



2023 COLLABORATIVE
PROGRAMME OF WORK
NATO SCIENCE AND TECHNOLOGY ORGANIZATION

Acknowledgements

Preface

Mr. John-Mikal STØRDAL, (NATO)

Director, Collaboration Support Office, NATO Science & Technology Organization

Action Officer

Mr. Thomas BLOOR, (NATO)

Staff Officer, Operations and Coordination Office, Collaboration Support Office, NATO Science & Technology Organization

Contribution & Supervising

Ms. Erin BOLDI, (USA)

Executive Officer, Operations and Coordination Office, Collaboration Support Office, NATO Science & Technology Organization

Col Laura REGAN, PhD (USA)

Head of Operations and Coordination Office/Assistant Chief of Staff (ACOS), Collaboration Support Office, NATO Science & Technology Organization

Interested in Joining Us?

Whether you are a government representative, a military member, a specialist from the industry, or an academic interested in any of our research topics, you can join our activities. There are two required steps in order to be a part of the CSO activities:

1. The first step is to contact your national coordinator

The national coordinator is an individual designated by the nation to facilitate his/her nation's participation in the STO. The list of institutions responsible for national coordination can be found on our website: <https://www.sto.nato.int/Pages/national-coordinators.aspx>

After you reach out to a national coordinator, they can provide you with more details on how your country is involved in activities and put you in contact with national representatives within a panel.

2. Contact Technical Committees (Panels/Group) Executive/Assistant

If you know which panel you are interested in, you can directly contact the Panel/Group Office. They will give you directions on how to join activities. Panel/Group contact information can be found here: <https://www.sto.nato.int/Pages/contactus.aspx>

Are you an academic or just interested in the use of science and technology in the military sector?

Reach out to your national coordinator who can guide you on further actions. Coordinator institutions can be found here:

<http://www.sto.nato.int/Pages/national-coordinators.aspx>

Write to a Panel Office. The list is found here:

<http://www.sto.nato.int/Pages/contactus.aspx>

Visit our website to find out what the Panels/Group do:

<http://www.sto.nato.int/Pages/sto-panels.aspx>

Where to Find the Points of Contact?

Table of Contents

Acknowledgements	i
Preface and Our Purpose	1
1. We are the Science and Technology Organization	2
2. S&T Strategy, Priorities, Strategic Initiatives and Emerging & Disruptive Technologies: What, Why and How	6
3. The STO Panels, Group and Activities	8
4. Structure of 2023 Collaborative Programme of Work	10
5. 2023 Business Meetings (PPW/PBM/STB)	11
6. Applied Vehicle Technology Panel (AVT)	12
7. Human Factors and Medicine Panel (HFM)	15
8. Information Systems Technology Panel (IST)	18
9. NATO Modelling and Simulation Group (NMSG)	20
10. System Analysis and Studies Panel (SAS)	23
11. Systems Concepts and Integration Panel (SCI)	26
12. Sensors and Electronics Technology Panel (SET)	29
13. STO Events in 2023 CPoW	34
13.1 Lecture Series in 2023	35
13.2 Technical Courses in 2023	36
13.3 Symposia in 2023	37
13.4 Workshops in 2023	41
13.5 Specialists' Meetings in 2023	42
14. Exploratory Teams	43
15. Cross-Panel Activities	46
16. CPoW in Numbers	48
Acronyms and Abbreviations	50



Table of Contents

List of Tables:

Table 1: 2023 STO CPoW Composition including ETs and SPs (as of 1 January 2023*)

Table 2: 2023 Business Meetings

Table 3: AVT Activities Continuing in 2023

Table 4: AVT Activities Starting in 2023

Table 5: HFM Activities Continuing in 2023

Table 6: HFM Activities Starting in 2023

Table 7: IST Activities Continuing in 2023

Table 8: IST Activities Starting in 2023

Table 9: NMSG Activities Continuing in 2023

Table 10: NMSG Activities Starting in 2023

Table 11: SAS Activities Continuing in 2023

Table 12: SAS Activities Starting in 2023

Table 13: SCI Activities Continuing in 2023

Table 14: SCI Activities Starting in 2023

Table 15: SET Activities Continuing in 2023

Table 16: SET Activities Starting in 2023

Table 17: 2023 Lecture Series

Table 18: 2023 Technical Courses

Table 19: 2023 Symposia

Table 20: 2023 Workshops

Table 21: 2023 Specialists' Meetings

Table 22: Exploratory Teams Continuing in 2023

Table 23: Exploratory Teams Starting in 2023

Table 24: Cross Panel Activities 2023

Table 25: Participation, Involvement, and Leadership of NATO Allies and EOPs within the 2023 STO CPoW

List of Figures:

Figure 1: STO Business Model

Figure 2: Activity Life Cycle

Figure 3: NMSG Mission Oriented Research

Figure 4: Yearly Overview of the STO CPoW TTs, ETs and SPs

Figure 5: Overview of the 2023 STO CPoW TTs, ETs and SPs per Panel and Group



Preface and Our Purpose



As we embark on a new year at the NATO Science and Technology Organization (STO) Collaboration Support Office (CSO), the global security landscape is more precarious than it has been in generations. Indeed, the climate we live in today could be described as one of permacrisis – an extended period of instability and insecurity. The Russian Federation’s war of aggression against Ukraine has brought the post-Cold War era to a crashing halt, posing the gravest risks to Euro-Atlantic peace since the 1960s; the People’s Republic of China continues to challenge Alliance interests, security and values; and climate change remains a pervasive threat to global well-being, with profound implications for security and stability.

Amid this upheaval, NATO’s mission – to guarantee the freedom and security of more than 1 billion people – becomes more important than ever. Ensuring access to the best weapons and equipment has always been essential to deterring and defending against NATO’s adversaries, and to saving the lives of Allied Nations’ warfighters in conflict. Science and Technology (S&T) are the foundation upon which such capabilities are developed, and upon which prosperous, resilient societies are built. As noted in the Strategic Concept adopted by NATO Leaders at the Madrid Summit last year, “technological primacy increasingly influences success on the battlefield”. Ensuring NATO’s technological primacy begins with the Collaborative Programme of Work (CPoW).

The CPoW aims to equip NATO and Partner Nations with the S&T they need to develop the interoperable, cutting-edge capabilities that ensure battlefield success. The engine behind this work is a unique voluntary and in-kind Collaborative Business Model that brings together 5,000 exemplary scientists and engineers in government, industry and academia from across the Alliance; collectively, they form the largest defence-focused S&T research network in the world. These scientists and engineers collaborate on more than 300 carefully selected and commonly agreed activities, with a cumulative value of around 300M euros. These activities focus on areas of critical importance to NATO militaries: cyber, space, sensors, weapons, command and control, human-machine interface, modelling and simulation, artificial intelligence, quantum technologies, and operational analysis.

The 2023 Collaborative Programme of Work publication details the publicly releasable portion of the 2023 CPoW, including a list of all ongoing projects, as decided by Nations. As such, this publication reflects current S&T priorities across the Alliance, and demonstrates the value that Nations gain through the STO collaborative business model. Through participating in the CPoW with in-kind donations, Nations benefit from the shared knowledge and technology that lead to life-saving capabilities in the battlefield, while also multiplying their own S&T investments. This form of collaboration – whereby Nations pool their resources and knowledge to strengthen capabilities and enhance interoperability – perfectly embodies the principle of collective defence upon which NATO was founded.

I am pleased that the NATO Science & Technology Board (STB) assessed the CPoW to be in “good health” last year, describing it as “the central pillar” of the STO. But we cannot rest on our laurels. The CPoW must continue to evolve in response to shifting geopolitical climates and National priorities. To that end, the STB last year established an Informal Working Group to holistically evaluate the STO and recommend steps to ensure that the CPoW remains fit for purpose into the future. This initiative, “CPoW 2030”, is both valuable and timely, and will be critical to ensuring that the CPoW remains the “forum of choice” for collaborative defence S&T for decades to come.

At the Collaboration Support Office (CSO), we have already begun assessing the CPoW from top to bottom, and will deliver concrete recommendations for reform to the STB by the end of 2023. At the same time, we have moved forward with several ongoing initiatives to rejuvenate and revitalise the collaborative network. These include “CPoW Challenges”, an STB initiative that identifies key topics to provide the CPoW with programmatic focus for the medium-term, and to build momentum in its planning and development. Four Nations are already moving forward on these Challenges with some early results, and more will soon follow.

Another key initiative is our early-career scientists programme, which, together with the Technical Committees, seeks to strengthen the resilience and diversity of our network through engaging with a broader range of young scientists and engineers and analysts. This programme is crucial to both ensuring the longevity of the CPoW and improving the quality of its outputs. As the STB has noted, the CPoW is “the STO’s main contribution to developing modern interoperable capabilities”, and it would not be possible without the tireless commitment and dedication of the scientists, analysts, and engineers in our network – and particularly the STO Technical Committees, the Panels, and Group that manage the core of our business. This network has demonstrated tremendous resilience over the past year, and I am proud to see that our scientific activities are recovering from the effects of the COVID-19 pandemic, as this publication makes clear.

I am also confident that our work will only become more critical in the coming years, as Nations navigate an increasingly complex threat landscape. S&T provides the foundation upon which life-saving capabilities, weapons, and equipment are developed; and as it evolves, I am confident that the CPoW will continue to play a fundamental role in empowering NATO’s technological edge, and in fulfilling our mission to protect the freedom and security of our citizens.

John-Mikal STØRDAL

Director, STO Collaborative Support Office

1. We are the Science and Technology Organization

Science and Technology Organization (STO): who are we?

Science and Technology (S&T) research has a rich and persistent history within NATO and celebrated its 70th anniversary in 2022. The predecessor to the STO, the Advisory Group for Aerospace Research and Development (AGARD), was formed in 1952 and served as a testbed for scientific cooperation among the early NATO Nations. Since then, NATO S&T research has broadened in scope and the STO network has grown into the largest international network of defence and security scientists, engineers, and analysts in the world.

The STO is a NATO subsidiary body created to meet the collective S&T needs of NATO. The STO takes its authority from the 2012 Charter of the NATO Science and Technology Organization and is guided by the 2018 NATO Science & Technology Strategy and well as the 2016 NATO Science & Technology Board STO Corporate Strategy. According to the STO Corporate Strategy:



Von Karman and the NATO Team

“The STO plans and delivers a Programme of Work (PoW) that covers a broad spectrum of defence and security related S&T. The STO PoW contributes to capability development, supports threat mitigation, and provides advice to decision makers. The STO welcomes participants and contributors from Allied and Partner Nations, coming from government, industry, or academia. In pursuing this mission, the STO positions S&T to the strategic advantage of Nations and NATO, thereby supporting the core tasks of the Alliance.”

How are we organised and governed?

Within the NATO organisational structure, the STO falls under the North Atlantic Council (NAC) and reports to both the NAC Military Committee and the Conference of National Armament Directors (CNAD). The STO is governed by the Science & Technology Board (STB). Comprised of senior national defence S&T leaders, the STB is responsible for developing and maintaining the strategic guidance for S&T in NATO, promoting synergies across stakeholders while respecting their individual responsibilities and authorities. The STB exercises governance through the following executive bodies which lead the organisation:

- **The Office of the Chief Scientist (OCS)** provides executive and administrative support to the Chief Scientist to exercise his/her role as a Chair of the Science & Technology Board and as the primary Scientific Advisor for NATO. The OCS promotes the exploitation of the results generated within the CPoW to numerous internal stakeholders and partners.
- **The Collaboration Support Office (CSO)** located in Neuilly-sur-Seine, France, is one of the three STO executive bodies. It provides executive and administrative support to the activities within the Collaborative Programme of Work (CPoW), maintains an active network of approximately 5,000 scientists, engineers, and analysts and manages six Technical Panels and one Group that organise technical activities.
- **The Centre for Maritime Research and Experimentation (CMRE)** organises, conducts scientific research and technology development, and delivers innovative and field-tested S&T solutions in the maritime domain to address the defence and security needs of the Alliance.

The STO PoW is comprised of two primary components, which follow two different business models:

1. The Collaborative Programme of Work (CPoW) managed by the Collaboration Support Office, which follows a collaborative business model where scientists, engineers, and analysts are resourced by their Nations or organisations; and
2. The Centre for Maritime Research and Experimentation Programme of Work, which follows an in-house delivery business model where research is customer funded.

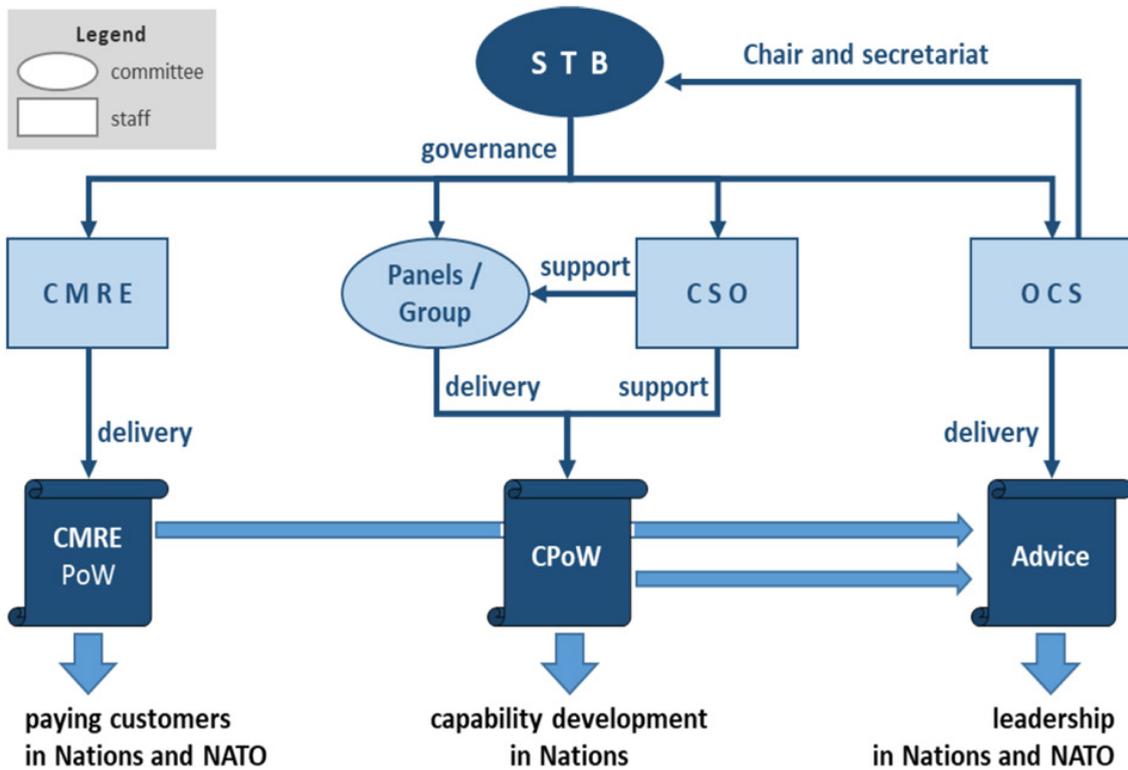


Figure 1: STO Business Model

How does the CSO enable NATO’s technological edge?



The CSO provides NATO Nations and Partner Nations with a technical forum whereby scientists, engineers, and analysts can define, conduct and promote cooperative research and information exchange. The CSO runs its many activities through a collaborative business model, in which the STO provides a forum whereby NATO Nations and Partner Nations elect to use their national resources to define, conduct and promote cooperative research and information exchange. The CSO does not perform in-house research itself, but instead, facilitates collaborative research amongst the Nations. This business model acts as a force and resource multiplier maximising Nations’ return on investment. The international collaborative programme of work is carried out in 7 different technical areas. These technical areas are represented by 6 Panels and 1 Group running their scientific efforts within several types of activities (see Sections 6 – 12).

An example of empowering our technological edge

A few years ago, a Nation came forward with a problem: how could we improve the mobility of military vehicles across different terrains? Immobilised vehicles were a serious operational challenge for this Nation, and it remains relevant today, as the Ukraine war has shown. When this problem was shared among NATO and Partner Nations in the Network, it turned out that 14 others were either already working to address it, or planned to begin working on it. The CSO enabled a team of 53 scientists and engineers from different nations to come together, and after three years, this group came up with a solution – the *Next-Generation NATO Reference Mobility Model*. Nations now have the digital tools to interpolate how vehicles will behave in certain environments. The NG-NRMM enables military decision makers, procurement agencies and warfighters to make the most accurate and precise predictions possible, while improving interoperability across NATO through strong standards. This example is just one of the 300 activities under way within the Collaborative Programme of Work. For digital readers, you can see the summary video [here](#).



Activity lifecycle

The Panels/Group take the initiative to create technical activities based upon guidance from the Nations, and initiatives from the Panels/Group scientific community. The Panels/Group usually meet twice a year (in spring and fall) during Panel (Group) Business Meetings (BMs) which are medium-scale 2 to 5-day events. Technical activities are organised in teams of national experts with clearly defined scopes and products as goals at the end of the activity.

The activity lifecycle is depicted in the Figure 2:

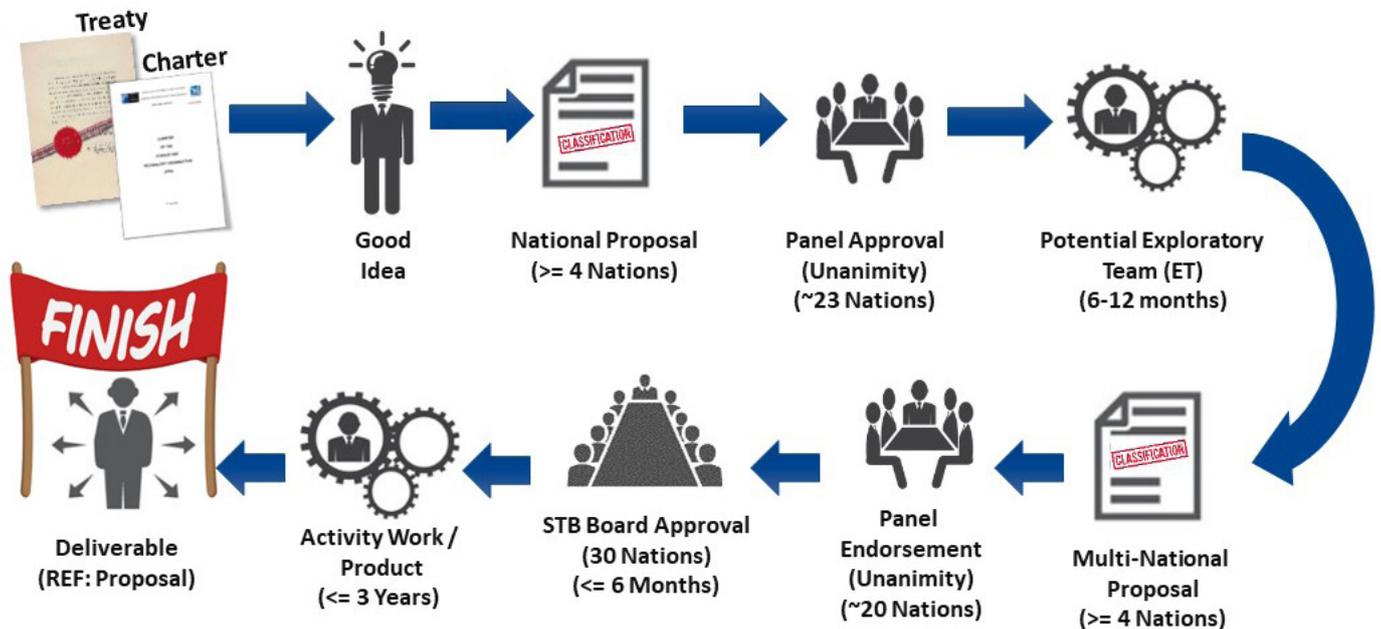


Figure 2: Activity Life Cycle

Ideas for new activities may originate from the Nations, the scientists/engineers/analysts from within the network, Panel Members, or NATO bodies. However, it is mandatory that the activity be supported by a minimum of at least 4 Nations before being initiated.

After an activity draft has been put together, a Technical Activity Proposal (TAP) is presented to the Panels/Group for decision prior to the upcoming PBMs. After the submission, the TAP must be approved unanimously by the Panel/Group. After the PBM, the new activities, which have been endorsed by the Panel, are submitted to the STB for approval through a 2-week silence procedure. Following the silence procedure, the activity is officially endorsed, provided that no objection is raised during the 2 weeks.

Depending on the type of an activity, a variety of final deliverables are possible, such as a technical report, a cooperative demonstration of technology or a meeting proceedings publication, etc.



All unclassified STO scientific publications are available on our website at: www.sto.nato.int

2. S&T Strategy, Priorities, Strategic Initiatives and Emerging & Disruptive Technologies: What, Why and How

The Collaborative Programme of Work (CPoW) is a tool designed to answer the Nations' needs and the NATO requirements within the field of defence and security S&T research. Therefore, its construct is based on the strategic orientation provided by the Nations, the Panels/Group during their business meetings, and the higher NATO centralised organisation. Ultimately, the Nations, through the S&T Board (STB), remain the collective authority deciding on how the CPoW should develop.

As a first reference, the NATO S&T Strategy provides the overarching guidance to steer the NATO S&T community's efforts in a coherent direction, establishing broad goals, defining Lines of Effort (LoEs), and investment areas. In this three-tier vision, the five LoEs drive the Strategy. The LoEs set the level of ambition to include the following:

1. Stay at the forefront of S&T to outperform our competitors;
2. Recognize partnerships as a strength;
3. Encourage technical demonstrations to reduce the gap between research and actual delivery of capabilities;
4. Aim at improving the Alliance decision-making, in all compartments (operations, planning, etc.); and
5. Concentrating the efforts on Nations and NATO crucial requirements to achieve visible and valuable results.

This Strategy appeals to pragmatism, efficiency, the will to share and cooperate, and lastly excellence.

A visionary document, the NATO S&T Strategy is complemented by a more practical document, the NATO S&T Priorities guidance, linking the strategic thoughts to actionable S&T priorities. Anticipating foreseeable military requirements, the NATO S&T Priorities guidance serves to steer medium- to long-term S&T planning across the NATO S&T community and to inform smart investment decisions in Nations. The Priorities are currently organised into 10 S&T Areas, broken down into 42 specific Targets of Emphasis (ToEs). These ToEs serve as key driving references, either to inspire new activities, or to verify that the envisaged new projects are consistent with the NATO S&T Priorities. The current NATO S&T Priorities were adopted in 2017.

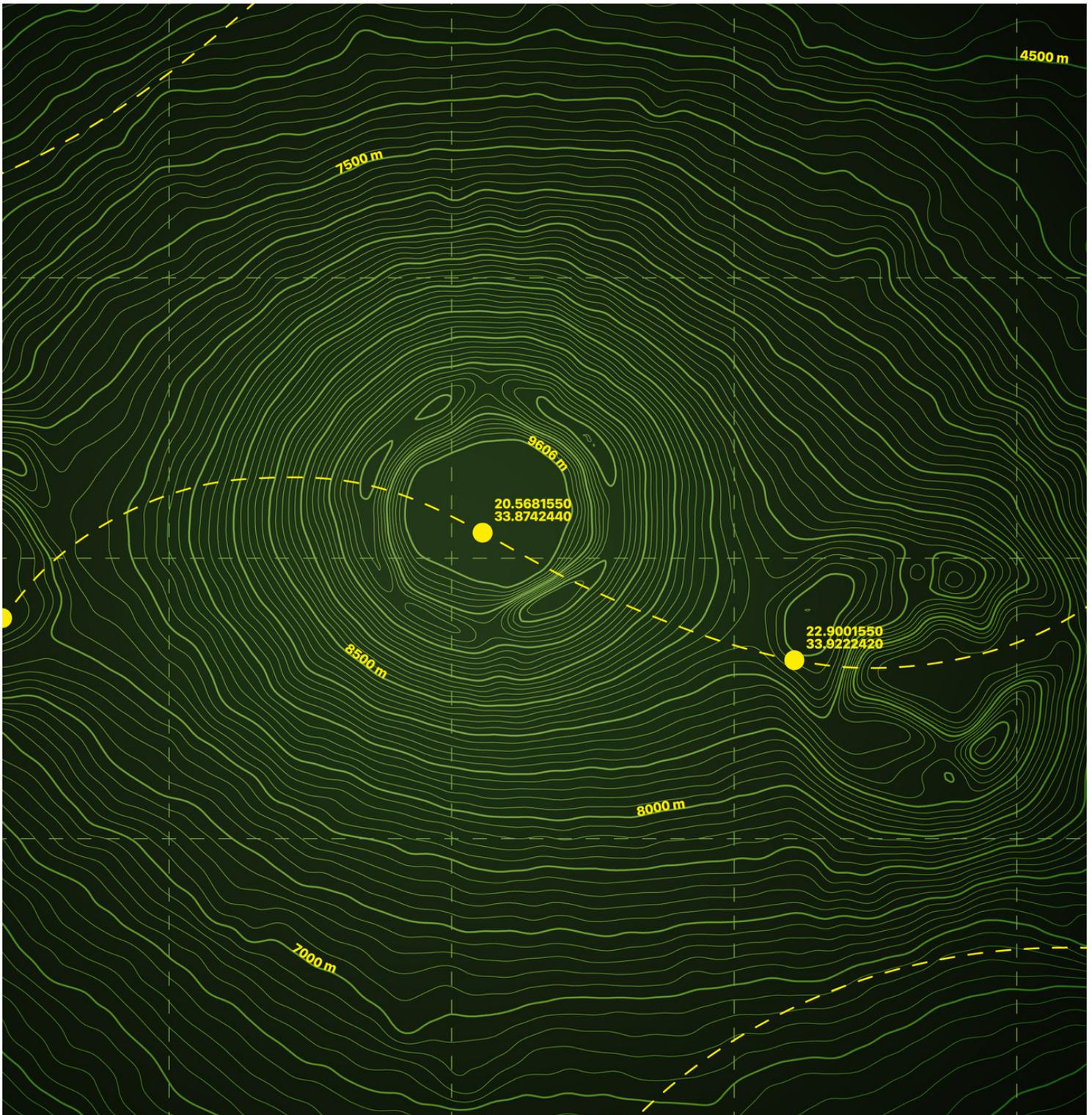
Aside from the S&T Priorities that provide valuable orientation to develop standard CPoW activities, the STB acknowledged the need for more tailored tools and procedures to focus on specific strategic cross-domain areas, topics or problems. The Strategic Initiatives address this need. Their purpose is to focus the attention of the NATO S&T community on important emerging technical challenges and opportunities, to address them from a comprehensive perspective, and to achieve results that are beyond the reach of individual stakeholders or specialised Panels and Group. In a practical sense, they help create communities of interest in specific domains across the whole S&T community, and they capitalise on, orient, and bring coherence to the Panels and Group activities while dealing with strategic S&T matters. The Von Karman Horizon Scanning (VKHS) studies, in particular, aim to deliver short-term focused studies (usually 1-year long studies) to enlighten senior leadership on emerging and/or disruptive S&T issues.

The above-mentioned set of guiding documents, tools and



procedures provides the STO community with the relevant and necessary means and frameworks to address the increasing emphasis that the NATO political and military leadership places on Emerging and Disruptive Technologies (EDTs). In October 2019, the Alliance Defense Ministers approved a (classified) Roadmap document that now focuses on eight separate EDTs. In 2023, the STO community continues to concentrate on developing knowledge and understanding of these EDTs, combined in clusters that associate S&T areas with operational functions.

The NATO S&T Strategy, the S&T Priorities, the Strategic Initiatives, and the Emerging and Disruptive Technologies Roadmap, supplemented by the future Roadmap Implementation Strategy, are key strategic guidance to address vital National S&T requirements. In 2023, they will find practical application through the work achieved during the Plans and Programmes Workshop and the Panels/Group Business Meetings, to successfully frame and execute the CPoW.



3. The STO Panels, Group and Activities

The success of the CPoW hinges upon effective project management of the technical activities. The six Technical Panels responsible for a wide range of research activities and a Group specialising in modelling and simulation are the lifeblood of the CPoW and comprise the scientific and technical committees. These Panels/Group are comprised of national and NATO Body representatives as well as recognised world-class scientists, engineers and analysts. They are responsible for proposing and managing the scientific work programme. In addition to providing critical technical oversight, they also provide a key link to military users and other NATO entities.

The current Level 2 committee structure consists of the following six Panels and one Group:

- Applied Vehicle Technology (AVT)
- Human Factors and Medicine (HFM)
- Information Systems Technology (IST)
- System Analysis and Studies (SAS)
- Systems Concepts and Integration (SCI)
- Sensors and Electronics Technology (SET)
- NATO Modelling and Simulation Group (NMSG)

The Programme of Work of each Panel/Group is carried out by Technical Teams made up of national experts. Prior to launching a Technical Team, when a Panel/Group believes that a particular expertise is required to assist or advise it on the technical merit or feasibility of a specific proposal, an **Exploratory Team (ET)** is established. Therefore, an ET is the Panels' and the Group's instrument to carry out a feasibility/pilot study to establish whether a research idea is worth investing resources for the longer term.

During the semi-annual business meeting, each NATO nation in the Panel/Group is polled to determine if it is willing to allocate resources and participate in a future ET on the topic. If the Panel/Group supports the initiative, the ET finalises the TAP and submits it to the Panel/Group Office for revision. The ET step is sometimes omitted if the idea has strong support and can go straight into a Technical Activity. It is, however, an essential probative instrument for scientists, engineers and analysts who wish to scope their proposal for a Technical Team.

Technical Teams are assigned by the Panels/Group to perform specific tasks such as:

- Research Task Group (**RTG**) – study group, up to 3 years
- Cooperative Demonstration of Technology (**CDT**)
- Field Trial (**FT**)
- Research Lecture Series (**RLS**) – junior and mid-level scientists
- Research Technical Course (**RTC**)
- Research Workshop (**RWS**) – selected participation, 2 – 3 days
- Research Specialists' Meeting (**RSM**) – up to 100 people, 2 – 3 days
- Advanced Guidance for Alliance Research and Development (**AG – AGARDograph**)
- Long-Term Scientific Study (**LTSS**)
- Multi-National Exercise (**MNE**)
- Military Application Study (**MAS**)
- Specialist Team (**ST**) – quick reaction
- Research Symposia (**RSY**) – more than 100 people, 3 – 4 days
- Support Project (**SP**)





A Research Task Group (RTG) allows researchers in different nations to work together in order to solve a particular scientific research and technology development problem. RTGs are sponsored by the Panel/Group to meet the needs of the Nations and NATO. RTGs are chartered for a maximum of three years after the initial meeting. Among the activities conducted during an RTG, a **Cooperative Demonstration of Technology (CDT)** or **Field Trial (FT)** may be organised. The findings will be documented in an STO publication (Technical Report or Technical Memoranda).

A Research Lecture Series (RLS) disseminates state-of-the-art scientific knowledge among junior and mid-level scientists, engineers and analysts in militarily-relevant domains that are not taught in universities. An RLS is a two-day educational event that is normally organised at three different locations. RLSs are combined with an STO publication (Educational Notes), which will be made available before the first RLS session.

A Research Technical Course (RTC) is an educational activity aimed at transferring practical knowledge and recent field developments through on-site instructor training or lectures to military decision makers. The material is tailored to a specific/specialised audience and is generally more operational in nature than RLS. An RTC can be offered up to a maximum of four times lasting from one to three days. A STO publication is not always provided for an RTC.

A Research Workshop (RWS) facilitates intensive information exchange and focused discussion on a specific topic among a limited number of invited experts. The prime purpose of a RWS is to enhance the capability of the NATO S&T community to respond adequately to the military requirements of NATO. An RWS (generally not more than 30 participants) is a two to three-day event with no prescribed format. A RWS results in an STO publication (Meeting Proceedings).

A Research Specialists' Meeting (RSM) promotes exchange of state-of-the-art knowledge among an audience of specialists on an important scientific or applied topic. The prime purpose of an RSM is to enhance the capability of the NATO S&T community to respond adequately to the military requirements of NATO. An RSM is a medium-scale (usually less than 100 participants), two to three-day event with invited speakers. Communications are primarily via invited keynote addresses and via oral presentations of authors invited by the Programme Committee. RSMs should include a roundtable discussion. An RSM results in an STO publication (Meeting Proceedings).

An AGARDograph (Advanced Guidance for Alliance Research and Development – AGARD) pertains to a single, clearly defined technical subject and comprises material generally agreed to be of lasting interest and value to the technical and war fighter communities represented throughout NATO. The AG material may be the work of a single author or be the coordinated and edited contributions of several authors. An AG team is chartered for a maximum of three years.

A Long-Term Scientific Study (LTSS) provides recommendations to NATO and National Authorities from the assessment of the impact on military operations that might be expected from developments in science and technology over both the medium- and long-term (typically 10 – 20 years). This typically includes how emerging technologies, systems and methods may affect tactical concepts and doctrines. An LTSS is chartered for three years after the initial meeting. Among the activities conducted during an LTSS, a brainstorming meeting, called a **Multi-National Exercise (MNE)**, is organised. An LTSS results in an STO publication (Technical Report) and in presentations to various NATO or national authorities.

A Military Application Study (MAS) is a short-term rapid-reaction study that assesses the application of technology to operational procedures to solve operational and equipment deficiencies.

Specialist Teams (ST) come together as a short-term reaction to requests. They often deal with specialist research that falls outside of the Programme of Work.

Research Symposia (RSY) aim at promoting exchange of state-of-the-art knowledge amongst a wide audience on an important scientific or applied topic. Keynote addresses, oral and poster presentations of submitted papers are conducted. An RSY results in an STO publication.

Support Project (SP) is an individual national project delivered by a supported nation with assistance from supporting nations.

4. Structure of 2023 Collaborative Programme of Work

As of 1 January 2023, the total number of ongoing activities in the STO CPoW is 266. This figure represents the sum of the number of activities that started before 2023 and will be still active in 2023 as well as number of new activities that will begin in 2023. Exploratory Teams (ETs) and Support Projects (SPs) are not formally considered as STO CPoW Technical Teams because their creation doesn't normally require the approval from the Science and Technology Board (STB).

Table 1: 2023 STO CPoW Composition including ETs and SPs (as of 1 January 2023*)

ACTIVITY TYPE		PANEL GROUP							TOTAL
		AVT	HFM	IST	NMSG	SAS	SCI	SET	
Task Group	RTG	29	37	19	16	25	27	43	196
Agardograph	AG	-	-	-	-	-	2	-	2
Long-Term Scientific Study	LTSS	1	1	-	-	-	-	-	2
Lecture Series	RLS	4	-	-	1	-	1	4	10
Specialists' Meeting	RSM	6	-	3	-	1	2	5	17
Symposium	RSY	1	2	3	2	1	-	3	12
Technical Course	RTC	-	1	-	1	1	-	-	3
Workshop	RWS	4	2	1	2	2	-	3	14
Specialist Team	ST	1	1	-	6	1	-	1	10
Total STO CPoW		46	44	26	28	31	32	59	266
Exploratory Team	ET	14	18	7	-	8	5	8	60
Support Project	SP	4	-	-	-	-	-	-	4
Total including ETs and SPs		64	62	33	28	39	37	67	330

A Panel/Group may set up an Exploratory Team (ET) when it believes that a particular expertise is required to assist or advise the Panel/Group on the technical merit or feasibility of a specific proposal for a technical activity. ETs may also be used to help the Panel/Group develop recommendations on future content of the Panel/Group's Programme of Work.

The STB will approve the Support Programme as part of the STO Collaborative Programme of Work and Budget each year but will not normally be asked to approve individual Support Projects except in one specific case: If a project is anticipated to consume 10 per cent or more of the approved budget for the entire Support Programme, it will be presented to the STB for discussion and approval.

Note: The data presented in this document provides information regarding the ongoing STO CPoW Technical Teams, Exploratory Teams and Support Projects that will be ongoing in 2023. The content of the document is viewed as dynamic in nature. After the Spring Panel and Group Business Meetings the Panels and the Group will endorse new activities that will be submitted to the STB for approval. The number of new activities varies each year.

5. 2023 Business Meetings (PPW/PBM/STB)

All major Science and Technology Organizations business meetings are listed in Table 2.

Table 2: 2023 Business Meetings

2023 PBM/STB/PPW		MEETING DATES	MEETING LOCATION
P/G	Plans & Programmes Workshop (PPW)	15 – 17 Feb	Paris (FRA)
AVT	Spring PBM	21 – 26 May	London (GBR)
	Fall PBM	08 – 13 Oct	Bastad (SWE)
HFM	Spring PBM	24 – 28 Apr	Warsaw (POL)
	Fall PBM	16 – 20 Oct	Madrid (ESP)
IST	Spring PBM	15 – 19 May	Skopje (MKD)
	Fall PBM	02 – 06 Oct	Amsterdam (NLD)
NMSG	Spring BM	15 – 19 May	Bled (SVN)
	Fall BM	16 – 20 Oct	Monterey, CA (USA)
SAS	Spring PBM	10 – 12 May	Harstad (NOR)
	Fall PBM	01 – 03 Nov	Laurel, MD (USA)
SCI	Spring PBM	08 – 12 May	Koblenz (DEU)
	Fall PBM	16 – 20 Oct	Sofia (BGR)
SET	Spring PBM	24 – 27 Apr	Bath (GBR)
	Fall PBM	11 – 13 Oct	Copenhagen (DNK)
STB	Spring STB	21 – 22 Mar	NATO HQ
	Fall STB	20 – 22 Sept	Espoo (FIN)



6. Applied Vehicle Technology Panel (AVT)

Panel Chair: **Dr. Tom THORVALDSEN (NOR)**

Panel Executive: **Mr. David KLASSEN (DEU)**

Panel Vice-Chair: **Mr. Christoph MUELLER (DEU)**

Panel Executive Assistant: **Ms. Ezgi YAZICIOGLU (NATO)**

Mission

The Applied Vehicle Technology Panel strives to improve the performance, reliability, affordability, and safety of vehicles through advancement of appropriate technologies. The Panel addresses platform technologies for vehicles operating in all domains – land, sea, air, and space, for both new and ageing systems.

To accomplish this mission, the members of the AVT community, comprising more than 1,200 participants, exploit their joint expertise in the fields of **(1) Mechanical Systems, Structures and Materials; (2) Propulsion and Power Systems; and (3) Performance, Stability and Control, Fluid Physics;** which are augmented by committees bolstering strategic guidance, scientific excellence and bi-national support.

By carrying out biannual Business Meeting weeks including discussions of all of its sponsored activities, the Panel guarantees the use of NATO's, as well as national resources in the most effective and efficient way. Generating synergies by multi-disciplinary and domain overarching approaches; building productive partnerships by a healthy mix of academic scientists, governmental researchers, military operators and industrial engineers; providing timely and targeted advice to NATO and Nations; and striving for scientific excellence are built into the Panel's work ethic.

Main Interests

The expertise of the Applied Vehicle Technology Panel covers a broad range comprising cross-cutting and technical focus areas. In alignment with its mission statement, the Panel is the STO's focal point for:

- Assessment of and multi-disciplinary cooperations on Hypersonic Vehicles;
- Further development and integration of Autonomous Vehicles in all domains;
- Screening and evaluation of novel Materials, Structures and Manufacturing Technologies for military applications;
- International collaboration on a Holistic Virtual Design approach for manned and unmanned future Combat Air Platforms;
- Determination and further compiling of innovative Propulsion as well as Power System Technologies for military purposes;
- Coordination and development of a Future Rotorcraft Requirement trade-space including maturing of key technologies;
- Assessment and advancement of Warship and Fleet Design capabilities;
- Standardisation and implementation of a Sustainable Use of Munitions across their life-cycles;
- Evaluation and integration of Software-Based Applications on the design, handling and service of platforms; and
- Sustainment and Life-Cycle Costs considerations of new and ageing platforms as well as fleet considerations.

Table 3: AVT Activities Continuing in 2023

ACTIVITY	ACTIVITY TYPE	TITLE
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-300	RTG	Naval Ship Manoeuvrability in Ice
AVT-311	RTG	Availability and Quality Issues with Raw Materials for Rocket Propulsion Systems and Potential Consequences for NATO
AVT-315	RTG	Comparative Assessment of Modelling and Simulation Methods of Shipboard Launch and Recovery of Helicopters
AVT-318	RTG	Low Noise Aeroacoustic Design for Turbofan Powered NATO Air Vehicles
AVT-331	RTG	Goal-Driven, Multi-Fidelity Approaches for Military Vehicle System-Level Design
AVT-332	RTG	In-Flight Demonstration (CDT) of Icephobic Coating and Ice Detection Sensor Technologies
AVT-333	RTG	Integration of Propulsion, Power, and Thermal Subsystem Models into Air Vehicle Conceptual Design
AVT-341	RTG	Mobility Assessment Methods and Tools for Autonomous Military Ground Systems
AVT-342	RTG	Interoperability of Additive Manufacturing in NATO operations
AVT-343	RTG	Novel Materials to Mitigate Rare Earth (RE) Criticality in High Speed Motors
AVT-344	RTG	Assessment of Micro Technologies for Air and Space Propulsion
AVT-345	RTG	Unified Tactical Missile Kinetic Performance Model
AVT-346	RTG	Predicting Hypersonic Boundary-Layer Transition on Complex Geometries
AVT-347	RTG	Large-Amplitude Gust Mitigation Strategies for Rigid Wings
AVT-348	RTG	Assessment of Experiments and Prediction Methods for Naval Ships Manoeuvring in Waves
AVT-349	RTG	Non-Equilibrium Turbulent Boundary Layers in High Reynolds Number Flow at Incompressible Conditions
AVT-350	RTG	Innovative Control Effectors for Manoeuvring of Air Vehicles – Advanced Concepts
AVT-351	RTG	Enhanced Computational Performance and Stability & Control Prediction for NATO Military Vehicles
AVT-352	RTG	Measurement, Modelling and Prediction of Hypersonic Turbulence
AVT-358	RLS	Advanced Computational Fluid Dynamics Methods for Hypersonic Flows
AVT-359	LTSS	Impact of Hypersonic Operational Threats on Military Operations and Technical High Level Requirements
AVT-362	RTG	Water Sampling, Monitoring and Control/Remediation for Live-Fire Military Ranges

ACTIVITY	ACTIVITY TYPE	TITLE
AVT-363	RTG	Improving the Understanding of Risks from Exposure to Munition Combustion Products
AVT-367	RTG	Sea-Ice Collision Risk Prediction and Mitigation for Naval Ships
AVT-369	RSY	Digital Twin Technology Development and Application for Tri-Service Platforms and Systems
AVT-371	RWS	Materials and Technologies for Electro-Optical Camouflage (Cross-Panel)
AVT-372	RSM	Military Value of Graphene Technologies
AVT-373	RSM	Emerging Technologies for Proactive Corrosion Maintenance
AVT-374	RWS	More Electric Gas Turbine Engines for Aircraft, Rotorcraft and UAVs
AVT-375	RLS	Munition Health Management Lecture Series: Implementation Challenges
AVT-376	RTG	Methodology for Tactical Missile IR Signature Predictions
AVT-377	RLS	Introduction to Quantum Computing in Fluid Dynamics
AVT-378	RTG	Progressive Rotorcraft Propulsion Alternatives
AVT-SCI-379	RWS	Technologies Needs for Hypersonic Operational Threats (TecNHOT)

Table 4: AVT Activities Starting in 2023

ACTIVITY	ACTIVITY TYPE	TITLE
AVT-368	RTG	Data Fusion and Assimilation for Scientific Sensing and Computing
AVT-370	RTG	Characterization of Structure-Borne Noise in Military Vehicles
AVT-384	RSM	Novel Materials and Manufacturing in Military Vehicle Design
AVT-385	RLS	Multi-Fidelity Methods for Multidisciplinary Design Optimisation
AVT-391	RSM	Advanced Wind Tunnel Boundary Simulation III
AVT-393	RWS	Environmental and Thermal Barrier Coatings for Military Aircraft Engines
AVT-394	RSM	Water Sampling, Monitoring and Control/Remediation for Live-Fire Military Ranges
AVT-397	RTG	Sustainable Aviation Fuel (SAF) in Military Context
AVT-SET-396	RSM	Technological Challenges for Hypersonic Flights
AVT-ST-009	ST	Technical Support to NATO Next Generation Rotorcraft Capability (NGRC)

7. Human Factors and Medicine Panel (HFM)

Panel Chair: **Dr. Janet BLATNY (NOR)**

Panel Executive: **Lt Col Erik LAENEN (NLD)**

Panel Vice-Chair: **Dr. Patrick MASON (USA)**

Panel Executive Assistant: **Ms. Marie LINET (NATO)**

Mission

The mission of the Human Factors and Medicine Panel is to provide the science and technology base for optimising health, human protection, well-being, and performance of the human in operational environments with consideration of 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.

Main Interests

Combat Casualty Care: Science and Technology (S&T) development in the field of combat casualty care must change and innovate on pace with and synchronous with the advancement of weapon systems and battlespace tactics, techniques, and procedures that will create novel military operational environments. Current combat casualty care and medical planning guidelines are based on rapid evacuation to damage control surgery and critical care. Future operational environments will considerably affect NATO forces' ability to adhere to these guidelines and medically evacuate casualties to provide life, limb, and eyesight saving treatments in a timely manner.

Chemical, Biological and Radiological Defence: Major changes in the security policy and the geopolitical and military situation as well as evolving agent and weapon technologies influence the Chemical, Biological, Radiological and Nuclear (CBRN) threat and defence. Consequently, CBRN defence requires closer collaboration between military and civilian sectors. Based on the threat out to 2030, S&T areas that can support CBRN defence need to be identified.

Human-Autonomy Teaming: Based on progress in Robotics, Artificial Intelligence and Human Performance Modelling, Human-Agent-Robot Teamwork (HART) systems are being developed and tested in which humans and autonomy dynamically adjust and cooperate to accomplish a joint objective, often in shared spaces. In these systems, team member's responsibilities and commitments are managed such that the human and automation jointly enhance performance and manage contingencies.

Cognitive Warfare: The change towards a more uncertain world where threats are impacting both military and civilian domains simultaneously requires a stronger hand-shake between security and defence to respond and mitigate these various threats. Hybrid methods, such as propaganda, deception, sabotage, and other non-military tactics have been used throughout the history of warfare to undermine adversaries from within. Along with the speed of technological/digital tools, these methods have increased and become more available for "all actors" use and is an element to share and control information faster.

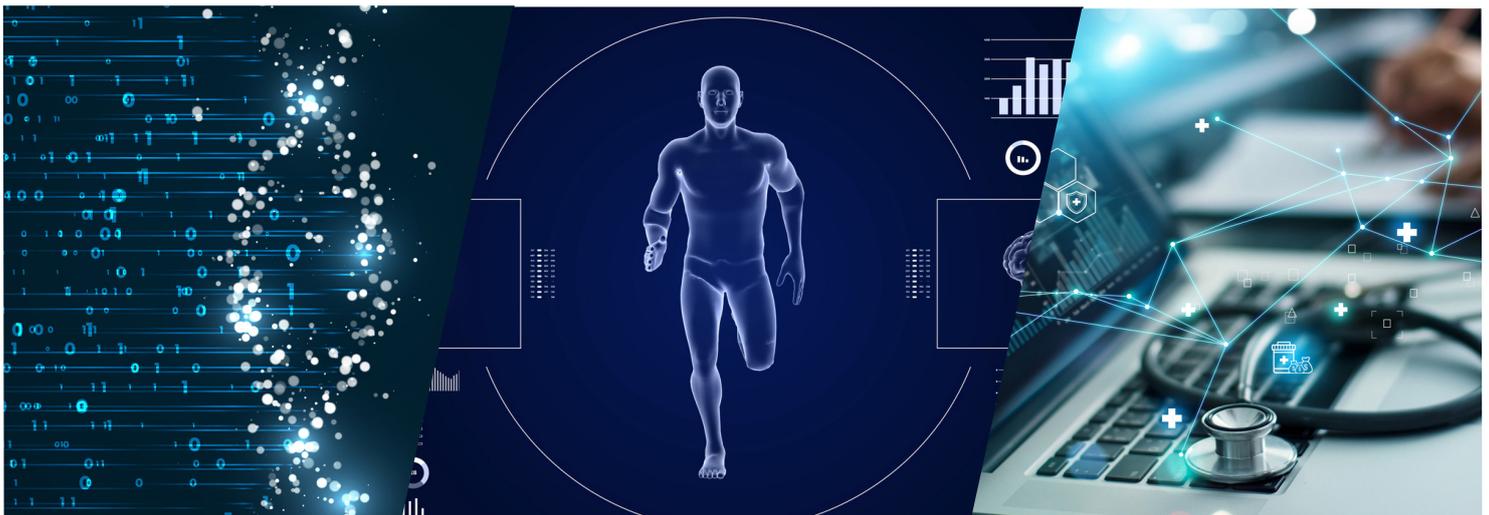


Table 5: HFM Activities Continuing in 2023

ACTIVITY	ACTIVITY TYPE	TITLE
HFM-274	RTG	The Impact of Hypobaric Exposure on Aviators and High-Altitude Special Operations Personnel
HFM-281	RTG	Personalized Medicine in Mental Health and Performance
HFM-285	RTG	Speech Understanding of English Language in Native and Non-Native Speakers/Listeners in NATO With and Without Hearing Deficits
HFM-294	RTG	Big Data In The Military: Integrating Genomics into the Pipeline of Standard-Care Testing & Treatment
HFM-299	RTG	Pulmonary Screening and Care in Aviators
HFM-306	RTG	Translating Medical Chemical Defence Research into Operational Medical Capabilities Against Chemical Warfare Agent Threats
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-316	RTG	Expert Panel for State of the Art Cardiovascular Risk Assessment in Aircrew and Other High Risk Occupations
HFM-317	LTSS	Solutions for Combat Casualty Care
HFM-318	RTG	Personnel Retention in the Armed Forces
HFM-319	RTG	Measuring the Cognitive Load on the Soldier
HFM-320	RTG	Fatigue Management in Aircrew
HFM-325	RTG	Performance Nutrition for Fresh Feeding during Military Training and Operations
HFM-326	RTG	Diet Supplementation for Military Personnel
HFM-327	RTG	Development of a NATO STANREC for Physiological Status Monitoring to Mitigate Exertional Heat Illness
HFM-329	RTG	A Psychological Guide for Leaders Across the Deployment Cycle
HFM-330	RTG	Human Systems Integration for Meaningful Human Control Over AI-based Systems
HFM-331	RTG	Biomedical Bases of Mental Fatigue and Military Fatigue Countermeasures
HFM-332	RTG	Development and Implementation of Autonomous Transport and Medical Systems for Casualty Evacuation
HFM-338	RTG	Development of Military Loading Exposure Guidelines for Prevention of Chronic Traumatic Encephalopathy
HFM-341	RTG	Validation of Modelling and Simulation Methodologies for Human Lethality, Injury and Impairment from Blast-Related Threats
HFM-342	RTG	C2 Capability Lifecycle Governance

ACTIVITY	ACTIVITY TYPE	TITLE
HFM-343	RTG	Digital Teaching Networks: Fostering Digital Collaboration Among Teachers, Trainers, Instructors, and Coaches in the Military
HFM-344	RTG	Human Impact Exposure Onboard High Speed boats
HFM-345	RTG	Operations Security and Susceptibility to Influence in the Information Environment
HFM-347	RTG	Military Service Member and Veteran Domestic Radicalization
HFM-349	RSY	Human Performance and Medical Treatment and Support During Cold Weather Operations
HFM-352	RTG	Moral Challenges in the Future Security Environment (FSE): Guidance for Leaders
HFM-358	RTG	Microbiome Applications in Human Health and Performance
HFM-359	RTG	Ionizing Radiation Bio Effects and Countermeasures
HFM-361	RSY	Mitigating and Responding to Cognitive Warfare
HFM-363	RWS	Understanding of Military Culture to Support Organisational Change: Systems Approaches, Critical Analyses, and Innovative Research Methods
HFM-364	RTC	Aerospace Medicine: RAMS USAF/NATO Flight Surgeons Conference STO HFM
HFM-AVT-340	RTG	Neuroscience-Based Technologies for Combat-Oriented Crew Cockpit Design and Operations
HFM-MSG-346	RTG	Assessment of Factors Impacting Cybersickness
HFM-MSG-354	RTG	Study, Design, Building and Deployment of a CBRN XR Training Platform
HFM-SAS-357	RTG	Standards for Military Personnel Data and Analytics Exchanges
HFM-SCI-351	ST	Verification in Trust Enabled Regimes (VITER)
HFM-SET-353	RTG	Operational CBR Threat Situational Awareness

Table 6: HFM Activities Starting in 2023

ACTIVITY	ACTIVITY TYPE	TITLE
HFM-365	RTG	Human Capability & Survivability Enhancement: Augmenting People to Deliver an Enhanced and More Resilient Capability for Defence
HFM-IST-366	RWS	Stakeholder Involvement Methods for Ethical Legal and Societal Aspects of Military AI

8. Information Systems Technology Panel (IST)

Panel Chair: **Dr. Nikolai STOIANOV (BGR)**

Panel Executive: **Lt Col Marek DOBEK (POL)**

Panel Vice-Chair: **Mr. Antoine SMALLEGANGE (NLD)**

Panel Executive Assistant: **Ms. Armelle DUTRUC (NATO)**

Mission

Command & Control, Communications, Computers, Cyber, Intelligence, Surveillance and Reconnaissance (C5ISR) concerns all military capabilities' (people, resources, methods) effective use of collected data to coordinate a networked mission. It is the critical link between the modern functions of military operations. Effective military action is impossible without C5ISR. Action in and orchestration of Multi-Domain Operations (air, land, sea, space and cyber) is predicated upon information systems technologies. At the same time, technological developments (particularly in the field of Information Communication Technology) are moving at lightning speed. This combination means that C5ISR must become not only interoperable, robust, and secure, but also flexible and adaptive. The mission of the IST Panel is to advance and exchange techniques and technologies in order to improve C5ISR systems.

Main Interests

The IST Panel focusses on all technological aspects of C5ISR, including the fields of Information Warfare and Assurance, Information and Knowledge Management, Communications and Networks, and Architecture and Enabling Technologies. It has a special focus on Artificial Intelligence, Big Data, Quantum Technology, Cognitive Warfare, and Cyber Security. All of this is done to provide timely, affordable, dependable, secure and relevant information to war fighters, planners, and strategists.

The IST Programme of Work is organised under three Focus Groups: Information Warfare & Assurance (IWA), Architecture and Intelligence Information Systems (AI2S), and Communications & Networks (COM), to which the activities of the Panel are attached.

Table 7: IST Activities Continuing in 2023

ACTIVITY	ACTIVITY TYPE	TITLE
IST-162 (IWA)	RTG	Cyber Monitoring and Detection Capability for Military Systems
IST-169 (AI2S)	RTG	Robustness and Accountability in Machine Learning Systems
IST-174 (COM)	RTG	Secure Underwater Communications for Heterogeneous Network-Enabled Operations
IST-175 (COM)	RTG	Full Duplex Radio Technology for Military Applications
IST-176 (COM)	RTG	Federated Interoperability of Military C2 and IoT Systems
IST-177 (IWA)	RTG	Social Media Exploitation for Operations in the Information Environment
IST-179 (AI2S)	RTG	Interoperability for Semi-Autonomous Unmanned Ground Vehicles
IST-180 (COM)	RTG	Network Management & Cyber Defence (NMCD) for Federated Mission Networking (FMN)
IST-181 (COM)	RSM	Terahertz-Band Communications and Networking
IST-184 (AI2S)	RTG	Visual Analytics for Complex Systems

ACTIVITY	ACTIVITY TYPE	TITLE
IST-186 (IWA)	RSM	Blockchain Technology for Coalition Operations
IST-187 (COM)	RTG	5G Technologies Application to NATO Operations
IST-188 (IWA)	RTG	Applying and Validating the Cyber Security Risk Assessment Process for Military Systems
IST-189 (COM)	RTG	Hybrid Military and Commercial SATCOM Networks
IST-191 (IWA)	RWS	Rescue Systems for Broken Trust
IST-192 (AI2S)	RTG	ANTICIPE*@STJU-22
IST-193 (AI2S)	RTG	Edge Computing at the Tactical Edge
IST-194 (COM)	RTG	Adaptive Networks at the Tactical Edge
IST-196	RTG	Cyber Security in Virtualized Networks
IST-199	RTG	Free-Space Optical Communications
IST-200	RSY	International Conference on Military Communication and Information Systems (ICMCIS)
IST-201	RTG	Federated Communication and Collaboration Services at the Tactical Edge
IST-SET-198	RSY	Quantum Technology

Table 8: IST Activities Starting in 2023

ACTIVITY	ACTIVITY TYPE	TITLE
IST-202	RTG	Federated Tactical Networking
IST-203	RSM	Wireless Communications Standardisation in NATO



9. NATO Modelling and Simulation Group (NMSG)

NMSG Chair: **Dr. Robert SIEGFRIED (DEU)**
 NMSG Vice-Chair: **Mr. Bharat PATEL (GBR)**
 MSCO Head: **LCdr Alvaro HERRAIZ-SOLLA (ESP)**

MSCO Technical Officer: **Mr. Adrian VOICULET (NATO)**
 MSCO Executive Assistant: **Mrs. Renata DANAUSKE (NATO)**

Mission

The NATO Modelling and Simulation Group (NMSG) is the STO Scientific and Technical Committee in which all NATO Modelling and Simulation (M&S) stakeholders and subject matter experts meet to coordinate and oversee the implementation of the NATO M&S Master Plan (NMSMP).

The NMSMP is a NAC-approved NATO policy document that provides strategic vision and guidance for coordinating and utilising M&S in NATO. The NATO M&S vision is *“to exploit M&S to its full potential across NATO and the Nations to enhance both operational and cost effectiveness.”*

The mission of the NMSG is to promote cooperation among Alliance bodies, NATO, and partner nations to maximise the effective utilisation of M&S. This includes M&S standardisation, education, and associated science, and technology. The NMSG, as nominated by the Conference of National Armaments Directors (CNAD), is the delegated tasking authority for standardisation in the NATO modelling and simulation domain.

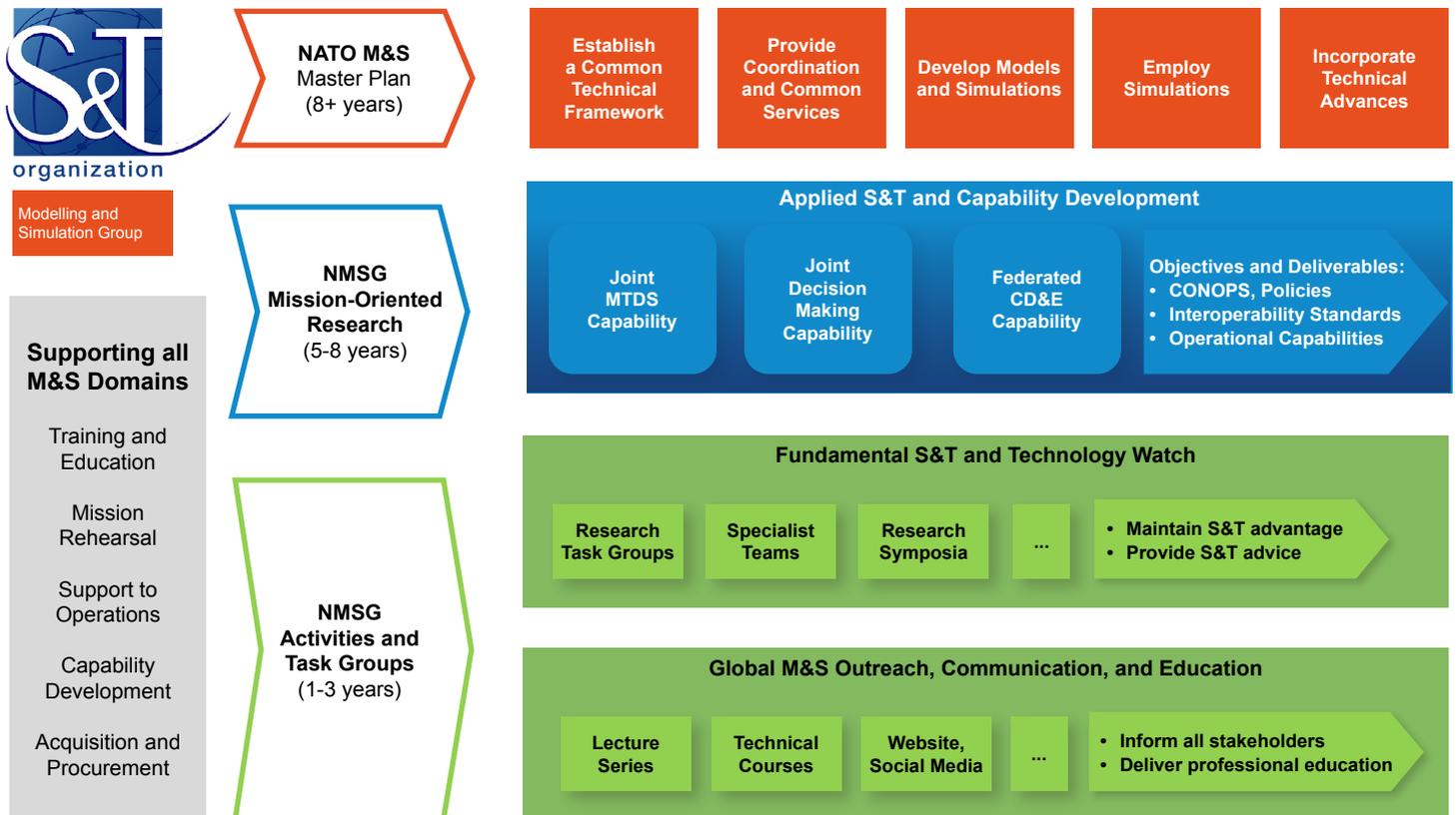


Figure 3: NMSG Mission Oriented Research

Main Interests

The NMSMP articulates the NATO vision and guiding principles regarding the use of M&S in support of the NATO mission, discusses the impact that achieving this vision will have on NATO M&S application areas and identifies the governance mechanisms and bodies and the primary NATO M&S stakeholders.

Under the umbrella of establishing a common technical framework, increasing interoperability and developing models, simulations and standards for M&S, the main current and future focus areas of work are: Distributed Synthetic Training, Federated Battle Labs for Collaborative Concept Development, Experimentation and Operational Mission Support.

With the mission to investigate, plan, update, and propose the future Programs of Work, the NMSG has three permanent sub-groups, the Military Operational Requirements Subgroup, the M&S Standards Subgroup and the Planning and Programmes Committee.

Table 9: NMSG Activities Continuing in 2023

ACTIVITY	ACTIVITY TYPE	TITLE
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-179	RTG	Modelling and Simulation for Acquisition
MSG-180	RTG	Implementation of Live Virtual Constructive – Training (LVC-T) in the Maritime Domain
MSG-181	RTG	Physics-Based Electro-Optic/Infrared Simulations – Best Practice Recommendations for Decision Support
MSG-186	RTG	Multi-Dimensional Data Farming
MSG-187	RTG	Space Weather Environmental Modelling (SWEM)
MSG-190	RTG	NATO M&S Professional Certification
MSG-191	RTG	NATO Standards for Federated Simulation and Services for Integration, Verification and Certification
MSG-195	RTG	Modelling and Simulation as a Service – Phase 3
MSG-200	RTG	Modelling Cyber Domain Entities and Events Within Distributed Simulations
MSG-201	RTG	Modelling and Simulation in Federated Mission Networking (FMN)
MSG-202	RTG	NATO Modelling and Simulation Resources/Standards Support Team – III
MSG-203	RLS	The Role of Modelling and Simulation to Support Current and Future NATO Operations
MSG-204	ST	NMSG Support to Distributed Synthetic Training (DST) A2CD2 Efforts
MSG-205	RTG	Allied Interoperability and Standardisation Initiatives for Digital Twins
MSG-208	RSY	MSG/MSCO Support to International Training & Education Conferences IT2EC, I/ITSEC and CA2X2 Forum 2023

ACTIVITY	ACTIVITY TYPE	TITLE
MSG-209	RWS	Modelling and Simulation as a Service – Cloud Security
MSG-212	ST	M&S in Federated Battle Labs for Collaborative Concept Development and Experimentation (CD&E)
MSG-213	ST	M&S in Support of Building Resilience and Refugee Flow Management
MSG-214	ST	M&S for Operational Mission Support
MSG-215	ST	Cross-Domain Security in Distributed Simulation
MSG-216	ST	AMSP-05 “CAX Handbook” Revision

Table 10: NMSG Activities Starting in 2023

ACTIVITY	ACTIVITY TYPE	TITLE
MSG-206	RTG	Common Framework for the Assessment of XR technologies for Use in Training and Education
MSG-207	RSY	NMSG Annual Symposium 2023
MSG-210	RWS	Commercial Technologies and Games for Use in NATO and Nations
MSG-211	RTC	Modelling and Simulation Standards in NATO Federated Mission Networking



10. System Analysis and Studies Panel (SAS)

Panel Chair: **Dr. Donna WOOD (CAN)**

Panel Executive: **LTC Spencer TIMMONS (USA)**

Panel Vice-Chair: **Dr. Richard DECKRO (USA)**

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

Mission

The System Analysis and Studies (SAS) Panel – NATO STO's expert panel for analytical advice – conducts studies and analysis for better decisions in strategy, capability development, and operations within NATO, NATO Nations, and partner Nations. Key drivers in the SAS Panel's work are the exploitation of new technologies, new forms of organisation, and new concepts of operation.

Main Interests

The focus of the Panel is on undertaking Operations Analysis activities related to challenges in the evolving strategic environment and the responses that both individual nations and NATO as a whole are making to tackle them. The research can be clustered into 4 focus areas: Policy and Strategy Decision Support, Operations Decision Support, Capability and Investment Decision Support, and Development and Maintenance of Analysis Capabilities.

The development and maintenance of analysis capabilities forms the basis of the Panel work and is essential to provide NATO with innovative and academically sound analytical capabilities that will ensure informed defence decision making. Activities include the development of analytical methods to address upcoming security challenges, information exchange on OA modelling concepts and best practice, research into new methodological approaches, and the development and exchange of models.

The Panel leverages its broad range of analysis capabilities to provide decision support at all levels and in different areas. To illustrate, the Panel identifies and assesses the impacts of geo-political drivers, regional contexts, futures, and technology changes to support policy and strategy decisions. It conducts analysis to improve operational tactics, training and procedures as well as develops better methods to support operational planning. Finally, it supports the development of systems, force element and enabler capability options, including the collection and collation of cost and performance data and defining the necessary missions for these individual systems and capabilities.

The main source for new research projects is proposals made by NATO Nations represented at the SAS Panel. The SAS Panel also addresses requests for such analysis and studies from a variety of other sources. These include the Science and Technology Board (STB) and other NATO bodies, such as the NATO Military Committee, the Conference of National Armament Directors (CNAD) with its Main Armaments Groups and the NATO Industrial Advisory Group (NIAG), Allied Command Operations (ACO), Allied Command Transformation (ACT) and the NATO Communications and Information Agency (NCIA).

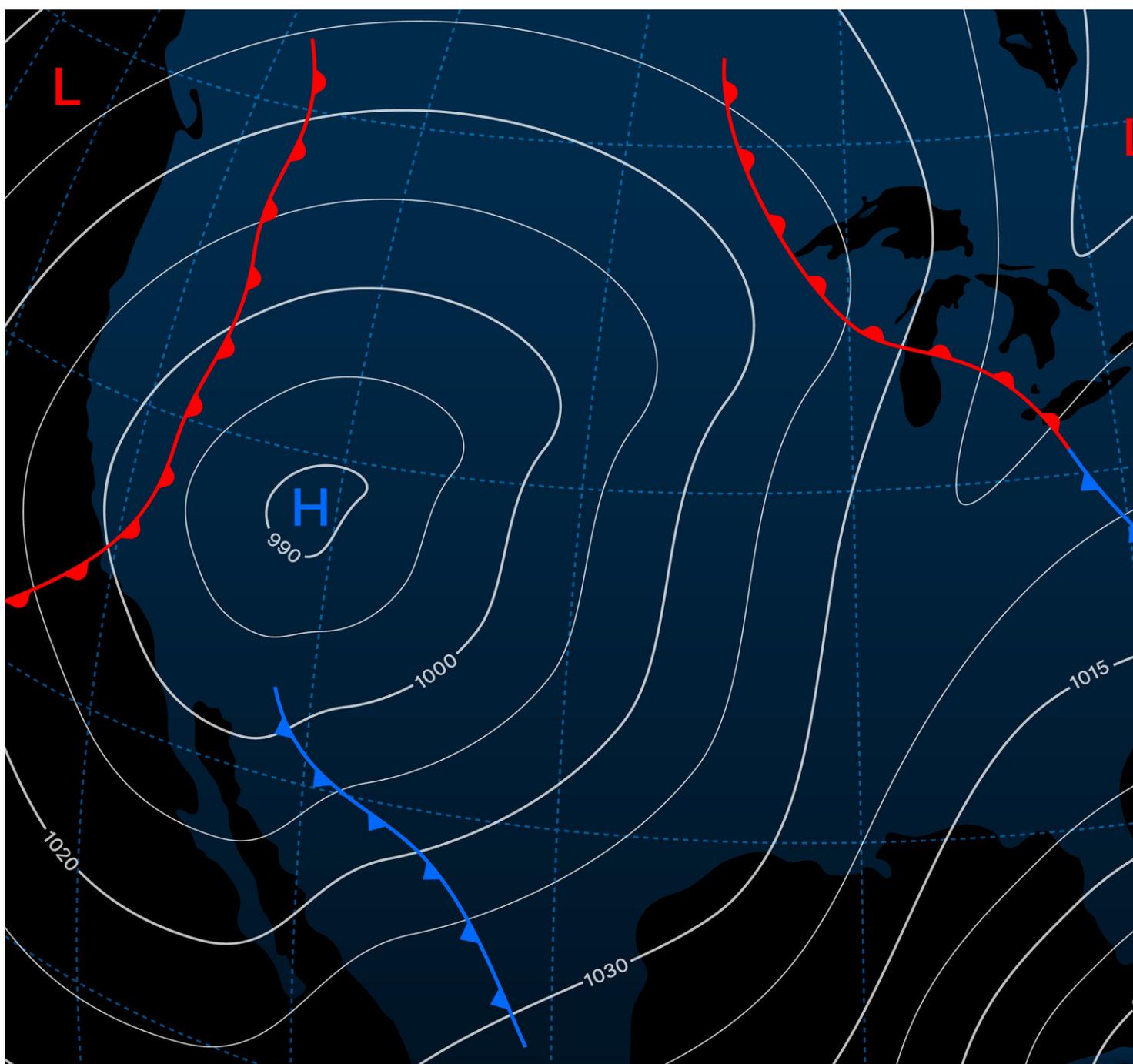


Table 11: SAS Activities Continuing in 2023

ACTIVITY	ACTIVITY TYPE	TITLE
SAS-124	RTG	Visualization Design for Communicating Defence Investment Uncertainty and Risk
SAS-140	RTG	Directed Energy Weapons Concepts and Employment
SAS-143	RTG	Agile, Multi-Domain C2 of Socio-Technical Organisations in Complex Endeavours
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-152	RTG	Conceptual Framework for Comprehensive National Defence System
SAS-153	RTG	Best Practices on Cost Analysis of Information and Communication Technology
SAS-154	RTG	Future Strategic Environment Assessment: Framework for Analysis
SAS-156	RTG	Developing a Standard Methodology for Assessing Multinational Interoperability
SAS-158	RTG	Employing AI to Federate Sensors in Joint Settings
SAS-159	RTG	How Could Technology Development Transform the Future Operational Environment
SAS-160	RTG	Ethical, Legal and Moral (ELM) Impacts of Novel Technologies on NATO's Operational Advantage – the "ELM Tree" Advantage – the "ELM Tree"
SAS-161	RTG	Military Aspects of Countering Hybrid Warfare: Experiences, Lessons, Best Practices
SAS-166	RTG	Wargaming Multi-Domain Operations in an A2/AD Environment
SAS-167	RTG	Assessing the Value of Cyber Operations in Military Operations
SAS-168	RTG	Coalition Sustainment Interoperability Study
SAS-170	ST	Distributed Wargaming for a COVID-19 World
SAS-172	RTG	Multi-Domain Operations Wargame
SAS-174	RSM	Are the Major Weapon Platforms Obsolete?
SAS-175	RWS	Integration of Unmanned Systems (UxS) into Operational Units
SAS-176	RTC	Taking FATE on the Road
SAS-177	RTG	Defending Democracy in the Information Environment – Foundations and Roles for Defence
SAS-178	RWS	Defence Investment Portfolio Decision-Making and Analysis Support
SAS-IST-171	RTG	C2 services in Multi Domain Operations for Federated Mission Networking (FMN)
SAS-ORA	RSY	(Annual) Operations Research & Analysis Conference

Table 12: SAS Activities Starting in 2023

ACTIVITY	ACTIVITY TYPE	TITLE
SAS-181	RTC	Exploiting Reinforcement Learning to Achieve Decision Advantage
SAS-182	RTG	The Effects of Climate Change on Security
SAS-183	RTC	Energy Security Resilience, Capability and Interoperability
SAS-IST-179	RTC	Semantic Representation to Enhance Exploitation of Military Lessons Learned
SAS-MSG-180	RTC	Modelling & Simulation-Wargaming Integration for Intermediate Force Capabilities (IFC)



11. Systems Concepts and Integration Panel (SCI)

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

Panel Executive: **Lt Col Roderick BENNETT (USA)**

Panel Vice-Chair: **Dr. Nicholas LAW (GBR)**

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

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.

Main Interests

The scope of Panel activities covers a multidisciplinary range of theoretical concepts, design, development and evaluation methods applied to integrated defence systems. The Panel operates in three working sessions whose areas of interest include:

- Systems Integration & Interoperability
- Integrated Survivability
- Enablers and Disruptive Capabilities



Table 13: SCI Activities Continuing in 2023

ACTIVITY	ACTIVITY TYPE	TITLE
SCI-304	RTG	Optimised and Reconfigurable Antennas for Future Vehicle Electronic Counter Measures
SCI-307	RTG	FAMOS Framework for Avionics Mission Systems
SCI-310	RTG	Expanded Countermeasure Methods Against IR Anti-Ship Threats in Varied Parameter and Scenario Engagements Using All-Digital Tools Sets
SCI-312	RTG	EO-IR Countermeasures
SCI-314	AGARD	AG-300 V.35 Ground and Flight Test Methods Used to Assure Aero Elastic Stability of Fixed Wing Aircraft
SCI-316	RTG	High Energy Laser Weapons: Quantifying the Impact of Atmospherics and Reflections
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)
SCI-325	RTG	Methods of Identifying and Evaluation the Camouflage and Deceptive Properties of the Military Equipment in Land Field Trials
SCI-326	RTG	Electronic Support (ES) Techniques Enabling Cognitive Electronic Warfare (EW)
SCI-327	RTG	Countermeasure Concepts against Anti-Aircraft Dual band EO/IR Imaging Seekers
SCI-329	RSM	Capabilities for Sensing, Search, and Surveillance in the Arctic
SCI-332	RTG	Radio Frequency-based Electronic Attack to Modern Radar
SCI-333	RTG	Multi-Sensor Fusion Architecture for the Detection of Person-borne-Improvised Explosive Devices (PB-IEDs)
SCI-334	RTG	Evaluation of Swarm System for Military Applications
SCI-338	AGARD	AG-300-V.37 Flight Testing of Unmanned Aerial Vehicles
SCI-340	RLS	HEL Weapon Technology, Opportunities, and Challenges
SCI-342	RTG	Explosive Ordnance Disposal (EOD) Tele-Manipulation Robot Technology Roadmap Development
SCI-343	RTG	Enabling Federated, Collaborative Autonomy
SCI-344	RTG	Future Multi-Sensor Threat Defeat Concepts
SCI-346	RTG	Space Risk Assessment Matrix (S-RAM)
SCI-347	RTG	SMART IED Threat Mitigation Technology Assessments SMiTMiTA
SCI-348	RTG	Real-Time Coalition Electromagnetic Battle Management (EMBM)
SCI-349	RTG	Heterogeneous Data-Driven Space Domain Decision Intelligence

ACTIVITY	ACTIVITY TYPE	TITLE
SCI-350	RTG	NATO Alliance SmallSat Constellation Effort (ALLSAT)
SCI-352	RTG	Flight Test Technical Team (FT3)
SCI-SAS-351	RTG	Alliance Space Deterrence Framework
SCI-SET-323	RSM	Above Water EO/IR Signature Requirements from an Operational Perspective
SCI-SET-353	RTG	C-UAS Mission-Level Modelling & Simulation

Table 14: SCI Activities Starting in 2023

ACTIVITY	ACTIVITY TYPE	TITLE
SCI-354	RTG	Cross-Panel Collaborative Experimentation for Improved Space Situational Awareness
SCI-SET-355	RTG	Cross-Panel Collaborative Experimentation for Improved Space Situational Awareness (SSA)



12. Sensors and Electronics Technology Panel (SET)

Panel Chair: **Mr. Frank VAN DEN BOGAART (NLD)**

Panel Executive: **LT COL Isidoro MARCONE (ITA)**

Panel Vice-Chair: **Prof. Marco MARTORELLA (ITA)**

Panel Executive Assistant: **Ms. Alicia MAHARAJ (NATO)**

Mission

The mission of the Sensors and Electronics Technology (SET) Panel is to foster co-operative 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 associated 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 organised into three Focus Groups: Radio-Frequency Technology (RFT); Optical Technology (OT); and Multi-Sensors & Electronics (MSE).

Main interests

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 principle, the Focus Groups are addressing the following domains:

1. Radio Frequency Technology:

- Radar (including Active, Passive, Synthetic Aperture Radar, Noise, Cognitive, Multi- and Bi-Static, Multi-Function, Software Defined);
- Automatic Target Recognition / Non-Cooperative Target Recognition (ATR / NCTR);
- Radar Imaging and Synthetic Aperture Radar Imaging;
- (Polarimetric) Radar Signatures;
- Resource Management and Spectrum Management;
- Electronic Warfare (Electronic Attack, Electronic Protection, Electronic Support Measures);
- Electronic Support (Direction Finding, Passive ESM Tracker).

2. Optical Technology:

- Optical Sensing from UV to Far IR and Hyperspectral Sensing;
- Light Detection and Ranging, laser Sources and Systems;
- 3D Imaging;
- System Performance Modelling (including environmental effects);
- Target Signatures;
- Optical Countermeasures;
- Computational Imaging / Compressive Sensing;
- Environmental Effects on the Battlefield;
- Optical Components and Design.

3. Multi-Sensors and Electronics:

- Application areas: Counter-Improvised Explosive Device; Swarms; Navigation; Autonomous Sensing; Counter-Unnamed Aerial Systems; Under-Water Technology
- Sensors: Multi-Sensor Fusion; Sensor Management; Acoustics; Chemical Biological Radiological Nuclear or Explosive; Sonar; Quantum Sensing.

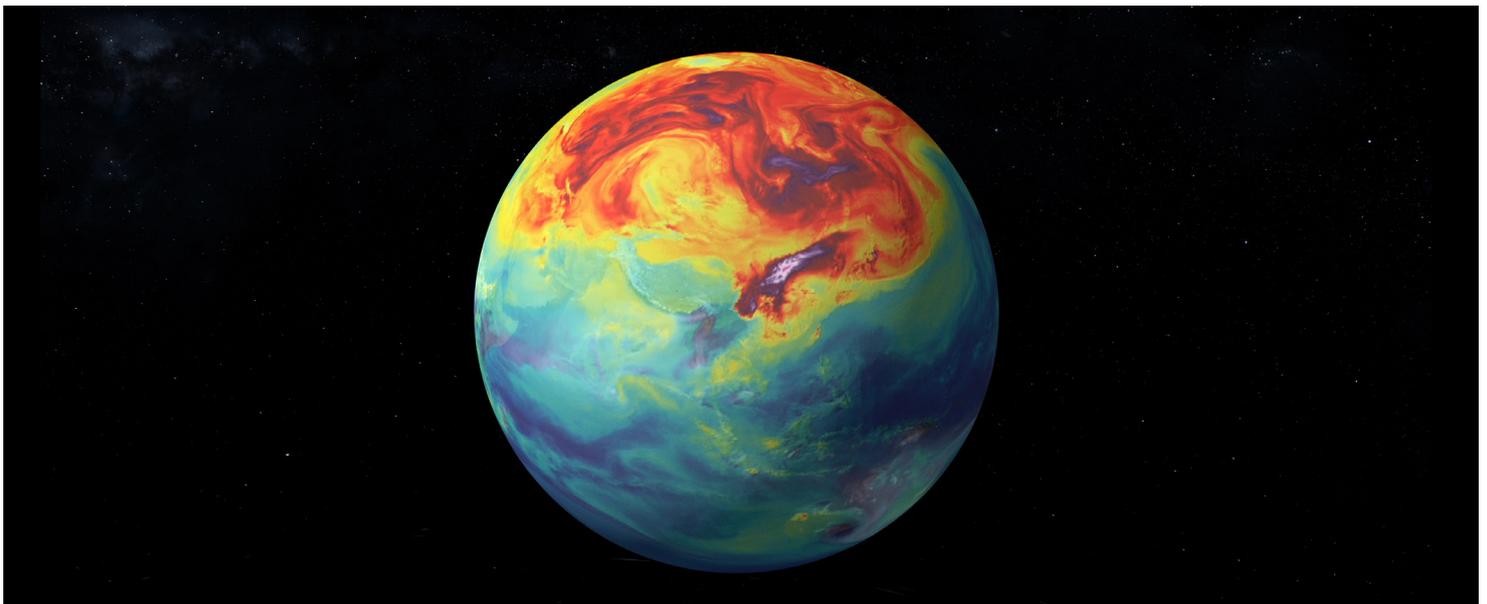


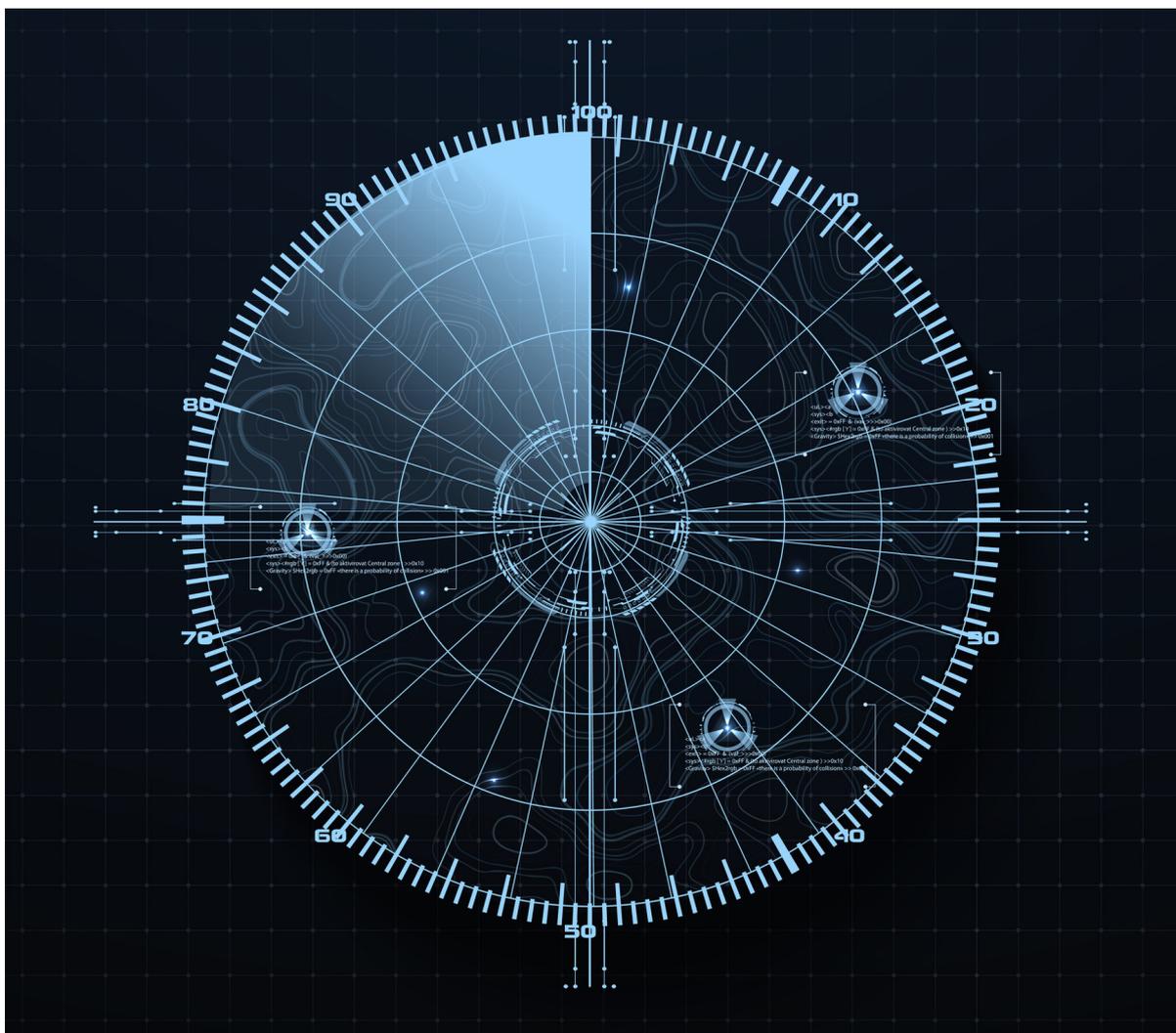
Table 15: SET Activities Continuing in 2023

ACTIVITY	ACTIVITY TYPE	TITLE
SET-242	RTG	Passive Coherent Locators on Mobile Platforms
SET-249	RTG	Laser Eye Dazzle Threat Evaluation and Impact on Human Performance
SET-257	RLS	Compressive Sensing Techniques for Radar and ESM Applications
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-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-274	RLS	Cooperative Navigation in GNSS Degraded and Denied Environments
SET-276	ST	Quality Assurance and Assessment Team for SPS on DEXTER (Detection of Explosives and Firearms to Counter Terrorism)
SET-278	RTG	Machine Learning for Wide Area Surveillance
SET-279	RTG	Space-Based SAR and Big Data Technologies to Support NATO Operations
SET-280	RTG	Phenomenology and Exploitation of Counter-Measures (CMs)
SET-283	RTG	Advanced Machine Learning ATR Using SAR/ISAR Data
SET-285	RTG	Multifunction RF Systems
SET-286	RTG	Acoustic and Seismic Sensing of Threats in Urban Environments
SET-287	RTG	Characterization of Noise Radar
SET-288	RTG	Integrating Compressive Sensing and Machine Learning Techniques for Radar Applications
SET-289	RWS	Nanotechnology For Optics & Infrared Photo Detection
SET-291	RTG	Sensitivity of EO TDAs to Environmental Factors
SET-292	RTG	Enhanced Raman Spectroscopy for Defence Applications
SET-293	RTG	RF Sensing for Space Situational Awareness

ACTIVITY	ACTIVITY TYPE	TITLE
SET-294	RTG	Advanced Mid-Infrared Laser Technology
SET-295	RTG	Radar Signature Measurements of Maritime Platforms
SET-296	RTG	Radar Against Hypersonic Threats
SET-298	RSM	Electronic Attack and Protection for Modern Active/Passive Netted Radars
SET-299	RLS	Passive Radars – Technology and Applications
SET-300	RTG	3D Active and Passive EO/IR Sensing for Urban Operations
SET-301	RTG	SimPL Simulation of Low Photon Lidar
SET-302	RTG	Cognitive Radar
SET-303	RTG	Military Applications of Extreme Laser Fields
SET-304	RTG	Modelling, Measuring and Mitigating Optical Turbulence: M3T
SET-305	RTG	Improved Field of View for Night Vision Goggles – Technical Challenges, Concepts, Performance Assessment
SET-306	RTG	Improved Panoramic Situational Awareness for Vehicle Platforms – Technical Challenges, Concepts, Performance Assessment
SET-307	RTG	Advanced Radar Techniques for Robust Situation Awareness and Threat Assessment Considering Class I UAS in Complex Environments
SET-309	RTG	NATO PNT Open System Architecture & Standards to Ensure PNT in NAWWAR Environments
SET-310	RTG	Assessment of EO/IR Compressive Sensing and Computational Imaging Systems
SET-311	RSY	10th Military Sensing Symposium (MSS)
SET-313	RTG	Advanced Methods for Hyperspectral Data Exploitation
SET-315	RSY	Detection, Tracking, ID and Defeat of Small UAVs in Complex Environments
SET-316	RTG	Realistic Trace Explosives Test Standards for Evaluation of Optical Sensors in Relevant Scenarios
SET-317	RTG	Multi-Dimensional / Multi-Platform Radar Imaging
SET-HFM-314	RWS	Multi-Omic Data Sciences Research Workshop

Table 16: SET Activities Starting in 2023

ACTIVITY	ACTIVITY TYPE	TITLE
SET-318	RSM	AI/ML and Cognitive Radars
SET-319	RSM	New Mathematical Frontiers for Multi-Dimensional Radar Systems
SET-320	RTG	New Frontiers in Modern Passive Radars
SET-321	RTG	Development of Standardised Military Targets for Military Search
SET-322	RTG	Evaluation Framework for Multi-Sensor Tracking and Fusion Algorithms
SET-323	RTG	Advance Methods for Laser Dazzle Evaluation
SET-325	RTG	Shortwave Infrared Technology: Irradiance Measurements to Evaluate Reflective Band Systems
SET-326	RLS	STO Summer School
SET-327	RSM	Women in SET (WiS)
SET-HFM-324	RTG	Surface and Ground Chemical Contamination Detection and Avoidance



13. STO Events in 2023 CPoW

Among the various activities administered by the Collaboration Support Office there are several types aimed at promoting exchange and dissemination of state of the art knowledge amongst targeted audiences on an important scientific or applied topic. These are: Lecture Series, Technical Courses, Symposia, Workshops and Specialists' Meetings.



Visit our website at: www.sto.nato.int to learn about STO Events we organise.



13.1 Lecture Series in 2023

A **Research Lecture Series (RLS)** technical team activity aims at disseminating state-of-the-art scientific knowledge among junior and mid-level scientists, engineers, and analysts in military-relevant domains that are not taught in universities. A RLS is a two-day educational event that is normally organised at three different locations. RLSs can include a roundtable discussion. RLSs are combined with an STO publication (Educational Notes), which will be made available before the first RLS session. The Lecture Series dates are currently being finalised. Please contact oco@cs0.nato.int if you are interested in participating in any of the lecture series.

Table 17: 2023 Lecture Series

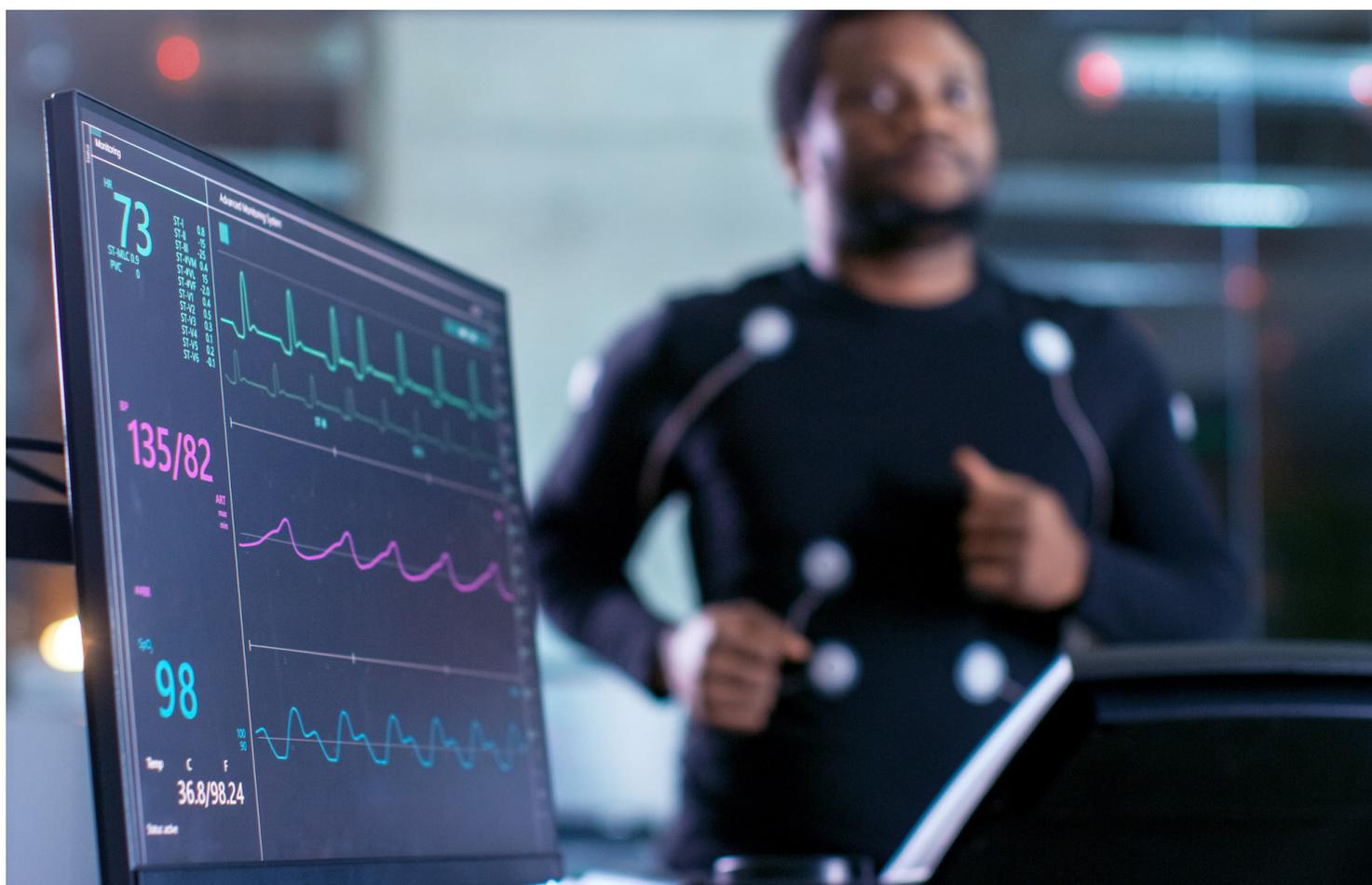
MONTH	ACTIVITY	TITLE	MEETING LOCATION	DISTRIBUTION AND PARTNER PARTICIPATION
27–28 Mar	SCI-340	HEL Weapon Technology, Opportunities, and Challenges	Adelaide (AUS)	STO EOPs, GP
28–29 Mar	SET-257	Compressive Sensing Techniques for Radar and ESM Applications	Ottawa (CAN)	STO EOPs, GP
Sept	AVT-377	Introduction to Quantum Computing in Fluid Dynamics	(USA)	STO EOPs, GP
Sept	AVT-385	Multi-Fidelity Methods for Multidisciplinary Design Optimisation	Lisbon (PRT)	STO EOPs, GP
TBD	AVT-358	Advanced Computational Fluid Dynamics Methods for Hypersonic Fluids	TBD	STO EOPs, GP
TBD	AVT-375	Munition Health Management Lecture Series: Implementation Challenges	TBD	STO EOPs, GP
TBD	MSG-203	The Role of Modelling and Simulation to Support Current and Future NATO Operations	TBD	STO EOPs, GP
TBD	SET-274	Cooperative Navigation in GNSS Degraded and Denied Environments	TBD	STO EOPs, GP
TBD	SET-299	Passive Radars – Technology and Applications	Boston (USA)	STO EOPs, GP

13.2 Technical Courses in 2023

A Research Technical Course (RTC) is an educational technical team activity aimed at transferring practical knowledge and recent field developments through on-site instructor training or lectures to military decision makers. The Technical Courses dates are currently being finalised. Please contact oco@cs0.nato.int if you are interested in participating in any of the lecture series.

Table 18: 2023 Technical Courses

MONTH	ACTIVITY	TITLE	MEETING LOCATIONS	DISTRIBUTION AND PARTNER PARTICIPATION
Mar	HFM-364	Aerospace Medicine: RAMS USAF/ NATO Flight Surgeons' Conference STO HFM	Garmisch- Partenkirchen (DEU)	STO EOP, PFP, MD, GP
May	SAS-176	Taking FATE on the Road	TBD	STO EOP, PFP, MD, GP
TBD	MSG-211	Modelling and Simulation Standards in NATO Federated Mission Networking	Rome (ITA), Bydgoszcz (POL), Lillehammer (NOR)	STO EOP, PFP, GP, Singapore



13.3 Symposia in 2023

A Research Symposium (RSY) technical team activity aims at promoting exchange of state-of-the-art knowledge among a wide audience on an important scientific or applied topic. The prime purpose of an RSY is to enhance the capability of the NATO S&T community to respond adequately to the military requirements of NATO. An RSY is a large-scale (100+ participants), three-to-four day event. Communications are primarily via invited Keynote Addresses and via oral and poster presentations of submitted papers, screened and selected for presentation by the Programme Committee as generated from a Call for Papers. An RSY results in an STO publication (Meeting Proceedings).

Table 19: 2023 Symposia

MONTH	ACTIVITY	TITLE	MEETING DATE	MEETING LOCATION	DISTRIBUTION AND PARTNER PARTICIPATION
Apr	SET-311	10th Military Sensing Symposium (MSS)	19 – 21 Apr 2023	London (GBR)	STO EOP, PfP
May	IST -200	International Conference on Military Communication and Information Systems (ICMCIS)	16 – 17 May 2023	Skopje (MKD)	STO EOP, PfP, Singapore
Oct	AVT-369	Digital Twin Technology Development and Application for Tri-Service Platforms and Systems	8 – 13 Oct 2023	Bastad (SWE)	STO EOP
Oct	IST-SET-198	Quantum Technology	3 – 4 Oct 2023	Amsterdam (NLD)	STO EOP, GP
Oct	SET-315	Detection, Tracking, ID and Defeat of Small UAVs in Complex Environments	9 – 10 Oct 2023	Copenhagen (DNK)	STO EOP, PfP
Oct	HFM-361	Mitigating and Responding to Cognitive Warfare	16 – 17 Oct 2023	Madrid (ESP)	STO EOP, PfP, GP, MD
Oct	MSG-209	NMSG Annual Symposium 2023	19 – 20 Oct 2023	Monterey, CA (USA)	STO EOP, PfP, GP, Brazil, India, Singapore
Oct-Nov	SAS-ORA	SAS – Operations Research and Analysis Conference	30 Oct – 1 Nov 2023	Laurel, MD (USA)	STO EOP, PfP
TBD	HFM-349	Human Performance and Medical Treatment and Support During Cold Weather Operations	TBD	TBD	STO EOP, GP
TBD	SET-264	Quantum Position Navigation and Timing for NATO Platforms	TBD	Avignon (FRA)	STO EOP, GP

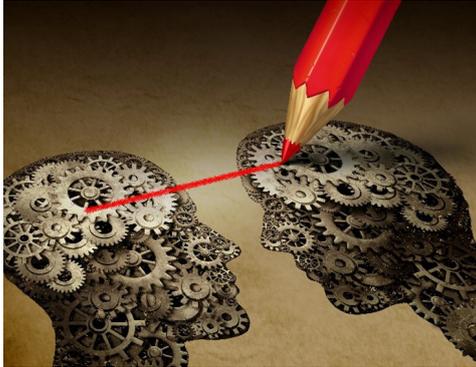
Symposia 2023 Advertisements

HFM-361 Mitigating and Responding to Cognitive Warfare

Date: 16 – 17 Oct 2023

Place: Madrid (ESP)

Point of contact: hfm@cs0.nato.int



Synopsis:

There are currently many definitions of Cognitive Warfare (CW). In general, CW addresses the human's ability to process and use information to destabilise and influence. CW can be looked upon as a strategy that focuses on altering how a population thinks, through to how it acts.

Due to revolutionary technological developments, the cognitive dimension has increased its effectiveness, as information flows faster and is easier to control. Modern technology allows information to be spread across a broader community than before, primarily as its availability increases and it becomes cheaper.

The purpose of this symposium is to:

1. Increase the understanding of CW and its effects, leading to a series of Warfare Development Initiatives stated in the NATO Warfighting Capstone Concept.
2. Help to improve collective understanding and prevention of cognitive warfare through shared research.

The conference proceedings with all the papers presented during the symposium will be published.

AVT-369 Digital Twin Technology Development and Application for Tri-Service Platforms and Systems

Date: 8 – 13 Oct 2023

Place: Bastad (SWE)

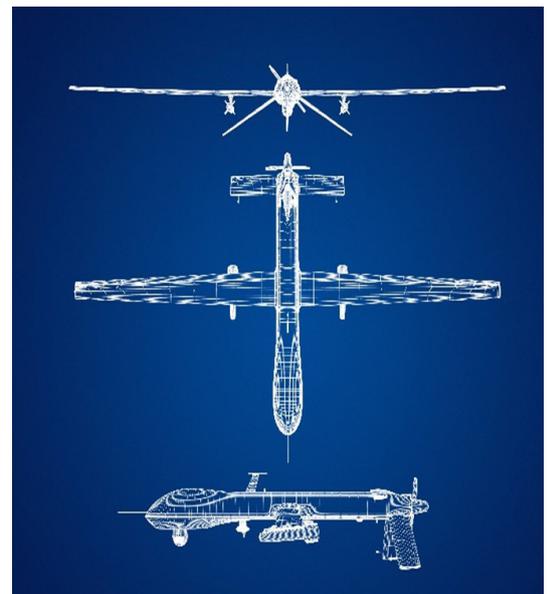
Point of contact: AVT@cs0.nato.int

Synopsis:

In the past years, there have been increasing R&D activities on digital twin technology development in NATO countries. Some Original Equipment Manufacturers have used digital twin / digital thread technologies for new product or weapon systems development. There is a need to look at the state-of-the-art of digital twin technology development, benefits of various digital twin outputs, and discuss digital twin applications on product development and sustainment.

The purpose of this symposium is to:

1. Review the state-of-the-art of digital twin technology development and the benefits of various digital twin outputs.
2. Present digital twin applications on product/system design, manufacturing, and sustainment for tri-service platforms and systems.
3. Identify the core enabling S&T methodologies for near and long term digital twin technology development and application.



IST-200 Symposium on International Conference for Military Communication and Information Systems (ICMCIS)

Date: 16 – 17 May 2023

Place: Skopje, MKD

Point of contact: IST@cso.nato.int

Synopsis:

The symposium covers four of NATO's Emergent Disruptive Technologies: big data, quantum, AI, and cyber. IST-200's challenges are to engage in distributed operations in complex settings and to operate with extreme resource constraints. Via this forum we are looking to bring together a broad array of military communication and information specialists to baseline, co-operate and watch IST trends.

The purpose of this symposium is to:

1. Provide a forum to identify and gain input on and resolution of issues associated with NATO Command, Control and Communications (C3) Policy and the IST-Panel Programme of Work (PoW).
2. Provide overviews of current NATO C3 activities pertaining to both the development and effective employment of ICT-solutions.
3. Highlight IST impact assessments and lessons learned.



IST-SET-198 Quantum Technology

Date: 3 – 4 Oct 2023

Place: Amsterdam (NLD)

Point of contact: IST@cso.nato.int

Synopsis:

An ambition to increase knowledge on Emerging and Disruptive Technology (EDT) Quantum and its military application has led to formation of IST-SET 198. Quantum has considerable application across a broad spectrum of NATO's activities. This symposium is important to exchange knowledge between multiple STO panels and beyond to baseline understanding and application for further research.

The purpose of this symposium is to:

1. Provide insight to the current state-of-the-art design and developments in quantum sensors (e.g., for imaging, Position Navigation Timing (PNT), Radio Frequency), quantum communications, quantum computing hardware and software (e.g., operating systems, quantum algorithms).
2. Identify, by quantitative system modulization, the impact of current state of the art performances in quantum technologies, on military capabilities of NATO forces.
3. Bring people from different scientific areas together, with military staff, to generate ideas for potential interdisciplinary research and key NATO application areas.



SET-311 10th Military Sensing Symposium (MSS)

Date: 19 – 21 April 2023

Place: London (UK)

Point of contact: SET@csso.nato.int

Synopsis:

The NATO Military Sensing Symposium (MSS) is the principal NATO conference on sensing research and technology within the Alliance and its partner nations. The tenth edition of the MSS is sponsored and organised by the NATO Science & Technology Organisation (STO) as activity SET-311 and covers all sensing modalities including radar, electro-optics, acoustics, and CBRN detection. This includes all aspects of research into sensor systems, processing, fusion and phenomenology and is open to nationally endorsed participants from industry and academia as well as government representatives. The symposium is open to NATO Nations and bodies, as well as Australia, Finland, Japan, Sweden and Switzerland.

The purpose of this symposium is to:

1. Share current information on sensors alongside demonstrations of operational use.
2. Foster technical critique to foster interoperability.
3. Improve the quality of national programmes relating to military sensing.

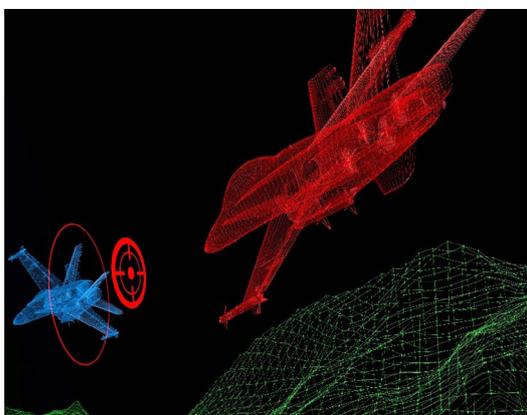


NMSG-207 Annual Symposium

Date: 19 – 20 Oct 2023

Place: Monterey, CA (USA)

Point of contact: msg@csso.nato.int



Synopsis:

Future military capabilities will spawn from technologies that are emerging now or in the near future. These technologies will disrupt M&S development and expand its exploitation across defence, including in multi-domain training, operational decision-making, and force or capability development. The M&S technologies will need to transform requirements rapidly into capabilities to meet the challenges to our peace and prosperity, that are increasingly complex, ambiguous, destabilising and potentially catastrophic. The future capabilities will need to meet known and unknown threats from state to individual actors, in adverse climate environments.

The purpose of this symposium is to:

1. Provide a forum to identify and gain input on and resolution of issues associated with NATO M&S Policy and the NMSG Action Plan.
2. Provide overviews of current NATO M&S activities pertaining to both the development and effective employment of M&S.
3. Highlight M&S impact assessments and lessons-learned.

13.4 Workshops in 2023

A **Research Workshop (RWS)** technical team activity aims at facilitating intensive information exchange and focused discussion on a specific topic among a limited number of invited experts. The prime purpose of a RWS is to enhance the capability of the NATO S&T community to respond adequately to the military requirements of NATO. An RWS (generally not more than 30 participants) is a two to three-day event with no prescribed format. An RWS results in an STO publication (Meeting Proceedings). The Workshop dates are currently being finalised. Please contact oco@cs0.nato.int if you are interested in participating in any of the lecture series.

Table 20: 2023 Workshops

MONTH	ACTIVITY	TITLE	MEETING LOCATION	DISTRIBUTION AND PARTNER PARTICIPATION
May	AVT-371	Materials and Technologies for Electro-Optical Camouflage (Cross-Panel)	London (UK)	STO EOP
TBD	AVT-374	More Electric Gas Turbine Engines for Aircraft, Rotorcraft and UAVs	TBD	
TBD	AVT-393	Environmental and Thermal Barrier Coatings for Military Aircraft Engines	TBD	STO EOP
TBD	HFM-363	Understanding of Military Culture to Support Organisational Change: Systems Approaches, Critical Analyses, and Innovative Research Methods	TBD	STO EOP
TBD	HFM-IST-366	Stakeholder Involvement Methods for Ethical Legal and Societal Aspects and Military AI	TBD	STO EOP
TBD	IST-191 (IWA)	Rescue Systems for Broken Trust	TBD	STO EOP, PfP
TBD	MSG-209	Modelling and Simulation as a Service – Cloud Security	TBD	STO EOP, PfP, GP, Singapore
TBD	MSG-210	Commercial Technologies and Games for Use in NATO and Nations	TBD	STO EOP, PfP, GP, Singapore
TBD	SAS-175	Integration of Unmanned Systems (UxS) into Operational Units	TBD	STO EOP
TBD	SAS-178	Defence Investment Portfolio Decision-Making and Analysis Support	TBD	STO EOP
TBD	SET-289	Nanotechnology for Optics & Infrared Photo Detection	TBD	STO EOP, PfP, GP
TBD	SET-HFM-314	Multi-Omic Data Sciences Research Workshop	TBD	STO EOP, PfP

13.5 Specialists' Meetings in 2023

A **Research Specialists' Meeting (RSM)** technical team activity aims at promoting exchange of state-of-the-art knowledge among an audience of specialists with invited speakers on an important scientific or applied topic. The prime purpose of an RSM is to enhance the capability of the NATO S&T community to respond adequately to the military requirements of NATO. An RSM is a medium-scale (usually less than 100 participants), two to three-day event. Communications are primarily via invited Keynote Addresses and via oral presentations of authors invited by the Programme Committee. RSMs should include a roundtable discussion. An RSM results in an STO publication (Meeting Proceedings).

Table 21: 2023 Specialists' Meetings

MONTH	ACTIVITY	PANEL	TITLE	MEETING DATE	MEETING LOCATIONS	DISTRIBUTION AND PARTNER PARTICIPATION
Feb	SET-319	SET	New Mathematical Frontiers for Multi-Dimensional Radar Systems	21 – 23 Feb 2023	Edinburgh (UK)	STO EOP, PfP, GP, South Africa
Apr	IST-186 (IWA)	IST	Blockchain Technology for Coalition Operations	27 – 28 Apr 2023	Ankara (TUR)	STO EOP, PfP
May	SAS-174	SAS	Are the Major Weapon Platforms Obsolete?	8 – 10 May 2023	Harstad (NOR)	STO EOP
May	SET-298	SET	Electronic Attack and Protection for Modern Active/Passive Netted Radars	30 May – 01 Jun 2023	Legionowo (POL)	STO EOP, PfP
Jun	SET-327	SET	Women in SET (WiS)	13 – 14 Jun 2023	Neuilly-sur-Seine (FRA)	STO EOP, PfP
Jun	SCI-329	SCI	Capabilities for Sensing, Search, and Surveillance in the Arctic	19 – 21 Jun 2023	Nuuk (DNK)	STO EOP, PfP, GP
Oct	AVT-373	AVT	Emerging Technologies for Proactive Corrosion Maintenance	8 – 13 Oct 2023	Bastad (SWE)	STO EOP
TBD	AVT-372	AVT	Military Value of Graphene Technologies	TBD	TBD	STO EOP
TBD	IST-181 (COM)	IST	Terahertz-Band Communications and Networking	TBD	TBD	STO EOP
TBD	IST-203	IST	Wireless Communications Standardisation in NATO	TBD	TBD	STO EOP
TBD	SCI-SET-323	SCI	Above Water EO/IR Signature Requirements from an Operational Perspective	TBD	TBD	STO EOP

14. Exploratory Teams

Exploratory Teams (ETs) may be established when a Panel/Group believes that a particular expertise is required to assist or advise the Panel/Group on the technical merit or feasibility of a specific proposal for a technical activity. ETs may also be used to help the Panel/Group develop recommendations on future content of the Panel/Group's Programme of Work.

Table 22: Exploratory Teams Continuing in 2023

ACTIVITY	TITLE
AVT-ET-226	Characterization of Thermal Protection Materials Designed for Extreme Environments
AVT-ET-227	Climate Change: Mitigation and Impact on NATO Platforms
AVT-ET-228	Vulnerability Standards for Unmanned Ground Vehicles & Robotic Autonomous Systems
AVT-ET-229	Assessment of Perovskite Photovoltaics as Low-Cost, Low-Environmental Impact, Resilient Energy Systems
AVT-ET-230	Collaboration Opportunities for the Aggregated Design of Hypersonic Gliding Vehicles (HGV)
HFM-ET-166	Evaluation of Treatments of Post-Amputation Phantom Limb Pain
HFM-ET-191	Treatment Challenges with Combined Injuries
HFM-ET-192	Blast Exposure Monitoring in Military Training and Operations (BEMMTO)
HFM-ET-194	Effectiveness of Legacy and Next-Gen Personal Protect Equipment Against Current and Emerging Blast Threats
HFM-ET-195	Pre-Symptomatic Detection of Biological Exposures
HFM-ET-196	Enhanced Physical Protection and Hazard Management in CBRN Defence
HFM-ET-197	Gender, Peace and Sustainable Security
HFM-ET-198	The Applicability of the Value-Based Healthcare Concept in NATO (Operational) Military Health Systems
HFM-ET-201	Human Security
HFM-ET-202	COVID-19 in Aerospace and Diving: Riding the High and Low Waves
HFM-ET-207	Operational Vision in the Aircrew
HFM-ET-356	Mitigating and Responding to Cognitive Warfare
IST-ET-116	Formal Modelling of Military Cryptographic Key-Management (COMSEC) Processes
IST-ET-117	Data Hiding in Information Warfare Operations
IST-ET-121	Behaviour Profiling in IoT
IST-ET-122	Designing Resilient Autonomous Vehicles

ACTIVITY	TITLE
IST-ET-123	Exploring Countermeasures against Misinformation of a Nation's Population
SAS-ET-FD	Understanding Strategic Culture
SAS-ET-FF	Planning for Uncertain Defence Budget Increases
SAS-ET-FG	Prediction and Intelligence Analysis
SAS-HFM-ET-FE	Early Warning System for Cognitive Warfare in Cyberspace
SAS-HFM-ET-FH	Inclusion of Generation Z+ to Defence Organisations
SCI-ET-061	High Power Microwaves and Directed Energy Weapons
SCI-IST-ET-060	Overview of Maritime Situational Awareness Activities Within STO, ACT, CMRE, and the Nations
SCI-SET-ET-059	CCDs Technologies to Counter Artificial Intelligence Targeting Systems
SCI-SET-ET-062	Satellite Artificial Intelligence & Machine Learning (SATAM)
SET-ET-128	Open Data RFT / OT Initiative
SET-ET-129	Algorithms as Observers: The Future of Imaging System Design, Modelling, and Testing
SET-HFM-ET-126	Nanopore Sequencing for Biological Identification

Table 23: Exploratory Teams Starting in 2023

ACTIVITY	TITLE
AVT-ET-231	Criteria for Security Evaluation of Tamper Protection Technologies for Military Systems
AVT-MSG-ET-232	Machine Learning and Artificial Intelligence for Military Vehicle Design
AVT-ET-233	Platform Implications for Hybrid Space Architectures for NATO Missions
AVT-ET-234	Physics and Modelling of Separated Flows Around Smoothly-Curved Bodies
AVT-ET-235	Lecture Series for Computational-Experimental Collaborations for Complex Aerodynamics Analysis
AVT-ET-236	Ground-Based Testing of Powered-Lift Configurations
AVT-ET-237	Emerging Propulsion Technologies for NATO Ground Vehicle Platform Systems
AVT-ET-238	Munition Health Management Technologies: Technical Working Group
AVT-ET-239	Per- and Polyfluoroalkyl Substances (PFAS) in the Environment: Mitigation, Remediation and Risk Management for NATO Members
HFM-ET-203	Optimised Menstrual Health in Service Women

ACTIVITY	TITLE
HFM-ET-204	Additive Manufacturing to Support Forward Deployed Medical Forces- Printable On-Demand Medical Capabilities
HFM-ET-205	Digital Mental Performance Training for Optimal Human Function
HFM-ET-206	Biomanufacturing of National Security Materials
HFM-ET-208	Definition of a Methodology for the Assessment of Sustainability of Military Organisations, Operations and Logistics (MIL_SDG)
HFM-IST-ET-200	Extended Reality (XR) Technology for Mediated Communication
IST-ET-124	Using an AI Maturity Model to Accelerate Successful AI Adoption
IST-ET-125	Evolving Threat Landscape for Coalition AI / ML Systems
SAS-ET-FI	Analytic Support for Military Adaptation in War
SCI-ET-063	Laser Jamming Assessment and Techniques Against IR Guidance Seeker
SET-ET-131	Applications of Neuromorphic Cameras
SET-ET-132	Quantum Algorithms for Data Fusion and Resources Management
SET-HFM-ET-130	Existence and Detection of Signal-induced Human Performance Degradation (HPD)



[Home](#)
[Event Summary](#)
[Upcoming Events ▾](#)
[How to ▾](#)
[Old Events](#)
[Contact us](#)

Getting Started



Welcome to the STO Events website.

To book **your first event on this website**, you will need to have an account with us. Existing STO website accounts will not be imported.

Login

[Create an account →](#)

[Forgot your username?](#)

[Forgot your password?](#)

To learn how to create an account and book your first event, please read [Getting Started](#).

Visit our website at: <https://events.sto.nato.int/> to find more details about STO Events.

15. Cross-Panel Activities

Cross-panel activities are a joint venture between two or more Panels/Group where different researchers collaborate by combining their unique set of specialist skills to tackle a multidisciplinary problem. Cross-panel activities bring together diverse perspectives, approaches to problem solving, and subject matter expertise to create unique synergies applied towards increasingly complex operating environment concerns. Within the CPoW, cross-panel activities are not a goal in-and-of themselves, but are instead an additional tool to meet National S&T needs.

Table 24: Cross Panel Activities 2023

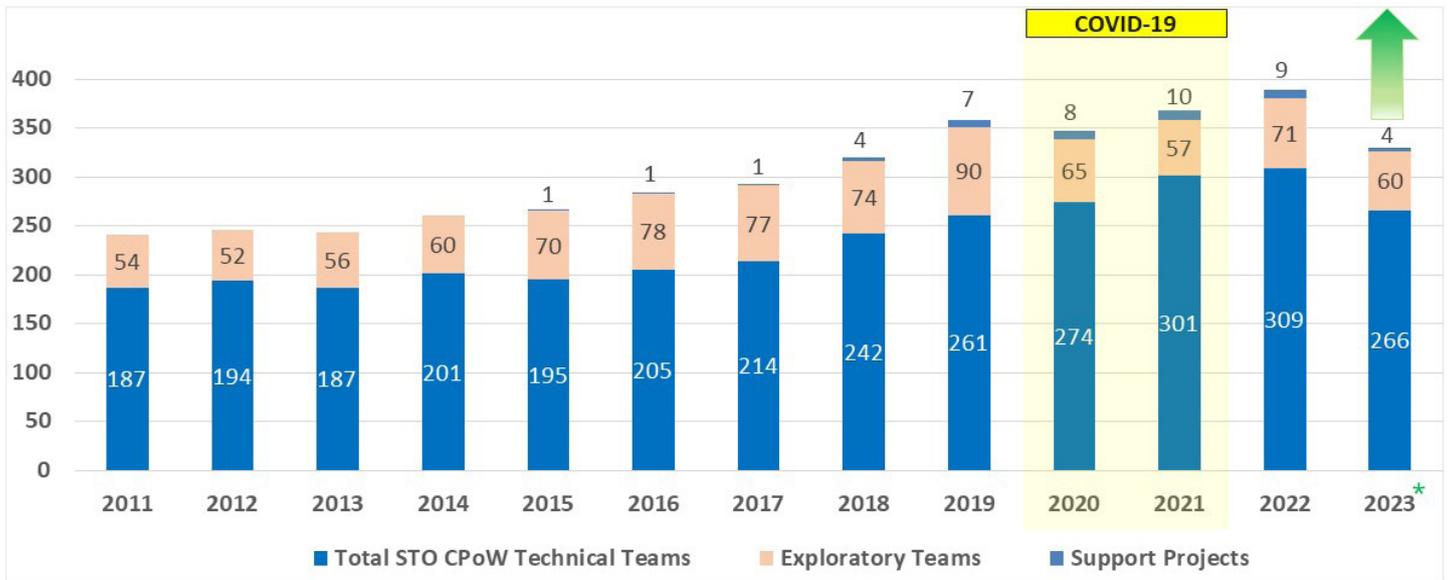
ACTIVITY	ACTIVITY TYPE	TITLE
AVT-MSG-ET-232	ET	Machine Learning and Artificial Intelligence for Military Vehicle Design
AVT-SCI-379	RWS	Technologies Needs for Hypersonic Operational Threats (TecNHOT)
AVT-SET-396	RSM	Technological Challenges for Hypersonic Flights
HFM-AVT-340	RTG	Neuroscience-Based Technologies for Combat-Oriented Crew Cockpit Design and Operations
HFM-IST-366	RWS	Stakeholder Involvement Methods for Ethical Legal and Societal Aspects of Military AI
HFM-IST-ET-200	ET	Extended Reality (XR) Technology for Mediated Communication
HFM-MSG-346	RTG	Assessment of Factors Impacting Cybersickness
HFM-MSG-354	RTG	Study, Design, Building and Deployment of a CBRN XR Training Platform
HFM-SAS-357	RTG	Standards for Military Personnel Data and Analytics Exchanges
HFM-SCI-351	ST	Standards for Military Personnel Data and Analytics Exchanges
HFM-SET-353	RTG	Operational CBR Threat Situational Awareness
IST-SET-198	RSY	Quantum Technology
SAS-HFM-ET-FE	ET	Early Warning System for Cognitive Warfare in Cyberspace
SAS-HFM-ET-FH	ET	Inclusion of Generation Z+ to Defence Organisations
SAS-IST-171	RTG	C2 Services in Multi Domain Operations for Federated Mission Networking (FMN)
SAS-IST-179	RTG	Semantic Representation to Enhance Exploitation of Military Lessons Learned
SAS-MSG-180	RTG	Modelling & Simulation-Wargaming Integration for Intermediate Force Capabilities (IFC)
SCI-IST-ET-060	ET	Overview of Maritime Situational Awareness activities within STO, ACT, CMRE, and the Nations
SCI-SAS-351	RTG	Alliance Space Deterrence Framework

ACTIVITY	ACTIVITY TYPE	TITLE
SCI-SET-323	RSM	Above Water EO/IR Signature Requirements from an Operational Perspective
SCI-SET-353	RTG	C-UAS Mission-Level Modelling & Simulation
SCI-SET-355	RTG	Cross-Panel Collaborative Experimentation for Improved Space Situational Awareness (SSA)
SCI-SET-ET-062	ET	Satellite Artificial Intelligence & Machine Learning (SATAM)
SET-HFM-314	RWS	Multi-Omic Data Sciences Research Workshop
SET-HFM-324	RTG	Surface and Ground Chemical Contamination Detection and Avoidance
SET-HFM-ET-125	ET	Nanopore Sequencing for Biological Identification
SET-HFM-ET-126	ET	Existence and Detection of Signal-Induced Human Performance Degradation (HPD)
SET-SCI-297	RSM	Space Sensors and Space Situational Awareness



16. CPoW in Numbers

TRENDS IN CPOW, 2012 – 2023



* 2023 is expected to exceed 2022 levels after Spring and Fall 2023 PBM's

Figure 4: Yearly Overview of the STO CPoW TTs, ETs and SPs

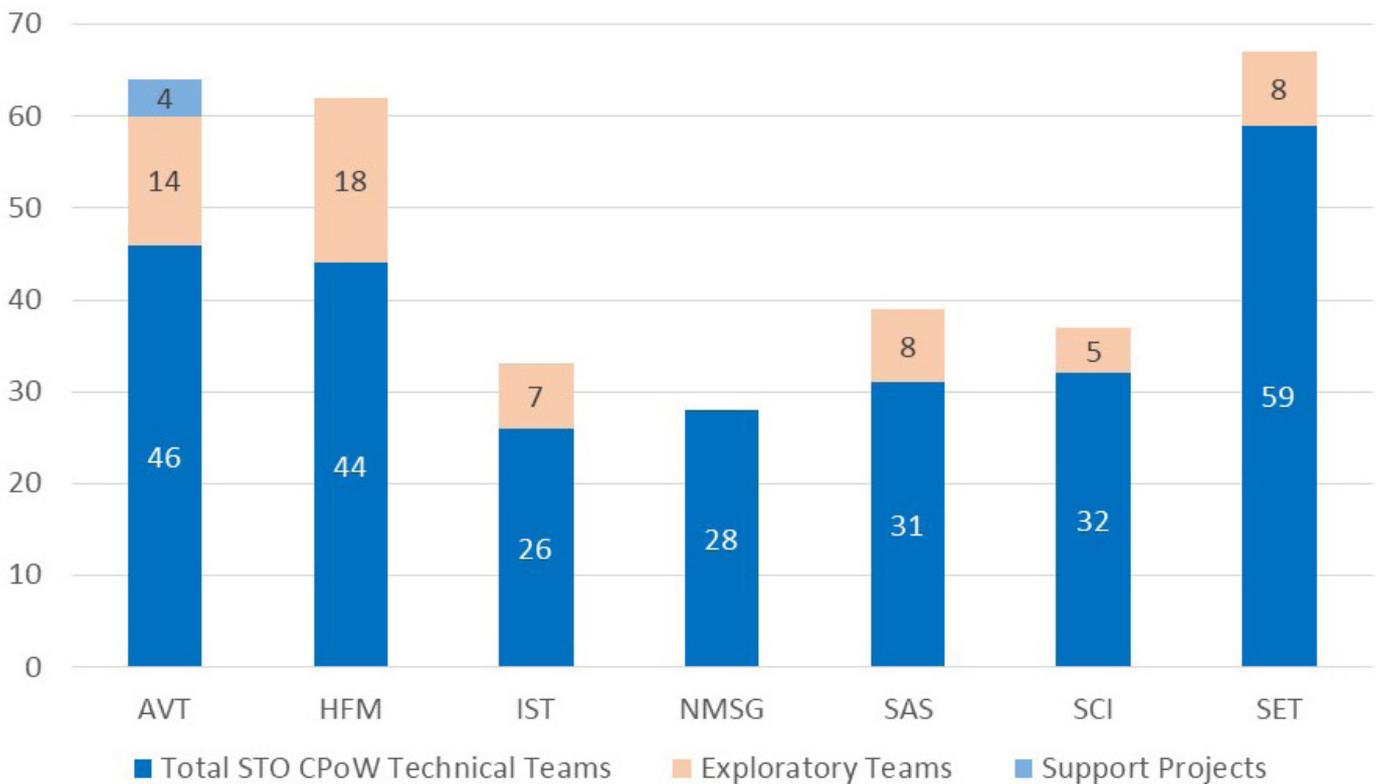


Figure 5: Overview of the 2023 STO CPoW TTs, ETs and SPs per Panel and Group

These numbers are expected to change as additional 2023 activities are approved throughout the year.

ENGAGEMENT IN THE 2023 STO CPOW

Table 25: Participation, Involvement and Leadership of NATO Allies and EOPs within the 2023 STO CPoW

ZONE	COUNTRY	PARTICIPATION	INVOLVEMENT	LEADERSHIP
		MEMBERS	ACTIVITIES	MEMBERS
NATO	Albania	1	1	0
NATO	Belgium	71	53	6
NATO	Bulgaria	7	7	0
NATO	Canada	247	151	51
NATO	Croatia	21	10	0
NATO	Czech Republic	43	34	5
NATO	Denmark	54	45	2
NATO	Estonia	29	22	1
NATO	France	202	106	9
NATO	Germany	433	210	48
NATO	Greece	12	13	0
NATO	Hungary	10	5	0
NATO	Italy	220	110	14
NATO	Latvia	8	8	0
NATO	Lithuania	9	7	0
NATO	Luxembourg	1	1	0
NATO	Netherlands	275	167	37
NATO	Norway	139	104	13
NATO	Poland	93	49	3
NATO	Portugal	30	23	1
NATO	Romania	11	11	1
NATO	Slovakia	6	6	0
NATO	Slovenia	16	13	0
NATO	Spain	82	57	1
NATO	Turkey	303	113	7
NATO	United Kingdom	492	190	46
NATO	United States	711	198	88
NATO	Montenegro	0	0	0
NATO	Iceland	0	0	0
NATO	North Macedonia	0	0	0
EOP	Australia	87	62	3
EOP	Finland	83	61	5
EOP	Japan	2	3	0
EOP	Sweden	156	98	9

Acronyms and Abbreviations

(C)-IEDs	(Countering) Improvised Explosive Devices	CIS	Communication and Information Systems
(NG)-NRMM	(Next Generation) NATO Reference Mobility Model	CMRE	Centre for Maritime Research and Experimentation
A2/AD	Anti-Access / Area Denial	CMs	Counter-Measures
ACG3/SG2	Aerospace Capability Group 3 Sub-Group 2	CNAD	Conference of National Armament Directors
ACO	Allied Command Operations	COM	Communications & Networks
ACT	Allied Command Transformation	COMEDS	Committee of Chiefs of Military Services in NATO
AFSC	Allied Future Surveillance & Control	COMSEC	Communications Security
AG	AGARDograph – Advanced Guidance for Alliance Research and Development	CPoW	Collaborative Program of Work
AI	Artificial Intelligence	CSO	Collaboration Support Office
AI & BD	Artificial Intelligence & Big Data	D&D	Denial and Deception
AI2S	Architecture and Intelligence Information Systems	DECS	Distributed Engine Control Systems
AR	Augmented Reality	DEW	Directed Energy Weapons
ATR	Automatic/Assisted Target Recognition	DEXTER	Detection of Explosives and Firearms to Counter Terrorism
AVT	Applied Vehicle Technology Panel	DFS	Data Farming Services
BD	Big Data	DIRCM	Deployability and Mobility
BEMMTO	Blast Exposure Monitoring in Military Training and Operations	DM	Deployable Multi-Band
BM	Business Meeting	DMPAR	Deployable Multi-Band Passive/Active Radar
C2	Command and Control	EDTs	Emerging and Disruptive Technologies
C3I	Command, Control, Communication, and Intelligence	ELM	Ethical, Legal, and Moral
CA2X2	Computer Aided Analysis, Exercise,– Experimentation Forum	EO	Electro-Optical
CAX	Computer Assisted Exercise Forum	EO/IR	Electro-Optical and Infrared
CBRN	Chemical, Biological, Radiological and Systems Nuclear	EOD	Explosive Ordnance Disposal
CC&D	Camouflage, Concealment, and Deception	EOP	Enhanced Opportunity Partners
CCDO	Camouflage, Concealment, Deception, and Obscuration	EO-TDAs	Electro-Optical Tactical Decision Aids
CDT	Cooperative Demonstration of Technology	ES	Electronic Support

ET	Exploratory Team	LoEs	Lines of Effort
EW	Electronic Warfare	LSS	Low Slow and Small
FATE	Futures Assessed Alongside Socio-Technical Evolutions	LTSS	Long-Term Scientific Study
FMN	Federated Mission Networking	LVC	Long Virtual Constructive
FT3	Flight Test Technical Team	LVC-T	Implementation of Live Virtual Constructive – Training
HART	Human-Agent-Robot Teamwork	M&S	Modelling and Simulation
HEADSTART	Hybrid/Electric Aircraft Design and Standards, Research and Technology	M3T	Modelling, Measuring and Mitigating Optical Turbulence
HEL	High Energy Laser	MAS	Military Application Study
HFM	Human Factors and Medicine Panel	MCDC	Multinational Capability Development Campaign
HLTCs	High-Level Technical Concepts	MD	Mediterranean Dialogue
HMP	Health, Medicine, & Protection	ML	Machine Learning
HQ	Headquarter	MNE	Multinational Exercise
HSB	Human Systems & Behaviour	MSaaS	Modelling and Simulation as a Service
I/ITEC	Interservice/Industry Training, Simulation, and Education Conference	MSCO	Modelling and Simulation Coordination Office (CSO)
ICI	Istanbul Cooperation Initiative	MSE	Multi-Sensors & Electronics
IED	Improvised Explosive Device	MSG	Camouflage, Concealment, Deception and Obscuration
IMS	International Military Staff	NAC	North Atlantic Council
IoT	Internet of Things	NATO	North Atlantic Treaty Organization
IR	Infrared	NAVWAR	Navigation Warfare
ISAR	Inverse Synthetic Aperture Radar	NCIA	NATO Communications and Information Agency
ISR	Intelligence, Surveillance and Reconnaissance	NCTR	Non-Cooperative Target Recognition
IST	Information Systems Technology Panel	NG	Next-Generation
ISTAR	Target Acquisition and Reconnaissance	NIAG	NATO Industrial Advisory Group
IT2EC	International Training Technology Exhibition & Conference	NMCD	Network Management & Cyber Defence
IWA	Information and Knowledge Management	NMSG	NATO Modelling and Simulation Group
JANUS	Multiple-Access Acoustic Protocol	NMSMP	NATO M&S Master Plan

NNAG	NATO Naval Armaments Group	RWS	Research Workshop
NR	NATO Restricted	SAR	Synthetic Aperture Radar
NRMM	NATO Reference Mobility Model	SAS	System Analysis and Studies Panel
NS	NATO Secret	SATCOM	Satellite Communication
NU	NATO Unclassified	SCI	Systems Concepts and Integration Panels
OA	Objective Area	SEAD	Suppression of Enemy Air Defence
OCS	Office of the Chief Scientist	SET	Sensors and Electronics Technology
OPSEC	Office of the Chief Scientist	SimPL	Simulation of Low Photon Lidar
OT	Optical Technology	SMiTMiTA	Smart IED Threat Mitigation Technology Assessments
PACVD	Plasma Assisted Chemical Vapor Deposition	SOF	Special Operations Forces
PB-IEDs	Person-Borne-Improvised Explosive Devices	SP	Support Project
PBM	Panel (Group) Business Meeting	SPS	Self-Protection System
PE	Peacetime Establishment	S-RAM	Space-Risk Assessment Matrix
PfP	Partnership for Peace	ST	Specialist Team
PNT	Positioning, Navigation and Timing	STANAG	NATO Standardization Agreement
PPW	Plans and Programmes Workshop	STANREC	Standardization Recommendation
RAM	Risk Assessments Matrix	STB	Science and Technology Board
RE	Rare Earth	STO	Science & Technology Organization
REACH	Registration, Evaluation, Authorization and Restriction of Chemicals	STOG	Simulation for Training and Operation Group
RF	Radio-Frequency	STOG-NG	Simulation for Training and Operation Group – Next Generation
RFT	Radio-Frequency Technology	SW	Spectrum Width
RLS	Research Lecture Series	SWEM	Space Weather Environmental Modelling
RSM	Research Specialist's Meeting	SYU	Selectable Yield Unitary
RSY	Research Symposia	TAP	Technical Activity Proposal
RTC	Research Technical Course	ToE	Target of Emphasis
RTG	Research Task Group	TRL	Technology Readiness Level

TTs	Technical Teams	UCAV	Unmanned Combat Aerial Vehicle
TW	Technology Watch (card)	UU	Public Released
UAS	Unmanned Aerial Systems	VIRIN	Visual Information Record Identification Number
UAV	Unmanned Aerial Vehicle	VKHS	Von Karman Horizon Scanning
UAxS	Unmanned Autonomous Systems	VKI	Von Karman Institute
UCATT	Urban Combat Advanced Training Technology Live Simulation Standards		





1025

3

135/82

98

36.8/98.24