of M&S, including: M&S Standardization, education and associated science and technology;
2. Coordinate customers, users and suppliers in the five areas of Simulation (Support to Operations, Capability Development, Mission Rehearsal, Training and Education, and Procurement);
3. Support customers in defining the operational needs regarding M&S, support users to fulfil these operational needs and support suppliers to provide the simulation assets in the five identified areas of simulation, helping NATO M&S stakeholders and subject matter experts to meet to initiate, coordinate and oversee the implementation of the NATO M&S Master Plan (NMSMP);
4. Monitor the degree of consistency with NMSMP in NATO organizations, being the custodian of the NMSMP;
5. Report on those situations (and decisions) in which inconsistency with NMSMP can or will introduce interoperability issues between NATO Members (and Partners).

#### SCOPE

The Group:

1. Is governed by the Strategy and Implementation Plan as approved by the STB;
2. Guides implementation of the M&S Master Plan and promoting best practices in the Alliance;
3. Is NATO's Delegated Tasking Authority for standardization in NATO M&S domain (ref. CNAD Letter DI(2003)243 dated 29 August 2003). Hence, develops, advocates and guides implementation of M&S Standardization documents;
4. Maintains a permanent link with operational people in order to collect operational needs and to validate the work of the Group and disseminate the Group results;
5. Fosters appropriate levels of M&S interoperability and reuse of models and simulations;
6. Develops, advocates and guides programs to facilitate education and information exchange in M&S science and technology, application methods and standards;
7. Identifies, advocates and executes science and technology projects to improve M&S tools, standards, interoperability, network concepts and databases; and
8. As required, provides M&S expertise to support pertinent projects of the other STO Level-II Committees or NATO Bodies and Organizations.



**Table 12: MSG Activities Continuing in 2019**

ACTIVITY	TYPE	TITLE
MSG-140	RTG	Urban Combat Advanced Training Technology – Live Simulation Standards (UCATT-LSS)
MSG-145	RTG	Operationalization of Standardized C2-Simulation Interoperability
MSG-146	RTG	Simulation for Training and Operation Group-Land (STOG-L)
MSG-147	RTG	M&S Support for Crisis and Disaster Management Processes and Climate Change Implications
MSG-150	RTG	M&S Supporting NATO CD&E
MSG-152	RTG	NATO M&S Professional Corps Development
MSG-154	RTG	Low, Slow, Small Threats Modelling and Simulation
MSG-155	RTG	Data Farming Services (DFS) for Analysis and Simulation-Based Decision Support
MSG-156	RTG	Dynamic Synthetic Environments for Distributed Simulation
MSG-157	RTG	NATO M&S Resources/Standards Support Team-II
MSG-158	RTG	Operational Requirements for Training Interoperability – 2019
MSG-163	RTG	Evolution of NATO Standards for Federated Simulation
MSG-164	RTG	Modelling and Simulation as a Service – Phase 2
MSG-165	RTG	Incremental Implementation of Mission Training Through Distributed Simulation for Joint and Combined Air Operations
MSG-166	RSY	MSG/MSCO Support to International Training & Education Reference Number MSG-166 Conferences ITEC, IITSEC and CAX Forum 2019
MSG-167	ST	NATO Modelling and Simulation for Uses Other Than Training
MSG-169	ST	Live Virtual Constructive – Training (LVC-T) in the Maritime Domain
MSG-170	ST	Top Ten Cyber Effects for Campaign and Mission Simulations

**Table 13: MSG Activities Starting in 2019**

ACTIVITY	TYPE	TITLE
MSG-168	RLS	Modelling and Simulation as a Service (MSaaS)
MSG-171	RSY	NMSG Annual Symposium 2019
MSG-172	RTG	NATO Modelling and Simulation Master Plan Implementation Update
MSG-173	RTG	Simulation for Training and Operation Group – Next Generation (STOG-NG)
MSG-174	RTG	Urban Combat Advanced Training Technology Live Simulation Standards (UCATT-LSS) – 2
MSG-175	RWS	Commercial Technologies and Games for Use in NATO and Nations – 16th WSh

**Table 14: MSG Activities Starting in 2020**

ACTIVITY	TYPE	TITLE
MSG-176	RSY	MSG/MSCO Support to International Training & Education Conferences ITEC, I/ITSEC and CAX Forum 2020
MSG-177	RSY	NMSG Annual Symposium 2020

## SYSTEM ANALYSIS AND STUDIES PANEL

**Chairperson: Dr. Ana Isabel BARROS (NLD)**

**Vice Chair: Mr. Espen SKJELLAND (NOR)**

**Panel Executive: LTC Timothy POVICH (USA)**

**Panel Assistant: Mr. Jeroen GROENEVELT (NATO)**

### Terms of Reference

#### MISSION

The mission of the System Analysis and Studies (SAS) Panel is:

1. To conduct studies and analyses of an operational and technological nature.
2. To promote the exchange and development of methods and tools for Operational Analysis (OA) as applied to defence problems.

#### SCOPE

The scope of the Panel’s activity is as follows:

##### System Analysis and Studies

The Panel will conduct studies, analysis and information exchange activities that explore how operational capability can be provided and enhanced through the exploitation of new technologies, new forms of organization or new concepts of operation. Such studies will, where appropriate, give explicit consideration to financial and other resource issues. The Panel will be responsive to requests for such studies from a variety of sources, including nations, the Science and Technology Board (STB), the Military Committee, the Conference of National Armament Directors (CNAD), the Main Armaments Groups, Allied Command Operations (ACO), Allied Command Transformation (ACT), the NATO Communications and Information Agency (NCIA), the NATO Industrial Advisory Group (NIAG), and industry. The Panel can also perform studies of a more purely technological nature if such studies are not appropriate for another NATO body.

##### Methodology

The Panel will undertake activities to develop and promote improved analysis methods and techniques to support defence decision making. This aspect of the Panel’s work will focus particularly on the methods required to address the new issues thrown up by the evolving strategic environment and the responses that both individual nations and NATO as a whole are making to it. Activities may include information exchange on OA modelling concepts and best practice, research into new methodological approaches and the development and exchange of models.

**Table 15: SAS Activities Continuing in 2019**

ACTIVITY	TYPE	TITLE
SAS-111	RTG	Collection and Management of Data for Analysis Support to Operations
SAS-118	RTG	Enhancing Strategic Awareness of Energy Security – A Holistic Approach
SAS-119	RTG	Energy and Defence: Reducing Dependencies & Vulnerabilities – Enhancing Efficiency
SAS-120	RTG	Integration of Women Into Ground Combat Units
SAS-123	RTG	Futures Assessed Alongside Socio-Technical Evolutions (FATE)

ACTIVITY	TYPE	TITLE
SAS-124	RTG	Visual Analytics for Communicating Defence Investment Uncertainty and Risk
SAS-125	RTG	Comparative Analysis of Acquisition Processes
SAS-128	RTG	Modelling Personnel Flows; Identifying Potential Solutions to Recruiting and Retention Challenges
SAS-129	RTG	Gamification of Cyber Defence/ Resilience
SAS-130	RTG	Course of Action Analysis in the 21st Century
SAS-132	RTG	Models and Tools for Logistics Analysis
SAS-133	RTG	Assessment/Analysis Support to Facilitate the Introduction of NLW by Addressing Line of Development Obstacles
SAS-134	RTG	Modelling the Transformation of Resource Inputs into Defence Outputs and Outcomes
SAS-135	RTG	Analysis of Factors Involved in Interalliance Biometric Sharing
SAS-136	RTG	Optimization of Investment in Simulation-Based Military Training
SAS-137	RSY	Integration of Women into Ground Combat Units
SAS-139	RTG	NATO Analytical War Gaming – Innovative Approaches for Data Capture, Analysis and Exploitation
SAS-140	RTG	Directed Energy Weapons Concepts and Employment
SAS-141	RSY	Deterrence and Assurance Within an Alliance Framework
SAS-142	ST	Development of an Internet Exploitation Grading System
SAS-143	RTG	Agile Multi-Domain C2 of Socio-Technical Enterprises in Hybrid Operations
SAS-144	RTG	Code of Best Practice for Conducting Survey Research in a Military Context
SAS-145	RTG	SWEAT (Soldier System Weapon & Equipment Assessment Tool)
SAS-146	ST	Understanding the Cost Related Implications of Autonomy – A System of Systems Perspective
SAS-147	RTG	Analysis of Anti-Access Area Denial (A2/AD)

**Table 16: SAS Activities Starting in 2019**

ACTIVITY	TYPE	TITLE
SAS-148	ST	Recruitment and Retention of Young Civilian Scientists
SAS-149	RTC	Basics of Complex Modern Urban Functions and Characteristics

## SYSTEMS CONCEPTS AND INTEGRATION PANEL

**Panel Chairperson: Dr. Karin STEIN (DEU)**

**Vice Chair: Mr. Allan CHAN (USA)**

**Panel Executive: Lt Col Ryan SNIDER (USA)**

**Panel Assistant: Ms. Carlotta ROSSI (NATO)**

### Terms of Reference

#### MISSION

The mission of the Systems, Concepts and Integration (SCI) Panel is to advance knowledge concerning advanced system concepts, integration, engineering techniques and technologies across the spectrum of platforms and operating environments to assure cost-effective mission area capabilities. Integrated defence systems, including air, land, sea, and space systems (manned and unmanned), and associated weapon and countermeasure integration are covered. Panel activities focus on NATO and national mid- to long-term system-level operational needs.

#### SCOPE

The scope of Panel activities covers a multi-disciplinary range of theoretical concepts, design, development, and evaluation methods applied to integrated defence systems. Areas of interest include:

- Integrated mission systems including weapons and countermeasures
- System architecture/mechanisation
- Vehicle integration
- Mission management
- System engineering technologies and testing

**Table 17: SCI Activities Continuing in 2019**

ACTIVITY	TYPE	TITLE
SCI-281	RTG	Solutions Advancing Next Generation Radar Electronic Attack
SCI-282	RTG	Countermeasures Against Anti-Aircraft EO/IR Imaging Seeker Threats
SCI-287	RTG	Assessment Methods for Camouflage in Operational Context
SCI-288	RTG	Autonomy in Communications-Limited Environments
SCI-294	RTG	Demonstration and Research of Effects of RF Directed Energy Weapons on Electronically Controlled Combustion Engines
SCI-295	RTG	Development of Methods for Measurements and Evaluation of Natural Background EO Signatures
SCI-297	RTG	Distributed EW Operations in the Modern Congested RF Environment
SCI-298	RTG	Identification and Neutralization Methods and Technologies for C-IED
SCI-301	RTG	Defeat of Low Slow and Small (LSS) Air Threats
SCI-302	RTG	DIRCM Concepts and Performances
SCI-303	AG	AG-300 V.33 Flight Test Techniques for the Assessment of Fixed Wing Aircraft Handling Qualities

ACTIVITY	TYPE	TITLE
SCI-304	RTG	Optimized and Reconfigurable Antennas for Future Vehicle Electronic Counter Measures
SCI-305	COM	Flight Test Technical Team (FT3)
SCI-306	AG	AG-300 V.34 Reduced Friction Runway Surface Flight Testing: Issue 2
SCI-307	RTG	FAMOS Framework for Avionics Mission Systems
SCI-309	RWS	Opportunities/Implications of Large Scale Commercial Small Satellite Constellations to NATO Operations
SCI-310	RTG	Expanded Countermeasure Methods Against IR Anti-Ship Threats in Varied Parameter and Scenario Engagements Using all-digital Tools Sets
SCI-311	RTG	Collaborative Space Domain Awareness Data Collection and Fusion Experiment
SCI-312	RTG	EO-IR Countermeasures
SCI-313	RSM	Human-Machine Trust: Risk-based Assurance and Licensing of Autonomous Systems
SCI-316	RTG	High Energy Laser Weapons: Quantifying the Impact of Atmospheric and Reflections
SCI-317	RLS	Hands-on with JANUS: Understanding, Implementing and Using the first Digital Underwater Communications Standard
SCI-319	RSY	Signature Management

**Table 18: SCI Activities Starting in 2019**

ACTIVITY	TYPE	TITLE
SCI-314	AG	AG-300 V.35 Ground and Flight Test Methods Used to Assure Aeroelastic Stability of Fixed Wing Aircraft
SCI-315	AG	AG-300 V.36 Flight Testing of Helmet Mounted Displays
SCI-318	RSM	The Space Domain and NATO Operations: A Critical S&T Review
SCI-320	RTG	Scientific Support to NNAG Above Water Warfare Capability Group
SCI-321	RTG	UAV Applications for Military Search
SCI-322	RTG	Scientific Support to NATO Aerospace Capability Group 3 Sub-Group 2 (ACG3/SG2) on Suppression of Enemy Air Defence (SEAD)

## SENSORS & ELECTRONICS TECHNOLOGY PANEL

**Panel Chairman: Prof. David BLACKNELL (GBR)**

**Vice Chair: Mr Frank van den BOGAART (NLD)**

**Panel Executive: Lt Col Francesco SANTORO (ITA)**

**Panel Assistant: Ms. Ewelina GLINSKA-LEWIS (NATO)**

### Terms of Reference

#### MISSION

The mission of the Sensors and Electronics Technology (SET) Panel is to foster cooperative research, the exchange of information, and the advancement of science and technology among the NATO nations in the field of sensors and electronics for defence and security. The SET Panel addresses the development and enhancement of both passive and active sensors, as well as electronic technology capabilities, multi-sensor integration and fusion as they pertain to Intelligence, Surveillance, Target Acquisition and Reconnaissance (ISTAR), Remote Sensing, Electronic Warfare (EW), Communications, and Navigation. To fulfil this mission, the SET Panel is organized into three Focus Groups: Radio-Frequency Technology (RFT); Optical Technology (OT); and Multi-Sensors and Electronics (MSE).

#### SCOPE

The research activities of the SET Panel predominantly address topics related to target signatures, propagation and battlespace environments, electro-optic (EO) / radio-frequency (RF) / acoustic/magnetic sensors, antennas, signal and image processing, components, sensor hardening, electromagnetic compatibility, and any other phenomena associated with sensors and electronics that may assist NATO war-fighters during future warfare and peace-keeping scenarios. In particular, the scope of activity in the SET Panel includes but is not limited to the following disciplines:

#### Phenomenology:

- Target/background signatures;
- Propagation and scattering;
- Battlespace environment characterization;
- Sensor hardening;
- Electronic protection measures and electromagnetic compatibility.

#### Sensors:

- EO sensors (ultraviolet, laser radar (ladar), lidar, imaging infrared (IR), IR search and track);
- RF sensors (radar, radiometers, radar imaging, ATR and NCTR) and related technologies, including passive RF sensors;
- Acoustic, seismic, magnetic, chemical, and inertial sensors;
- Urban, indoor, and subterranean navigation sensors;
- Terahertz (THz) sensors (from the point of view of military technology, especially in the context of urban warfare and DAT);
- Communications, electromagnetic warfare (counter measures, electronic attack, electronic protection, electronic support measures, electronic intelligence), and dual-use sensors for a wide range of applications (urban/high intensity to security/low intensity).



**Electronics:**

- Processing;
- Antenna processing and aperture control;
- Signal processing;
- Image processing;
- Multi-sensor fusion;
- Pattern recognition, including automatic target recognition and non-cooperative target recognition.

**Components:**

- EO (optics, integrated optics, fibre optics, focal plane arrays, lasers);
- RF (antennas, amplifiers, filters, Digital Radio-Frequency Memories (DRFMs), monolithic microwave integrated circuits, high power microwave sources);
- Micro-electronics;
- Micro-mechanics;
- Displays;
- Mechanical, chemical, etc.

**Sensor hardening:**

- Electronic protection measures;
- Electromagnetic compatibility.

**Table 19: SET Activities Continuing in 2019**

ACTIVITY	TYPE	TITLE
SET-215	RTG	Model-based SAR Automatic Target Recognition
SET-217	RTG	Assessing and Modelling the Performance of Digital Night Vision Image Fusion
SET-224	RTG	Coherent Mid-Infrared Fibre Source Technology
SET-225	RTG	Spatial and Waveform Diverse Noise Radar
SET-226	RTG	Turbulence Mitigation for Electro Optics (EO) and Laser Systems
SET-227	RTG	Cognitive Radar
SET-229	RTG	Cooperative Navigation in GNSS Degraded and Denied Environments
SET-232	RTG	Computational Imaging and Compressive Sensing for EO/IR Systems NOT ACTIVE – PLANNING
SET-233	RTG	Acoustic Transient Threat Detection Sensors & Signal Processing for Battlefield Situational Awareness
SET-234	RTG	Environmental Limitations of Fielded EO-TDAs
SET-236	RTG	Design and Analysis of Compressive Sensing Techniques for Radar and ESM Applications
SET-237	RTG	Printed Standards for Stand-off Detection
SET-238	RTG	Side-Attack Threat Detection Strategies, Technologies and Techniques

ACTIVITY	TYPE	TITLE
SET-240	RTG	Exploitation of Longwave Infrared Airborne Hyperspectral Data
SET-242	RTG	Passive Coherent Locators on Mobile Platforms
SET-243	RLS	Passive Radar Technology
SET-245	RTG	Radar Based Non-Cooperative Target Recognition (NCTR) in the Low Airspace and Complex Surface Environments
SET-246	RTG	Short Wave Infrared Technology: A Standardized Irradiance Measurement and Compatibility Model to Evaluate Reflective Band Systems
SET-249	RTG	Laser Eye Dazzle – Threat Evaluation and Impact on Human Performance
SET-250	RTG	Multi-Dimensional Radar Imaging
SET-251	RTG	Radar Signature Management – Benefit To Ships
SET-252	RTG	Development of a Validation Model of a Stealth UCAV
SET-256	RTG	Interoperability & Networking of Disparate Sensors and Platforms for ISR Applications
SET-258	RTG	DMPAR Deployment and Assessment in Military Scenario
SET-260	RTG	Assessment of EO/IR Technologies for Detection of Small UAVs in an Urban Environment
SET-264	RSY	Quantum Position Navigation and Timing for NATO platforms
SET-265	RSM	Compressive Sensing applications for Radar, ESM and EO/IR Imaging
SET-267	RWS	Advanced Mid-Infrared Laser Technology

**Table 20: SET Activities Starting in 2019**

ACTIVITY	TYPE	TITLE
SET-257	RLS	Compressive Sensing Techniques for Radar and ESM Applications
SET-263	RTG	Swarms Systems for Intelligence Surveillance and Reconnaissance
SET-266	RTG	Multi-Functional EO/IR Sensors for Counter-Surveillance
SET-268	RTG	Bi-/Multi-Static Radar Performance Evaluation Under Synchronized Conditions
SET-269	RTG	EO/IR Ship Signature Dynamics
SET-270	RTG	Overcoming the Technical Barriers that Inhibit Use of Fuel Cells for Dismounted Soldier Applications
SET-271	RTG	Airborne Maritime Radar Based Submarine Periscope Detection and Discrimination at High Grazing Angles
SET-272	RTG	Automated Scene Understanding for Battlefield Awareness
SET-273	RSM	Multidimensional Radar Imaging and ATR

## THEMATIC APPROACH

1. Themes are urgent multi-disciplinary topics described as a military capability (or group of capabilities) that Nations need to be able to accomplish. Themes will be cross-panel in nature and are meant to identify areas where NATO should increase S&T as well as lead to the establishment of new Communities of Interest across the Panel/Group structures.
2. In the Spring of 2017, three themes were identified:
  - a. Autonomy;
  - b. Artificial Intelligence and Big Data for Military Decision Making; and
  - c. Operations in a Contested Urban Environment.
3. The tables below list the current activities (and new in 2019) that support these themes. The second table for each topic lists the ETs for each Theme. ETs are approved at the Panel/Group level when a particular expertise is required to assist or advise on the technical merit or feasibility of a specific proposal for a technical activity.

**Table 21: Autonomy**

ACTIVITY	TYPE	TITLE
AVT-255	RTG	Unmanned Systems Mission Performance Potential for Autonomous Operations
AVT-274	RLS	Unmanned Air Vehicles – Technological Challenges, Concepts of Operations and Regulatory Issues
AVT-278	RTG	Risk-Based Safety Assessment of Operational Airworthiness and Certification Requirements
AVT-279	RTG	Formation Flying for Efficient Operations
AVT-336	RSM	Enabling Platform Technologies for Resilient Small Satellite Constellations for NATO Missions
HFM-242	RTG	Technology Alternatives for Medical Training: Minimizing Live Tissue Use
HFM-257	RTG	Modelling and Simulation Technologies for Training Medical/Healthcare Professionals
HFM-259	RTG	Human Systems Integration Approach to Cyber Security
HFM-260	RTG	Enhancing Warfighter Effectiveness with Wearable Bio Sensors and Physiological Models
HFM-276	RTG	Human Factors and ISR Concept Development and Evaluation
HFM-279	RTG	Leveraging Technology in Military Mental Health
HFM-297	RTG	Assessment of Augmentation Technologies for Improving Human Performance
HFM-300	RSY	Symposium on Human Autonomy Teaming
IST-146	RTG	EM Environment Situational Awareness for NATO
IST-147	RTG	Military Applications of Internet of Things
IST-149	RTG	Capability Concept Demonstrator for Interoperability Within Unmanned Ground Systems and C2
IST-152	RTG	Autonomous Cyber Defence Agents
IST-157	RTG	Human in the Loop Considerations for Artificial Intelligence
IST-162	RTG	Cyber Monitoring and Detection Capability for Military Systems (IWA)

ACTIVITY	TYPE	TITLE
IST-163	RTG	Deep Machine Learning for Cyber Defence (IWA)
IST-164	RTG	Securing Unmanned and Autonomous Vehicles for Mission Assurance (IWA)
MSG-145	RTG	Operationalization of Standardized C2-Simulation Interoperability
MSG-154	RTG	Low, Slow, Small Threats Modelling and Simulation
MSG-165	RTG	Incremental Implementation of Mission Training through Distributed Simulation for Joint and Combined Air Operations
SAS-133	RTG	Assessment/Analysis Support to Facilitate the Introduction of NLW by Addressing Line of Development Obstacles
SAS-146	ST	Understanding the Cost Related Implications of Autonomy – A System of Systems Perspective
SCI-288	RTG	Autonomy in Communications-Limited Environments
SCI-294	RTG	Demonstration and Research of Effects of RF Directed Energy Weapons on Electronically Controlled Combustion Engines
SCI-297	RTG	Distributed EW Ops in Congested RF Environment
SCI-299	RTG	Demonstration and Research of Effects of RF Directed Energy Weapons on Electronically Controlled Combustion Engines
SCI-301	RTG	Defeat of Low Slow and Small (LSS) Air Threats
SCI-313	RSM	Human-Machine Trust: Risk-based Assurance and Licensing of Autonomous Systems
SCI-317	RLS	Hands-on with JANUS: Understanding, Implementing and Using the First Digital Underwater Communications Standard
SET-227	RTG	Cognitive Radar
SET-229	RTG	Cooperative Navigation in GNSS Degraded and Denied Environments
SET-260	RTG	Assessment of EO/IR Technologies for Detection of Small UAVs in an Urban Environment
SET-272	RTG	Automated Scene Understanding for Battlefield Awareness

**Table 22: Autonomy – Exploratory Teams**

ACTIVITY	TITLE
HFM-ET-167	Development of Autonomous Medical Systems for Tactical Evacuation
HFM-ET-169	Closed Loop (Automated) Control of Medical Devices
HFM-ET-178	Meaningful Human Control Over AI-based Systems
SAS- ET-DV	Risk Based Operational Planning in Co-operative Human-Machine Battle Networks
SCI-ET-041	UAV Swarms for Electronic Warfare in Urban Environment
SCI-ET-044	Evaluation of Swarm Systems for Military Application
SET-ET-106	Remote Intelligence of Building Interiors (RIBI)
SET-ET-107	Automated Scene Understanding for Battlefield Awareness

**Table 23: Big Data and Artificial Intelligence for Military Decision Making**

ACTIVITY	TYPE	TITLE
AVT-252	RTG	Stochastic Design Optimization for Naval and Aero Military Vehicles (DELINQUENT)
AVT-334	RTG	CDT on Augmented Reality (AR) to Enhance Situational Awareness for Armoured Fighting Vehicle Crew
HFM-276	RTG	Human Factors and ISR Concept Development and Evaluation
HFM-286	RTG	Leader Development for NATO Multi-national Military Operations
HFM-293	RTG	Digital and Social Media Assessment for Effective on Communication and Cyber Diplomacy
HFM-294	RTG	Big Data in the Military: Integrating Genomics into the Pipeline of Standard-Care Testing and Treatment
IST-132	RTG	Multi-Level Fusion of Hard and Soft Information (DELINQUENT)
IST-141	RTG	Exploratory Visual Analytics
IST-144	RTG	Content-Based Multi-media Analytics
IST-159	RTG	Cyber Intelligence and Social Media
IST-165	RTG	High-Level Fusion of Hard and Soft Information for Intelligence
IST-163	RTG	Deep Machine Learning for Cyber Defence (Start 2018)
IST-169	RTG	Robustness and Accountability in Machine Learning Systems
IST-177	RTG	Social Media Exploitation for Operations in the Information Environment
IST-178	RWS	Big Data Challenges: Situation Awareness and Decision Support
MSG-155	RTG	Data Farming Services (DFS) for Analysis and Simulation-based Decision Support
SAS-111	RTG	Collection and Management of Data for Analysis Support to Operations
SAS-139	RTG	NATO Analytical War Gaming – Innovative Approaches for Data Capture, Analysis and Exploitation
SAS-142	ST	Development of an Internet Exploitation Grading System
SAS-143	RTG	Agile Multi-Domain C2 of Socio-Technical Enterprises in Hybrid Operations
SET-215	RTG	Model-based SAR Automatic Target Recognition
SET-227	RTG	Cognitive Radar
SET-245	RTG	Radar Based Non-Cooperative Target Recognition (NCTR) in the Low Airspace and Complex Surface Environments
SET-250	RTG	Multi-Dimensional Radar Imaging
SET-256	RTG	Interoperability and Networking of Disparate Sensors and Platforms for ISR Applications
SET-257	RLS	Compressive Sensing Techniques for Radar and ESM Applications
SET-263	RTG	Swarms Systems for Intelligence Surveillance & Reconnaissance
SET-272	RTG	Automated Scene Understanding for Battlefield Awareness
SET-273	RTG	Multidimensional Radar Imaging and ATR

**Table 24: Big Data and Artificial Intelligence for Military Decision Making – Exploratory Teams**

ACTIVITY	TITLE
HFM-ET-180	Blockchain Technology and Its Application Towards a Wearable EMR
HFM-ET-181	Measuring the Cognitive Load on the Soldier
IST-ET-105	Digital Employees for Network Management and Control
SAS-ET-EC	Analytical Methods for Casualty Rate Estimation
SAS-ET-ED	Developing a Standard Methodology for Assessing Multi-National Interoperability
SET-ET-103	Airborne Maritime Radar Based Submarine Periscope Detection and Discrimination at High Gazing Angles
SET-ET-107	Automated Scene Understanding for Battlefield Awareness
SET-ET-110	Machine Learning for Wide Area Surveillance
SET-ET-111	Integrating Compressive Sensing and Machine Learning Techniques for Radar Applications

**Table 25: Operations in a Contested Urban Environments**

ACTIVITY	TYPE	TITLE
AVT-282	RTG	Unsteady Aerodynamic Response of Rigid Wings in Gust Encounters
AVT-310	RTG	Hybrid/Electric Aircraft Design and Standards, Research and Technology
AVT-314	RTG	Assessment and Reduction of Installed Propeller and Rotor Noise from Unmanned Aircraft
AVT-318	RTG	Low Noise Aeroacoustic Design for Turbofan-Powered NATO Air Vehicles
AVT-323	RSY	Hybrid/Electric Aero-Propulsion Systems for Military Applications
HFM-262	RTG	Health Risk Assessment for Chemical Exposures of Military Interest
HFM-273	LTSS	Chemical, Biological and Radiological Defence
IST-150	RTG	NATO Core Services Profiling for Hybrid Tactical Networks
MSG-140	RTG	Urban Combat Advanced Training Technology – Live Simulation Standards (UCATT-LSS)
MSG-146	RTG	Simulation for Training and Operation Group-Land (STOG-L)
MSG-156	RTG	Dynamic Synthetic Environments for Distributed Simulation
MSG-158	RTG	Operational Requirements for Training Interoperability
MSG-174	RTG	Urban Combat Advanced Training Technology Live Simulation Standards (UCATT-LSS) – 2
SAS-149	RTC	Basics of Complex Modern Urban Functions and Characteristics
SET-240	RTG	Exploitation of Longwave Infrared Airborne Hyperspectral
SET-246	RTG	Short Wave Infrared Technology: A Standardized Irradiance Measurement and Compatibility Model to Evaluate Reflective Band Systems
SET-250	RTG	Multi-Dimensional Radar Imaging

ACTIVITY	TYPE	TITLE
SET-260	RTG	Assessment of EO/IR Technologies for Detection of Small UAVs in an Urban Environment
SET-266	RTG	Multi-Functional EO/IR Sensors for Counter-Surveillance

**Table 26: Operations in a Contested Urban Environment – Exploratory Teams**

ACTIVITY	TITLE
SCI-ET-041	UAV Swarms for Electronic Warfare in Urban Environment
SET-ET-106	Remote Intelligence of Building Interiors (RIBI)
SET-ET-108	Active and Passive 3D EO/IR Sensing for Urban Operations

## NEW 2019 ACTIVITIES BY TYPE

**Table 27: Lecture Series**

ACTIVITY	TITLE	MEETING DATES	MEETING LOCATIONS	DISTRIBUTION and PARTNER PARTICIPATION
HFM-314	Aircrew Neck Pain Prevention and Management Lecture Series	May 2019	CAN, BEL, GBR	Public Release
HFM-315	Medical Unexplained Physical Symptoms	May 2019	TBD	Public Release
IST-170	Cyber Security Science and Engineering 2.0 (IWA)	TBD	CSO Facility Neuilly-sur-Seine FRA	NATO UNCLASSIFIED STOEOP
MSG-168	Modelling and Simulation as a Service (MSaaS)	TBD	United Kingdom, France and USA	Public Release Non-NATO Invited
SET-257	Compressive Sensing Techniques for Radar and ESM Applications	11-12 March	Birmingham, UK	NATO UNCLASSIFIED Non-NATO Invited
		14-15 March	Athens, GRE	
		11-12 Sept	Dayton, OH, USA	

**Table 28: Task Groups**

ACTIVITY	TITLE	MEETING DATES	MEETING LOCATIONS	DISTRIBUTION and PARTNER PARTICIPATION
AVT-309	Implication of Synthetic Fuels on Land Systems and on NATO Single Fuel Policy	May 2019, October 2019,	Slovakia; Norway	NATO UNCLASSIFIED Non-NATO Invited
AVT-310	Hybrid/Electric Aircraft Design and STAndards, Research and Technology (HEADSTART)	May 2019, October 2019,	Slovakia; Norway	NATO UNCLASSIFIED STOEOP
AVT-311	Availability and Quality Issues with Raw Materials for Rocket Propulsion Systems and Potential Consequences for NATO	May 2019, October 2019,	Slovakia; Norway	NATO UNCLASSIFIED STOEOP
AVT-312	Airworthiness Tools and Processes for Complex Rotorcraft Systems Safety	May 2019, October 2019,	Slovakia; Norway	NATO UNCLASSIFIED STOEOP
AVT-313	Incompressible Laminar-to-Turbulent Flow Transition Study	May 2019, October 2019,	Slovakia; Norway	NATO UNCLASSIFIED STOEOP
AVT-314	Assessment and Reduction of Installed Propeller and Rotor Noise from Unmanned Aircraft	May 2019, October 2019,	Slovakia; Norway	NATO UNCLASSIFIED STOEOP
AVT-315	Comparative Assessment of Modelling and Simulation Methods of Shipboard Launch and Recovery of Helicopters	May 2019, October 2019,	Slovakia; Norway	NATO UNCLASSIFIED Non-NATO Invited
AVT-316	Vortex Interaction Effects Relevant to Military Air Vehicle Performance	May 2019, October 2019,	Slovakia; Norway	NATO UNCLASSIFIED Non-NATO Invited



ACTIVITY	TITLE	MEETING DATES	MEETING LOCATIONS	DISTRIBUTION and PARTNER PARTICIPATION
AVT-317	Trade-Space Exploration to Support the Early Stage Design of Effective & Affordable (Fleets) of Warships	May 2019, October 2019,	Slovakia; Norway	NATO UNCLASSIFIED Non-NATO Invited
AVT-318	Low Noise Aeroacoustics Design for Turbofan Powered NATO Air Vehicles	May 2019, October 2019,	Slovakia; Norway	NATO UNCLASSIFIED Non-NATO Invited
AVT-319	High Speed Rotorcraft Analysis and Evaluation	May 2019, October 2019,	Slovakia; Norway	NATO UNCLASSIFIED
AVT-320	Assessments of Numerical Simulation Methods for Turbulent Cavitating Flows	May 2019, October 2019,	Slovakia; Norway	NATO UNCLASSIFIED Non-NATO Invited
AVT-327	Standardization Recommendation (STANREC) Development for Next-Generation NATO Reference Mobility Model (NRMM)	May 2019,	Slovakia	NATO UNCLASSIFIED Non-NATO Invited
AVT-332	In-Flight Demonstration of Icephobic Coating and Ice Detection Sensor Technologies	27 April – 01 May 2020,	Canada	NATO UNCLASSIFIED Non-NATO Invited
AVT-334	CDT on Augmented Reality (AR) to Enhance Situational Awareness for Armoured Fighting Vehicle Crew	20 – 24 May 2019,	Slovakia	NATO UNCLASSIFIED Non-NATO Invited
HFM-310	Human Performance and Medical Treatment and Support During Cold Weather Operations	May 2019,	CSO Facility Neuilly-sur-Seine FRA	Public Release STOEOP
HFM-311	Cognitive Neuroenhancement: Techniques and Technology	May 2019,	CSO Facility Neuilly-sur-Seine FRA	Public Release
HFM-312	Unexplained Physiologic Events in High-Performance Aircraft	TBD	TBD	Public Release Non-NATO Invited
HFM-313	Re-Introduction of Phage Therapy In Military Medicine	TBD	TBD	Public Release Non-NATO Invited
IST-169	Robustness and Accountability in Machine Learning Systems (AI2S)	TBD	CSO Facility Neuilly-sur-Seine FRA	NATO UNCLASSIFIED STOEOP
IST-172	Airborne Beyond Line of Sight Communication Network (COM)	TBD	CSO Facility Neuilly-sur-Seine FRA	NATO UNCLASSIFIED STOEOP
IST-175	Full Duplex Radio Technology for Military Applications (COM)	TBD	CSO Facility Neuilly-sur-Seine FRA	NATO UNCLASSIFIED
IST-176	Federated Interoperability of Military C2 and IoT Systems (COM)	TBD	CSO Facility Neuilly-sur-Seine FRA	Public Release
IST-177	Social Media Exploitation for Operations in the Information Environment (IWA)	TBD	Helsinki, Finland	NATO SECRET Non-NATO Invited
MSG-172	NATO Modelling and Simulation Master Plan Implementation Update	01 Feb	CSO Facility Neuilly-sur-Seine FRA	Public Release

ACTIVITY	TITLE	MEETING DATES	MEETING LOCATIONS	DISTRIBUTION and PARTNER PARTICIPATION
MSG-173	Simulation for Training and Operation Group – Next Generation (STOG-NG)	01 Apr	CSO Facility Neuilly-sur-Seine FRA	NATO UNCLASSIFIED Non-NATO Invited
MSG-174	Urban Combat Advanced Training Technology Live Simulation Standards (UCATT-LSS) – 2	01 Sep	Orlando, USA	Public Release
SCI-320	Scientific Support to NNAG Above Water Warfare Capability Group	26-28 March	FOI, SWE	NATO SECRET
SCI-321	UAV Applications for Military Search	03-04 Apr	Linköping, SWE	NATO SECRET
SCI-322	Scientific Support to NATO Aerospace Capability Group 3 Sub-Group 2 (ACG3/SG2) on Suppression of Enemy Air Defence (SEAD)	13-15 Feb	CSO Facility Neuilly-sur-Seine FRA	NATO SECRET
SET-263	Swarms Systems for Intelligence Surveillance and Reconnaissance	12-13 Feb	CSO Facility Neuilly-sur-Seine FRA	Public Release Non-NATO Invited
SET-266	Multi-Functional EO/IR Sensors for Counter-Surveillance	04-05 March	CSO Facility Neuilly-sur-Seine FRA	NATO CONFIDENTIAL Non-NATO Invited
SET-268	Bi-/Multi-Static Radar Performance Evaluation Under Synchronized Conditions	14-15 March	CSO Facility Neuilly-sur-Seine FRA	NATO UNCLASSIFIED Non-NATO Invited
SET-269	EO/IR Ship Signature Dynamics	March/April	CSO Facility Neuilly-sur-Seine FRA	NATO SECRET STOEOP
SET-270	Overcoming the Technical Barriers that Inhibit use of Fuel Cells for Dismounted Soldier Applications	March/April	CSO Facility Neuilly-sur-Seine FRA	NATO UNCLASSIFIED Non-NATO Invited
SET-271	Airborne Maritime Radar Based Submarine Periscope Detection and Discrimination at High Grazing Angles	March/April	CSO Facility Neuilly-sur-Seine FRA	NATO SECRET STOEOP
SET-272	Automated Scene Understanding for Battlefield Awareness	March/April	CSO Facility Neuilly-sur-Seine FRA	NATO CONFIDENTIAL Non-NATO Invited

**Table 29: Specialists’ Meetings**

ACTIVITY	TITLE	MEETING DATES	MEETING LOCATIONS	DISTRIBUTION and PARTNER PARTICIPATION
AVT-335	Range Design and Management for Sustainable Live Fire Training Ranges	20-24 May	Slovakia	NATO UNCLASSIFIED Non-NATO Invited
AVT-336	Enabling Platform Technologies for Resilient Small Satellite Constellations for NATO Missions	20-24 May	Slovakia	NATO UNCLASSIFIED Non-NATO Invited
AVT-338	Advanced Wind Tunnel Boundary Simulation Ii	20-24 May	Slovakia	NATO UNCLASSIFIED STOEOP

ACTIVITY	TITLE	MEETING DATES	MEETING LOCATIONS	DISTRIBUTION and PARTNER PARTICIPATION
IST-167	IST Participation in ICMCIS Conference	13-17 May	Budva, MNE	Public Release
SCI-318	The Space Domain and NATO Operations: a Critical S&T Review	24-28 Jun	Torino, ITA	NATO UNCLASSIFIED Non-NATO Invited
SET-273	Multidimensional Radar Imaging and ATR	12-13 Oct 2020	CHE	NATO RESTRICTED Non-NATO Invited

**Table 30: Workshops**

ACTIVITY	TITLE	MEETING DATES	MEETING LOCATIONS	DISTRIBUTION and PARTNER PARTICIPATION
AVT-337	Anti-Tamper Protective Systems for NATO Operations	20-24 May	Slovakia	NATO UNCLASSIFIED Non-NATO Invited
IST-178	Big Data Challenges: Situation Awareness and Decision Support (A2S)	TBD	HUN	Public Release
MSG-175	Commercial Technologies and Games for Use in NATO and Nations – 16th WSh	TBD	CSO Facility Neuilly-sur-Seine FRA	Public Release

**Table 31: Technical Course**

ACTIVITY	TITLE	MEETING DATES	MEETING LOCATIONS	DISTRIBUTION and PARTNER PARTICIPATION
SAS-149	Basics of Complex Modern Urban Functions and Characteristics	Fall	Rome, ITA	NATO UNCLASSIFIED Non-NATO Invited

**Table 32: Symposia**

ACTIVITY	TITLE	MEETING DATES	MEETING LOCATIONS	DISTRIBUTION and PARTNER PARTICIPATION
MSG-171	NMSG Annual Symposium 2019	Oct	TBD	Public Release

**Table 33: Agardograph**

ACTIVITY	TITLE	MEETING DATES	MEETING LOCATIONS	DISTRIBUTION and PARTNER PARTICIPATION
SCI-314	AG-300 V.35 Ground and Flight Test Methods Used to Assure Aeroelastic Stability of Fixed Wing Aircraft	TBD	TBD	Public Release
SCI-315	AG-300 V.36 Flight Testing of Helmet Mounted Displays	TBD	TBD	Public Release

**Table 34: Support Programme**

ACTIVITY	TITLE	MEETING DATES	MEETING LOCATIONS	DISTRIBUTION and PARTNER PARTICIPATION
AVT-SP-004	Assessment of Environmental and Toxicological Impacts Associated With Ammunition: Life-Cycle Approach To Assist the Reach Regulation	NA	NA	NATO Unclassified

**Table 35: Specialist Team**

ACTIVITY	TITLE	MEETING DATES	MEETING LOCATIONS	DISTRIBUTION and PARTNER PARTICIPATION
SAS-ST-148	Recruitment and Retention of Young Civilian Scientists	Spring 2019	TBD	Public Release

## NEW 2020 ACTIVITIES BY TYPE (FIRST MEETING)

**Table 36: Task Groups 2020**

ACTIVITY	TITLE	MEETING DATES	MEETING LOCATIONS	DISTRIBUTION and PARTNER PARTICIPATION
AVT-330	Impact of Underwater Dumped Munitions and Maritime Safety, Security and Sustainable Remediation	27 April – 01 May 2020,	Canada	NATO UNCLASSIFIED Non-NATO Invited
AVT-331	Goal-driven, Multi-fidelity Approaches for Military Vehicle System-level Design	27 April – 01 May 2020,	Canada	NATO UNCLASSIFIED STOEOP
AVT-333	Best Practices for Modelling Integrated Propulsion, Power, and Thermal Subsystems for Air Vehicle Conceptual Design	27 April – 01 May 2020,	Canada	NATO UNCLASSIFIED STOEOP

**Table 37: Symposium 2020**

ACTIVITY	TITLE	MEETING DATES	MEETING LOCATIONS	DISTRIBUTION and PARTNER PARTICIPATION
MSG-176	MSG/MSCO Support to International Training & Education Conferences ITEC, I/ITSEC and CAX Forum 2020	TBD	DEU	Public Release
MSG-177	NMSG Annual Symposium 2020	TBD	GBR	Public Release

**Table 38: LTSS 2020**

ACTIVITY	TITLE	MEETING DATES	MEETING LOCATIONS	DISTRIBUTION and PARTNER PARTICIPATION
AVT-329	Nexgen Rotorcraft Impact on Military Operations	27 April – 01 May 2020,	Canada	NATO UNCLASSIFIED Non-NATO Invited

