



SCIENCE AND TECHNOLOGY ORGANIZATION  
SYSTEM ANALYSIS & STUDIES PANEL



**SYSTEM ANALYSIS & STUDIES (SAS) PANEL  
CALL FOR PAPERS**

**SAS-190 Research Symposium on  
“Enhancing Energy Security Resilience, Capabilities and Interoperability”**

**This event is open to representatives from NATO nations, NATO bodies/agencies, Partnership for Peace (PfP) nations, and Global Partner (GP) nations and will be conducted at a NATO UNCLASSIFIED level.**

**To be held in  
Warsaw, Poland  
12-14 November 2024**

**DEADLINE FOR RECEIPT OF ABSTRACTS:  
01 May 2024**

## SYMPOSIUM INFORMATION

### A. BACKGROUND

In January 2023, the NATO Science and Technology Board (STB) authorized the formation of, a Research Task Group entitled, “Enhancing Energy Security Resilience, Capability and Interoperability.” (SAS-183) The goal was to continue the work initiated under SAS-163, “Energy Security in the Era of Hybrid Warfare”, notably addressing threats that hybrid warfare tactics posed to the NATO Member States’ energy sector, and by extension, the Alliance’s cohesion. More specifically, SAS-183 looks more closely at regional analyses on NATO’s eastern members and early warning technologies in cyber domain.

### B. MILITARY RELEVANCE

An important component of hybrid warfare is the ability to attack and negatively impact civilian infrastructure. Many of the attacks conducted so far have been directed toward the energy sector, including both the power grid and fuel distribution. Numerous cyber-attacks on Ukraine’s power supply in recent years have highlighted hybrid warfare’s potentially devastating impact as well as the overall vulnerability of this sector. There is also the question of measuring the impact of hybrid warfare, or the threat of hybrid warfare, on large-scale military readiness and societal well-being. What is clear is that the hybrid warfare threat to the energy sector has not abated since mid-2020. If anything, it has intensified. The Colonial Pipeline ransomware hack of May 2021 was the most glaring example of the continued vulnerability. More recently, the commencement of the Russia-Ukraine War in February 2022 has created conditions that demand greater NATO attention to this dynamic. Our view is that it is imperative that national security experts continue to analyze this vital field—and concentrate on developing NATO resilience, capabilities, and interoperability.

### C. OBJECTIVES

The purpose of the proposed Research Symposium is to organize a multi-day event dedicated to deeper analysis of the concepts and challenges addressed in SAS-183. Through a Call for Papers, inviting keynote speakers and dedicated workshops, the event will increase the depth and scope of critical areas, with an underlying theme of improving resilience, capabilities, and interoperability. The event will focus on the exchange of ideas and best practices, as well as to highlight the study’s accomplishments and more narrowly focus on ways to enhance NATO member states’ resilience, capabilities and interoperability in a hybrid warfare/energy security context. In this context, paper presentations will be used in development of the SAS-183 study. For our purposes, we identify these attributes in the following manner:

1. Resilience as the ability of NATO member states collectively or individually to deter, detect, withstand, and recover from a variety of hybrid tactics launched against the energy infrastructure;
2. Capability as allowing NATO to operate more effectively in an energy-constrained environment, and;
3. Interoperability, which permits the member states to interact seamlessly in different environments, conditions and platforms.
4. Military responsibilities within the broader civilian energy context. The necessary balance between society and military energy needs

### D. TOPICS

The symposium’s presentation and panels will focus on the following five topics:

1. **Enhanced regional focus on the Baltic, Black, and Arctic Seas.** The symposium will highlight the work done by the teams dedicated to the Arctic, Black and Baltic Seas. While these analyses will be separate, there will be an interrelated component which emphasizes standardized capabilities and interoperability in the energy sector across all disciplines. The NATO defense posture along with the broader area of hybrid warfare and the supply chain will also be considered. This symposium will

explore the potential of a deeper analysis of the continued threat posed to NATO member state security via the confluence of hybrid warfare and the energy sector.

2. **The broader geo-political implications and strategic foresight assessment.** Notably, how does NATO operate in the energy global commons and what future considerations should be considered? What challenges and investments should the Alliance consider addressing the mid-century security environment, notably in the eastern tier?
3. **Enhancing NATO resilience, capabilities and interoperability.** Emphasis on military operational capabilities development and interoperability, and better integration into the NATO Warfare Development Agenda (WDA), Line of Deliveries (LODs) and the NATO Defense Planning Process (NDPP). Interoperability deserves greater emphasis. The goal is to identify gaps and inform current capabilities and interoperability. Resilience among NATO warfighters is the ability to operate in a potentially resource-constrained environment. Resource-constraints can arise from conflict, or from the energy transition to meet net-zero targets by 2050. A deeper assessment of malign influence in the energy sector will be explored. For instance, the importance of an effective strategic communications division to address misinformation efforts will be a main emphasis of the symposium.
4. **Advanced Cyber Defense Topics Concentrating on Early Warning.** The cyber working group will focus on creating a virtual model prototype to improve maritime security by protecting energy critical infrastructure from cyber-attacks. Specifically, the model will focus on the topic: "Threat detection and cyber security incidents prevention in microgrids using emerging technologies - Energy resilience through automatic insulation". How can a microgrid best be isolated from national grid infrastructure to ensure independent energy security and protection from cyber-attacks? Energy storage systems and controllable loads may also be examined. The prototype will use real data from microgrid hardware, wind turbines, photovoltaic panels, biomass, and wave energy extractors to create accurate detection of normal cyber behavior for early detection of malicious cyber intrusions into energy critical infrastructure. The University of Constanta has received EU funding that will provide for the software and hardware needed to produce the virtual demonstrator prototype. It is anticipated a demonstration of the prototype will be conducted during the symposium.
5. **Exercise Results.** SAS-183 anticipates a successful completion of Nordic Pine 23 in September of 2023, from which relevant findings can be discussed at the symposium and leveraged for the final paper. We also anticipate other exercises, possibly in the Black Sea, which will balance our analysis on NATO's eastern tier.

## E. ABSTRACT SUBMISSION

Interested candidates are invited to submit an abstract (between 150 to 250 words) for consideration no later than **01 May 2024**. Candidates are asked to submit their abstracts to [arnold.dupuy@nps.edu](mailto:arnold.dupuy@nps.edu).

US-affiliated authors will have send their abstract in copy to their STO National Coordinator at [osd.pentagon.ousd-atl.mbx.usnatcor@mail.mil](mailto:osd.pentagon.ousd-atl.mbx.usnatcor@mail.mil).

The selection of abstracts will be based on the following evaluation criteria:

1. Relation to symposium topics
2. Clarity and readability
3. Argumentation
4. Technical quality
5. Novelty of contribution
6. Military relevance
7. Conclusion

Authors will be notified of the Programme Committee decision by **01 June 2024**.

## F. AUTHOR INSTRUCTIONS

Selected authors will receive author instructions by email.. Papers must follow the instructions and be in the STO template, provided by email to selected authors and uploaded to the [STO Events site](#). Papers that do not follow the prescribed format or that do not achieve an acceptable standard for grammar and spelling will be returned without review.

Authors should submit a paper in UK English. The text is typeset in Times New Roman 12 pt. (single or one and a half spaced). For special characters, please use Symbol or Arial Unicode. The total length of the paper should be 3000 words. You can use all the functions in Word, particularly displayed lists, type styles such as bold or italics, the indexing function, and the footnote function.

Avoid using acronyms and abbreviations if possible, and if used acronyms should be spelled out in entirety the first time they are used.

Title: The title should be a 15-words maximum; with a description of the study type, if relevant. Subtitle is an option.

Author Name: For multiple authors, you may list them here in the same format. For more than six contributors, consider only listing the principal authors and name the other people in the acknowledgements section.

Abstract: Abstract should be one paragraph long (not more than 250 words in total) and be complete in itself (no reference numbers). It should indicate subjects dealt with in the paper and state the objectives of the investigation. Newly observed facts and conclusions of the experiment or argument discussed in the paper must be stated in summary form; readers should not have to read the paper to understand the abstract. Abstract is not an introduction.

Introduction: State the research problem or questions to be answered, background or context, who were the stakeholders or clients, what was your hypothesis and introduce the methods or analysis.

Analytical Methods: Provide a description of the analytical methods or process used in your work. Explain why you chose those methods, and the advantages and disadvantages of them. Is it a new method or a new application of an existing method?

Results: Present your results and / or data in a manner that is easy to read and interpret. Make sure the results answer the problem or questions posed in the introduction, or if they do not, explain why not. Describe any impact of the results.

Conclusion: Discuss the relationships between your results and how they relate to your initial objectives or hypotheses. Describe the implications of your work and any further applications. You should provide major conclusions, supported with evidence

References: For references please follow IEEE format: <https://ieeauthorcenter.ieee.org/wp-content/uploads/IEEE-Reference-Guide.pdf>

Example: [4] F. Yan, Y. Gu, Y. Wang, C. M. Wang, X. Y. Hu, H. X. Peng, et al., "Study on the interaction mechanism between laser and rock during perforation," Optics and Laser Technology, vol. 54, pp. 303-308, Dec 2013.

Acknowledgements: Optional section, to thank those who were directly involved in your work

## **G. PUBLICATION RELEASE AUTHORITY**

To allow publication of material from selected authors, the STO requires a signed Publication Release Form (STO form 13-3(E)), provided by email to authors and uploaded to the [STO Events site](#). Authors submit their paper, presentation and signed Publication Release Form to the Programme Committee via email to [arnold.dupuy@nps.edu](mailto:arnold.dupuy@nps.edu).

US-affiliated authors will have to send their material with the internal review by local Public Affairs or Foreign Disclosure Office (or its equivalent) in copy to their STO National Coordinator at [osd.pentagon.ousd-atl.mbx.usnatcor@mail.mil](mailto:osd.pentagon.ousd-atl.mbx.usnatcor@mail.mil) for counter signature.

The event is open to representatives from NATO nations, NATO bodies/agencies, Partnership for Peace (PfP) nations, and Global Partner (GP) nations. The security marking on your material and on the Publication Release Form should therefore be:

### **NATO UNCLASSIFIED, Releasable to PFP, GP**

However, to allow unlimited distribution, please consider no marking, which makes the documents publicly releasable.

The paper template acts as both a style-formatting template and guidance to authors for writing a proceedings paper to be submitted in the meeting proceedings.

## **H. PRELIMINARY SCHEDULE**

- Abstract submission deadline: 01 May 2024
- Abstracts acceptance notification: 01 June 2024
- Opening registration: 01 June 2024
- U.S. paper submission: 15 September 2024
- Other nations paper submission: 15 October 2024
- Presentation submission deadline: 07 November 2024
- Closing registration: 07 November 2024

## THE NATO SCIENCE AND TECHNOLOGY ORGANIZATION

Science & Technology (S&T) in the NATO context is defined as the selective and rigorous generation and application of state-of-the-art, validated knowledge for defence and security purposes. S&T activities embrace scientific research, technology development, transition, application and field-testing, experimentation and a range of related scientific activities that include systems engineering, operational research and analysis, synthesis, integration and validation of knowledge derived through the scientific method.

In NATO, S&T is addressed using different business models, namely a collaborative business model where NATO provides a forum where NATO Nations and partner Nations elect to use their national resources to define, conduct and promote cooperative research and information exchange, and secondly an in-house delivery business model where S&T activities are conducted in a NATO dedicated executive body, having its own personnel, capabilities and infrastructure.

The mission of the NATO Science & Technology Organization (STO) is to help position the Nations' and NATO's S&T investments as a strategic enabler of the knowledge and technology advantage for the defence and security posture of NATO Nations and partner Nations, by conducting and promoting S&T activities that augment and leverage the capabilities and programs of the Alliance, of the NATO Nations and the partner Nations, in support of NATO's objectives, and contributing to NATO's ability to enable and influence security and defence related capability development and threat mitigation in NATO Nations and partner Nations, in accordance with NATO policies.

The total spectrum of this collaborative effort is addressed by seven Scientific and Technical Committees who manage a wide range of scientific research activities:

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

These Scientific and Technical Committees are the power-house of the collaborative model and are made up of national representatives as well as recognized world-class scientists, engineers and information specialists. In addition to providing critical technical oversight, they also provide a communication link to military users and other NATO bodies.

The scientific and technological work is carried out by Technical Teams, created under one or more of these bodies, for specific research activities which have a defined duration. These research activities can take a variety of forms, including Research Task Groups, Research Workshops, Research Symposiums, Research Specialists' Meetings, Research Lecture Series and Research Technical Courses.

For further information, please consult the STO web site: [www.sto.nato.int](http://www.sto.nato.int)

## THE SYSTEM ANALYSIS AND STUDIES (SAS) PANEL

The System Analysis and Studies (SAS) panel, designated as NATO STO's foremost expert panel for providing analytical advice, conducts studies and analyses to enhance decision-making in matters of strategy, capability development, and operational activities within NATO, NATO member nations, and partner nations. The SAS panel's key driving factors encompass the effective utilization of emerging technologies, innovative organizational structures, and novel operational concepts.

The primary focus of the Panel centers on conducting Operations Analysis activities that address challenges arising within the evolving strategic landscape, as well as the responses formulated by individual nations and the collective NATO body to address these challenges. The research initiatives can be categorized into four core areas:

1. **Policy and Strategy Decision Support:** This entails providing decision-making support by analyzing and assessing the impacts of geopolitical forces, regional dynamics, future scenarios, and technological shifts to facilitate policy and strategy decisions.
2. **Operations Decision Support:** The panel engages in analysis to enhance operational tactics, training protocols, and procedures. It actively contributes to the development of improved methods for operational planning.
3. **Capability and Investment Decision Support:** The SAS panel aids in decision-making related to systems, force elements, and enabler capabilities. This involves collecting and consolidating cost and performance data and defining the necessary missions for these specific systems and capabilities.
4. **Development and Maintenance of Analysis Capabilities:** The foundational work of the Panel revolves around developing and sustaining analytical capabilities that are innovative and academically robust. This is crucial to furnish NATO with the necessary analytical tools for well-informed defense decision-making. Activities in this area include the creation of analytical methods to address emerging security challenges, sharing knowledge on Operations Analysis modeling concepts and best practices, researching new methodological approaches, and developing and exchanging analytical models.

The Panel harnesses its extensive spectrum of analytical capabilities to provide decision support at various levels and across diverse domains. This includes not only identifying and assessing the influence of geopolitical factors but also enhancing operational tactics, devising more effective training procedures, and supporting the development of advanced systems and capabilities. Additionally, it plays a pivotal role in collecting and consolidating essential cost and performance data.

The SAS panel's research projects stem from proposals put forth by NATO member nations participating in the SAS panel. Furthermore, it responds to requests for analysis and studies from a multitude of sources, which encompass the Science and Technology Board (STB) and various other NATO entities such as the NATO Military Committee, the Conference of National Armament Directors (CNAD) with its Main Armaments Groups, the NATO Industrial Advisory Group (NIAG), Allied Command Operations (ACO), Allied Command Transformation (ACT), and the NATO Communications and Information Agency (NCIA).