



**NATO
ADVISORY GROUP
ON EMERGING
AND DISRUPTIVE
TECHNOLOGIES**

**ANNUAL REPORT
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1.0 Foreword

Over the past year, NATO has taken ambitious steps to augment its technology readiness and respond to global developments in emerging and disruptive technologies (EDTs). In our first annual report, we highlighted the need to make technology leadership a critical issue on NATO's agenda, and it is encouraging to see rapid progress across the areas that were identified—particularly financing innovation, fostering innovation ecosystems, and developing talent. The announcements to launch DIANA and the NATO Innovation Fund, as well as the endorsement of the AI Strategy and the Data Exploitation Framework Policy, are testimony to the Alliance's ambitious approach.

In November this year, this group had the pleasure of finally visiting NATO HQ and engaging in direct discussions with NATO's Innovation Board – previously not possible due to COVID travel restrictions. Composed of twelve experts from the private sector and academia, the NATO Advisory Group on EDTs provides external advice to NATO's innovation efforts and challenges existing approaches to its adoption of new technologies. These experts from across the Alliance have led cutting-edge research, driven policy developments on EDTs and have been responsible for the delivery of significant innovation programmes in their respective domains.

The purpose of this report will be to examine three critical, ongoing work-strands aimed at enabling NATO and Allies to adopt new technologies at pace and maintain a 'technological edge': the Defence Innovation Accelerator for the North Atlantic (DIANA); the NATO Innovation Fund (NIF); and the Human Capital Innovation Policy (HCIP). Amidst the ongoing work to update NATO's Strategic Concept, this report aims to: identify the unique features of NATO endeavours in these domains; suggest metrics of success for each; and outline issues and risks that will need to be considered. We hope that our advice and considerations will help shape all three of these activities and, more broadly, the wider innovation and EDT-related strategies of the Alliance.

Professor Deeph Chana

*Chairperson of the NATO
Advisory Group on Emerging
and Disruptive Technologies*





2.0

Technology & Innovation in the NATO Strategic Concept

The adoption of emerging and disruptive technologies (EDTs) in the coming decades will be characterised by an ever-increased interconnectivity between people, machines and services. Whilst the existence of computing networks, big-data processing, digital transactions and ubiquitous sensing already seem to have established themselves as the norm in the wealthiest parts of the world, the global-scale transformation promised by these innovations is, in reality, in its early stages. The rapid adoption and integration of cyber-physical technologies across the world in the years to come will transform economies by redefining and removing established boundaries between industrial sectors, government institutions and other infrastructure constructs. Furthermore, advances in blockchain, distributed ledgers and crypto-tokens promise a profound influence on the impact of human activity in 'cyber-space'. These advances drive trends in decentralisation (e.g., decentralised finance), and likewise change notions of citizenship, identity and statehood.

In the context of this report, the unprecedented connectivity in and between our societies should be read as a key disruptive force. When we talk of disruptive technologies, we talk of enablers of broader disruption to our global security and insecurity challenges. Increased connectivity between citizens shifts their concerns toward these shared challenges – with climate change and its associated risks as a key example. We also see geopolitical shifts that will, in all likelihood, oscillate between short-, medium- and long-term priorities. Ideology fuelled by digital information, disinformation and misinformation already increases short-term security volatility. As technologies continue to proliferate, so, too, may political instability and security uncertainty. The increasing reach of technology suggests this pattern is likely to manifest itself in new locations in the coming years, making this an emerging global security trend, without a clear owner.

Examining such EDT-enabled security trends on short, medium and long timescales suggests, therefore, a need to revise strategies and priorities in security and defence efforts. Over the long term, connective technologies should motivate defence postures that are geared toward mitigating the risks of global insecurity. Yet shorter periods will more likely be characterised by volatility, continuing to precipitate wars and conflict. Ideally, it seems, defence and security innovations are needed to simultaneously address both timescales. Strategies that concentrate primarily on conflict readiness and execution need to shift focus toward the delivery of sustainable conflict minimisation – investing time, effort and resources on science and technology that can achieve this objective.

In this report, we emphasise the need to preferentially support innovations that simultaneously fulfil NATO's tactical purposes and also contribute to a long-term global defence mission with the core priority of solving global insecurity. Such a stance should align with the United Nation's Sustainable Development Goals. We define dual-use technologies, therefore, as innovations that can serve both these objectives. And we therefore argue for NATO to pursue activities that encourage and facilitate their development and adoption. We consider this shift in focus, narrative and thinking as an EDT-motivated **holistic defence pivot**.

In this document, we expand on the work of our previous report to outline a three-pillar approach for a NATO response to meet the challenge of this changing defence and security landscape – as well as describe what has already been achieved to date under each of the following topics:

- The NATO Defence Innovation Accelerator for the North Atlantic;
- A NATO Innovation Fund; and
- A new Human Capital Innovation Policy for NATO.

In line with the goals and objectives of NATO 2030, we argue that this programme, and the narrative in which it is situated, will enable NATO to keep pace with rapidly developing EDTs, leverage the underpinning science and, crucially, influence responsible development and use. Through this effort, NATO has an opportunity to lead in establishing a revised and progressive global agenda for defence.

3.0

The NATO Defence Innovation Accelerator for the North Atlantic (DIANA)

Currently NATO lacks effective mechanisms to engage with disruptive innovation, in particular with academia and small-to-medium-sized enterprises, which represent a critical base of innovation across the globe. The Alliance represents a rich pool of technology talent and is uniquely placed to harness this talent for the purposes of developing the next generation of dual-use technologies in order to maintain its competitive edge. Working in collaboration with partners, NATO is in a position to lead on fostering the development of proactive innovation ecosystems of significant scale and international benefit. Specifically, NATO needs to establish a program that enables the Alliance to achieve the following in a sustainable manner:

- Foster a resilient transatlantic innovation ecosystem and address innovation gaps within the Alliance by promoting diversity, inclusiveness and embracing geographic balance;
- Enable a more effective and proactive mechanism for engaging with a wide innovation talent base, facilitating a more efficient horizon scanning process;
- Develop an Alliance-wide innovation network that would act as a source of technology insights and solution proposals on varying timescales, including in times of urgent need;
- Conduct horizon scanning for science and technology developments relevant to a progressive defence mission;
- Establish a mechanism by which innovators can receive development support in the form of grants and access to knowledge networks to benefit the development of their solutions; and
- Provide the means by which innovators might access test and evaluation facilities and processes for the purposes of research, development, testing and demonstration and conduct development by design including cybersecurity.

To achieve the above, this group has advocated the creation of a NATO-wide innovation accelerator network, which was incorporated under the banner of the Defence Innovation Accelerator for the North Atlantic (DIANA), the establishment of which Allies agreed at the 2021 Brussels Summit.



3.1

Features, structure and working of DIANA

Over the last year, this group has undertaken significant work in providing inputs to the development of a charter for DIANA. The charter outlines a governance structure and initial operating model for DIANA that sees the establishment of a defence innovation ecosystem within the Alliance. DIANA should provide grants, growth networks and implementation pathways for next-generation EDT technologies. The charter sees the establishment of two regional offices on each side of the Atlantic, with a remit to coordinate, manage and develop a NATO-wide DIANA ecosystem. In addition, it has been our recommendation that DIANA should make specific provision for:

- A means of brokering and connecting DIANA innovators with trusted investment networks through the maintenance of a mechanism such as a trusted capital database;
- Connection to existing test centres and other relevant technology test facilities already in existence to enable technology development, testing, evaluation and verification;
- Where feasible, connection and coherence with pre-existing national innovation initiatives and promotion of best practices; and
- Overall, a more efficient pathway for technologies to transition from concept through testing and finally, to implementation – in essence, a rapid adoption service.

To be successful, DIANA will need to operate in a manner that is markedly different from other entities within NATO, adopting an agile, risk-tolerant and flexible approach that will allow it to be responsive to nascent technology developments. To ensure trustworthiness, DIANA will also need to operate with high standards of transparency to citizenries and will need to be effective in outreach activities that will allow it to connect with the widest possible set of innovators and innovation stakeholders from across the Alliance and beyond. DIANA will need to be afforded a high degree of flexibility and autonomy for its operating procedures to remain adaptive, and it will need to be run by teams capable of operating within the highly dynamic domain of technology innovation. Furthermore, DIANA will require leadership that exhibits high levels of technical, business, and geopolitical competence in order to effectively direct and navigate the complex EDT defence and security space.

3.2

Metrics for progress and success

DIANA will need to maintain and lead a commitment to the progressive agenda set out here with respect to dual-use technology, and likewise embody a refreshed defence and security perspective for the future. Failing to do so will risk the effort simply being a repetition or replication of past or current innovation initiatives, making it effectively redundant.

If NATO succeeds in equipping DIANA with the necessary agility and flexibility, DIANA will be in a position to influence, shape and augment its existing efforts as a transatlantic driving force. DIANA will succeed if the innovations that it seeds lead to an array of dual-use solutions that will, after suitable development, be put into real-world operation. Crucially, operationalised technology that falls outside of the traditional bounds of defence will need to be recognised and measured as successes, in line with the revised defence posture outlined earlier.

To this end, it is critical that DIANA's commitment to dual-use is made mainstream. Technical solutions that, for example, serve to augment naval combat capabilities whilst also providing a solution to human trafficking or illicit fishing – both global insecurity issues – should be prioritised as the most sought-after. Examining this approach through an economic lens, it is important to note that such multiplicity of use represents higher potential returns on investment for DIANA's portfolio and, therefore, a greater draw for scale-up investors. In time, the NATO DIANA brand should provide DIANA innovators with a respected hallmark for future investors, joint-venture partners and collaborators, de-risking their pathways to success.

Once established, it is our recommendation that the executive management of DIANA outline high-level metrics for success. Appropriate timeframes would need to reflect the reality that DIANA's full impact will be difficult to assess accurately in early years, as the first cohorts will not have fulfilled their full potential within this timeframe. Nevertheless, metrics should be established to indicate progress during this early phase and might include measurements such as:

- x number of innovators have accessed a DIANA-affiliated test centre.
- x number of innovators identified for the accelerator programme.
- x number of innovators have secured further investment.
- x number of innovators have secured contracts with defence agencies or others.
- x number of innovators working on technology with impact in sector y (related to dual-use).

Such quantitative metrics should be considered alongside more nuanced impacts that DIANA should be focused on achieving, such as contributing towards the maintenance of a rich technology talent pool for NATO economies. Managing expectations around quantitative metrics of success and resisting short-termism will be among the key challenges that DIANA's leadership must be prepared for, as both issues will represent risks to its reputation and success.

4.0

NATO as an EDT investor

In our previous report, we highlighted the need for NATO to make direct investments in technology development to fuel a globally competitive technology ecosystem within the Alliance and to play an active role shaping solutions to meet its needs and objectives. Extending past grant funding, such as that which would be available through DIANA, we suggested that NATO should establish a mechanism for supporting and encouraging the growth of technologies beyond a company's start-up phase. Specifically, we advocated for the formation of a formal equity-taking investment vehicle through which NATO would engage in a range of strategies, from seed funding to venture capital-style investments.

4.1

The NATO Innovation Fund

As with DIANA, significant progress has been achieved on the NATO Innovation Fund (NIF) in the last 12 months. Progress has been rapid, and the Advisory Group has supported NATO officials to formulate and structure the NIF, which was formally announced at the Brussels Summit 2021 and has been signed-up to by 21 Allies to date.

The NIF has been conceived as a wholly separate entity from DIANA, providing an option for further investment for companies that have been through the DIANA accelerator program. NIF investment would simply form one option for DIANA cohorts seeking financing, with other trusted capital sources also included within the trusted investors database, described previously. Equally, the NIF should not be obliged to solely support DIANA entities, giving it the freedom to invest across a wide range of technology readiness levels and enabling it to build the strongest portfolio possible.

By taking equity and seeking investment returns through mechanisms such as licensing, we suggest that a pathway for developing the NIF into a self-sustaining evergreen fund is possible with diligent management. Having a focus on deep-tech and EDTs, the NIF will occupy a unique role in the investor community, acting as a source of patient capital, where needed, and as a de-risking signal for other investors in the sector by virtue of its brand and that of DIANA. As such, the fund's success should be measured preferentially against strategic criteria supporting dual-use technological developments, rather than being focussed solely on profit return.

Furthermore, the NIF should be structured to align itself with the rapidly growing trend of Environmental, Social and Governance, 'ESG'-based investment in the market. The arguments we have presented here, with respect to an EDT-motivated holistic defence pivot and the accompanying definition of dual-use technology, have been purposefully made with this in mind. It is clear that ESG and responsible investment trends will be a dominant factor across the investment space for the foreseeable future, as they should be.

We argue, therefore, that investing in the defence and security technology space in its current form will become an increasingly unattractive proposition to investors. Through its explicit aims and values, the NIF should align with these emergent trends and practices in order to successfully engage and maintain the wider investor community's interest in the future. The NIF should establish a new, progressive, transparent and ethical posture for defence science and technology investment that is aligned to the NATO 2030 goals.



4.2

Unique features of the NIF

In the points below, we highlight the core, unique facets of the NIF that would differentiate it from other funding vehicles. These core facets clarify how the NIF would fill a critical gap within the current market:

- The NIF would provide the primary mechanism by which NATO can establish itself as an EDT scale-up partner with longer term and larger scale commitment than the scale of initiatives such as grants from DIANA. The NIF would offer companies a landing ground for their scale-up aspirations and, implicitly, connect them to trustworthy and transparent capital that is in line with the evolutions in ethical investment. Association with the NATO Brand (including through scientific and technological due diligence, which the NATO Science and Technology Organization could potentially provide) will provide innovators with financial and reputational due diligence in any future financing round in which they participate.



- The NIF would provide scale-up and market exposure opportunities for dual-use technologies, providing pathways for product development with potential for real-world applications related to global challenges, (in)security and defence.
- As a unique multinational fund, NIF support would encourage the development of common operating standards across nations, enhancing interoperability and facilitating the delivery of truly scalable and compatible deployments.
- In contrast to other funds, the NIF would provide a source of patient capital that recognises the possibility of short and longer-term lead times for solution development. At the same time, the NIF will need to keep abreast and engage with shorter-term strategic innovation needs to support Allied access to critical developments and applications. The NIF will therefore facilitate a multi-speed investment community in dual-use security and defence, enabling rapid impact as well as longer-term maturation, as appropriate.
- The NIF will provide a de-risking signal to other investors by virtue of its brand and reputation and will take a role in being a trusted keystone investor that will attract other investors to its portfolio and areas of interest.

4.3

Measuring and ensuring the success of the NIF

As with DIANA, measuring the success of the NIF will need to take into account measurable criteria, together with more nuanced considerations of impact. In the bullet points below, we summarise some of the key aspects for those running the NIF to consider, and also establish detailed performance metrics, targets and assessment criteria.

- As already outlined, the dual-use nature of the NIF means that it will be important to seek and record successes of technologies that contribute to global security, even outside the remit of classically defined security and defence application domains. Extending this further, the NIF should account for innovations that are successfully 'spun-in' to alleviate global insecurity, as well as those that are spun out. Achieving this will be challenging, particularly as the Fund grows and matures. The NIF will need to ensure that there is a robust method to measure spin-ins and -outs and that there is a continual effort to maintain an effective tracking function as the Fund evolves.
- The NIF's reputation should eventually bestow a badge of esteem for companies who win support from it, giving them a greater ability to raise future funds and capture international market attention for their technology. Carrying the NIF brand should enable funded entities to engage more readily with other private/national/multinational funds, potentially even augmenting their impact, returns and risk exposure through co-investment.



- The NIF executive will need to develop a series of short-, medium- and long-term targets related to the points above and to other quantifiable metrics, including numbers of contracts awarded, time horizons for investment returns or levels of investment returns.
- The NIF will need to be able to guard against short-term geopolitical shifts that might negatively influence or dilute its core aspects. As an example, there is a significant risk of losing the dual-use focus over time, effectively compromising the core feature of the NIF. A similar risk would be a shift toward seeking higher returns on shorter timescales, undermining another core feature of the Fund to offer a spread of time-horizon expectations to include longer-term patient capital. The objectives and aspirations of the Fund need to be well documented and codified. Likewise, the public should be clear on the purpose of the NIF from the outset.

Ultimately, the NIF will be deemed successful if investments grow in value due to the success of the companies in which it invested, the integration of respective developments in Allied forces and the application of supported solutions to benefit civil society, prevent resource shortages, cope with environmental disasters or impact other drivers of insecurity and conflict risk.



Talent and Human Capital

In our first report, we emphasised the pivotal and central role of technical human capital within NATO to ensure that the organisation, as a whole, is well equipped to track issues related to developments, opportunities, ethics and ramifications of technology. This ethos applies to talent management for technologies of today and, most importantly, of the likely EDT landscape of the future.

The COVID-19 pandemic has illustrated all too clearly that decision-makers, contractors, politicians and users struggle to navigate scientific topics and debates about technology when equipped with limited technical insight. Dwelling on this point, we emphasise the need to differentiate between the idea of technical literacy and deep technical expertise on the one hand, and more general technical awareness of EDTs on the other hand. Whilst NATO does face greater challenges with the former and possesses good capacity with the latter, securing deep-level expertise will also be a growing challenge for the organisation and the defence and security sector in general.

Talented individuals equipped with deep technical skills will be in higher demand as technology economies mature and grow, increasing the competition for their attention. It is important, therefore, for NATO to connect with broader technology talent market trends outside of defence – for example within the financial sector – to stay informed on the state, trends and measures that others are taking in order to de-risk future projections of skills deficiency in their workforce. To summarise we recommend that NATO actively engage in:

- Developing and educating its current workforce with the aim of creating a widely distributed base level of technical competence within its staff, including at the most senior levels.
- Creating a culture of innovation and agility to cultivate ways of working that attract technically literate and technically expert people.
- Creating a culture that values technical literacy at all levels and understands the profound influence and impact that EDTs bring to all aspects of defence and security consideration.
- Influencing the development of Science, Technology, Engineering, Mathematics and Business (STEM-B) talent pools across the Alliance and globally, so as to develop human resources to empower NATO's emerging innovation initiatives such as DIANA and the NIF, as well as future generations of talent. It is worth noting that the very existence of DIANA and the NIF are likely to stimulate people to engage in STEM-B education and entrepreneurship.

5.1

The NATO Human Capital Innovation Policy

Over the last 12 months, this group has provided advice related to skills, talent and culture, as a contribution to a significant effort within NATO examining the organisation's human capital systems and policies. Within a short period, this effort has culminated in the NATO Human Capital Innovation Policy (HCIP), which was discussed in NATO's Innovation Board. The HCIP contains far-reaching and significant recommendations on how the organisation's culture, practices and systems might be brought in line with the themes discussed in this and our previous report.

In the context of NATO's ongoing EDT and innovation-related efforts, investing in an enduring transformation of NATO's human capital policies is crucial. The development, evolution, and adoption of EDTs has already profoundly influenced ideas related to the structure of organisations, the working environments for employees and their appetite for trials and experimentation. In combination, these organisational traits connect directly to how rapidly an organisation can discover and adopt new ideas and keep pace in a fast-moving technology environment.

A cultural transformation for NATO is indispensable to establishing its 'technology readiness'. A spirit of innovation needs to be infused across the entire Alliance and working practices of NATO as an organisation. To drive the necessary cultural shift, desirable traits include an increased acceptance of risk, as well as an augmented ability to learn rapidly from failures.

On the important issue of attracting future talent, NATO will have to develop a reputation as a trusted defence technology entity with a modern mission and outlook. These qualities should make the organisation a prestigious and sought-after employer across the widest possible talent pool. NATO will need to stay ahead of the EDT curve, rather than simply responding to it, and will need to honestly recognise that the current reputational status of defence leaves plenty of room and opportunity for improvement. Establishing itself as a defence thought leader that sets the tone for, and is home to, innovative thinking will be key. With a reputation as an innovative and responsible actor, the Alliance can make inroads to attract, retain, and develop the best talent in a talent market whose high-temperature will continue to rise in the coming years.

The Alliance must work hard to make NATO representative of the diversity of the citizens that it represents in order to encourage and attract talent from all quarters. Ensuring diversity is critical

for NATO to be equipped for wide-ranging perspectives on challenging socio-technical EDT topics. A key example to this end is responsible and ethical use of technology. NATO must demonstrate the value of inclusivity that it aims to stand for, including through the explicit makeup of its human capital, increased transparency and connection with external entities. Proactively engaging a wider human capital ecosystem – comprised of the NATO Enterprise, Allied institutions, Allied academia and industry and partner organisations – is a robust suggested strategy to address many of these core objectives.

Metrics for progress and success in the HCIP

NATO's approach to Human Capital should not only establish the need to create a wider ecosystem perspective for NATO's human capital on innovation, but also outlines four base objectives that NATO should pursue within it, namely:

- Engage broadly in the ecosystem to access relevant human capital;
- Evolve human capital by collaborating on people development across the ecosystem;
- Empower human capital to innovate and create solutions for NATO's challenges; and
- Embed human capital as a core consideration in NATO's strategic discussions/deliberations.

These objectives should be considered through different lenses as priority topics of concern, importantly placing 'organisational culture and change' as the connecting theme between them all.



Figure 1: Lenses of the NATO Human Capital Innovation Policy

The HCIP should take a holistic approach. The Policy should be implemented through a series of short- and medium-term actions to initiate wider-change transformation across the organisation.

An external Advisory Group on Human Capital, composed in a similar manner to this one, could identify these actions, together with the task of developing and maintaining appropriate metrics for progress. This Advisory Group, if convened, should be structured so that the Alliance may benefit from the cutting-edge, impactful thought leadership of the best organisations in this space – which are not always the biggest ones. It is worth highlighting here that NATO, as an organisation, is not alone in the EDT human capital challenges it faces. Many other organisations across sectors also struggle with this challenge – including large and well-established 'incumbents' across the triple helix of innovation. Therefore, it is important that an External Advisory Group on Human Capital be carefully composed not just of the most established brand names, but rather include those who have made real progress in innovating human capital policies. Big brands do not necessarily translate to edified human capital policies and postures, and in fact many stand to be disrupted for this very reason.

The HCIP could take NATO to the tipping-point of implementing necessary human capital changes to define a new and bold approach to EDT talent, skills and culture. However, the major risk to moving EDT human capital approaches forward is that the HCIP remains a theoretical white paper, which is much admired, but not yet actioned. The focus at this point, therefore, should be rapid and tangible action in a similar vein to what has been achieved with DIANA and the NIF initiatives.

Concluding remarks

We have seen significant, rapid progress against the recommendations of our last report and have received informal feedback that the pace and impact achieved working with the NATO Enterprise is without precedent. This is encouraging to see and demonstrates that agility can be achieved within an organisation of scale and complexity. Such a notion is often met with the type of scepticism that engenders inaction and contributes to problems rather than their solutions. That is not to say that we decry scepticism; indeed, as scientists and technologists, scepticism is something to be valued when it motivates progress. It is perhaps, therefore, pessimism with which we take issue.

Individually, each of these initiatives moves NATO toward technological readiness. In particular, DIANA and the NIF are signs of real action. Nevertheless, NATO will need to attract top talent in the future if it is to be a relevant player in an EDT-proliferated landscape. The organisation must embody diversity, inclusion and a progressive defence mission if it is to attract the best technically literate talent to its cause. If it fails to do this, its other innovation initiatives will not receive the oxygen they need to survive.

Drawn together, the themes of this report outline a progressive, EDT-motivated, **holistic defence pivot** that NATO is ideally placed to lead, and which connects directly to its stated NATO 2030 strategic objectives.

Members of the NATO Advisory Group on Emerging and Disruptive Technologies 2020-2022





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Prof. Galia Angelova is Professor in Computer Science and Doctor of Sciences, Director of the Institute of Information and Communication Technologies, Bulgarian Academy of Sciences. Her major fields of research are: Natural Language Processing, Knowledge Technologies and Artificial Intelligence applications. She has published more than 150 scientific publications in journals, book chapters, and edited Conference volumes. She was the Coordinator or Principal Investigator of more than 25 projects with international or national funding. In 2012-2016 she coordinated the project [ACoMin](#) “Advanced Computing for Innovation”, a 3,2M Euro grant with the European Commission, FP7 Capacity, included by the European Commission in the book [“Achievements of FP7: examples that make us proud”](#). Prof. Angelova teaches Computational Linguistics to MSc students in Sofia University “St. Kliment Ohridski” and acts as a reviewer and evaluator for the European Commission and other institutions. In 2020 she took part in the development of the Bulgarian AI strategy.



Dr. Bruno Bellier is a graduate of Ecole Polytechnique; he has a PhD in pharmaceutical science, and a master in Public Law & Administration, both from the University of Paris. Currently Head Strategy & Defence Technologies of the recently created French Defence Innovation Agency, he is in charge of coordinating R&T policy and managing upstream R&T defence contracts as well as international cooperation and partnerships with academic institutions supporting defence-oriented research and innovation. His career alternated between expertise and project management activities in his field of specialty (defence against chemical and biological agents), R&T and innovation strategy and policy in a broader scope, and international defence cooperation.



Cecilia Bonefeld-Dahl is Director-General of DIGITALEUROPE, the leading digital technology industry association representing over 36,000 digital companies in Europe. She has for the last two years been lead on the EU Commissions high level group for AI, she is a member of the Stakeholder Cybersecurity Certification Group of ENISA (the European Union Agency for Cybersecurity) and a board member of the European Commission’s Digital Skills and Jobs Coalition and the European Parliament-led European Internet Forum and a board member of EIT the European Institute for Innovation and Technology. She was an Executive Board Member of the Royal Danish Export Council and Chair of the Export Grant Committee under the Danish Foreign Ministry. Cecilia Bonefeld-Dahl has more than 25 years of experience in the ICT industry. She previously held international positions at IBM and Oracle as well as with SMEs, building businesses across Europe and China.



Prof. Deeph Chana is Co-Director, Institute for Security Science and Technology & Co-Director, Centre for Financial Technology Imperial College London. Prof Chana has extensive experience of leading science and technology initiatives in academia, industry and government with a focus on global risks. He is interested in low probability high impact events and their ramifications on sustainable security and resilience. He has published on the use of machine learning methods for defensive and offensive cyber security, developed advanced technologies for dealing with safety and security related problems and has consulted and lectured internationally with companies and governments on disruptive technology and the use of science to handle disruptive events. He is actively engaged in a number of technology entrepreneurship activities and is an advisor on emerging and disruptive technologies to NATO. Deeph holds MSc and PhD degrees in Physics from King’s College London.



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Dr. Kash Khorasani received the B.S., M.S., and Ph.D. degrees in Electrical and Computer Engineering from the University of Illinois at Urbana-Champaign in 1981, 1982 and 1985, respectively. From 1985 to 1988 he was an Assistant Professor at the University of Michigan at Dearborn and since 1988 he has been at Concordia University, Montreal, Canada, where he is currently a Professor and Concordia University Tier I Research Chair in the Department of Electrical and Computer Engineering and Concordia Institute for Aerospace Design and Innovation (CIADI). His main areas of research are in nonlinear and adaptive control, cyber-physical systems and cybersecurity, intelligent and autonomous control of networked unmanned systems, fault diagnosis, isolation and recovery (FDIR), diagnosis, prognosis, and health management (DPHM), satellites, and neural networks/machine learning. He has authored/co-authored over 450 publications in these areas that have also led to the training of over 125 highly qualified personnel. He has served as an Associate Editor of the IEEE Transactions on Aerospace and Electronic Systems.



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Dr. Angelo Volpi entered CNR-National Research Council of Italy in 1988 carrying on research on laser diagnostics applied to the combustion of solid rocket propellants. He spent 12 years in Japan as visiting scientist and as Head of the Science Office of the Embassy of Italy in Tokyo. Since 2011 he is at CNR Liaison Office in Brussels. He has been Bo Stokes Fellow at MSIAC- NATO HQ, and member of the Italian national delegations at intergovernmental and G8 meetings. He is the Italian Governmental Expert for the CapTech "Aerial System" of EDA.



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