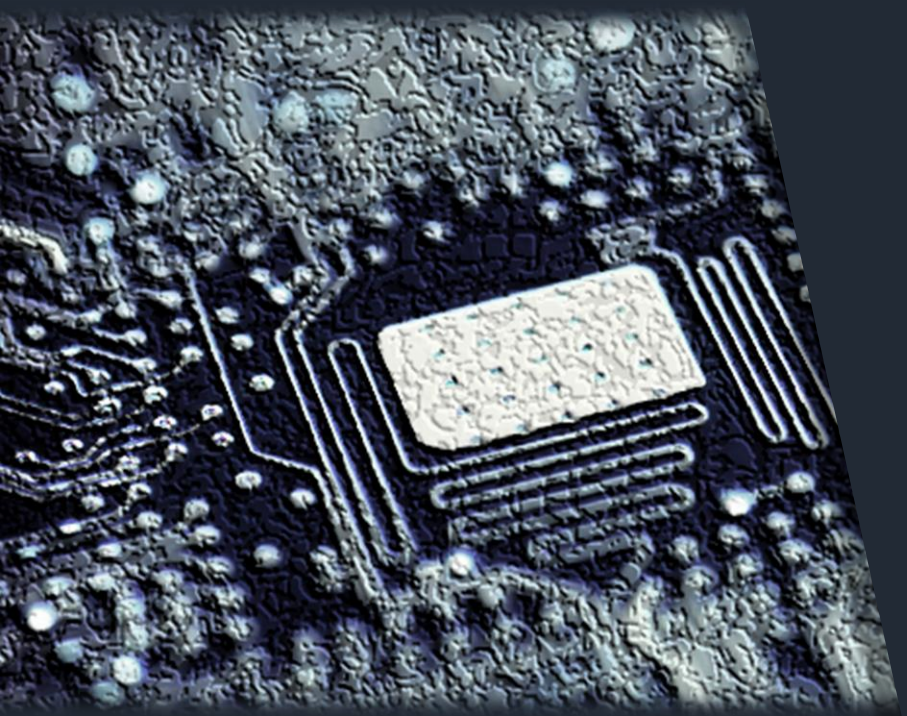
NATO-INDUSTRY FORUM

REPORT 2016



NATO-INDUSTRY FORUM

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FOREWORD

The NATO-Industry Forum 2016 was held at the Palais d'Egmont in Brussels, Belgium on November 9, 2016, under the theme: *'Industry, a pillar for the credibility of Alliance posture'*. The event gathered more than 420 participants, including Chief Executive Officers (CEOs) and senior managers from leading defence companies.

Under the leadership of NATO Secretary General Jens Stoltenberg, the Forum welcomed the participation of the EU High Representative for Foreign Affairs and Security Policy, Federica Mogherini and EU Commissioner for Internal Market, Industry, Entrepreneurship, and Small and Medium-sized Enterprises (SME), Elżbieta Bieńkowska, all three emphasising the need for strong and complementary NATO-EU cooperation .

The level of attendance was unprecedented, with the number and the seniority of participation reflecting the increasing interest in the engagement and cooperation between NATO and Industry in the development of capabilities, which are needed to defend the core values of NATO, the EU, national governments and citizens.

More than ever, the Forum proved to be a valuable and great opportunity for NATO, including national political and military leadership, to meet with industry, academia and think-tanks from Europe and North America. The Forum offered the chance to debate strategies and to define innovative solutions to capability needs that will enhance the Alliance's credibility, and ensure that NATO maintains its technical edge as a vital contribution to Trans-Atlantic security.

Several directions of interest were identified throughout the day's debates such as the need for NATO to be a faster and more agile organisation, particularly in procurement; to deepen its engagement with industry; to work together with industry on the twenty-first century standardisation; to foster and capture innovation, and to develop more cooperation and dialogue within Europe and across the Atlantic.

We would like to wholeheartedly express our appreciation to all participants, as well as to the Belgium authorities who supported this conference, in making it such a resounding success.

Denis Mercier
General French Air Force
Supreme Allied Commander Transformation

Camille Grand
Assistant Secretary General
For Defence Investment

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Disclaimer - The debates in the breakout and plenary sessions were held under Chatham House rules. The opinions quoted in this report reflect the views of individual participants, and they are neither consensual nor necessarily represent NATO's position.

EXECUTIVE SUMMARY

Hosted by Belgium in the Palais d'Egmont, Brussels, and jointly organized by the Supreme Allied Commander Transformation (SACT) and the Assistant Secretary General for Defence Investment (ASG/DI), the NATO-Industry Forum (NIF) gathered more than 420 participants from Industry, including Chief Executive Officers (CEOs) from Airbus, Boeing, DCNS, Indra, Leidos, Leonardo, Lockheed-Martin, MBDA, Sabena Aerospace and Terma, as well as key policy-makers from the European Union, NATO and Nations.

Key takeaways identified during the discussion include:

- Participants agreed that NATO should leverage industry's innovative capacity during the earliest phases of capability development. In particular, NATO should strive to increase its understanding of industrial possibilities, to position itself as a knowledgeable customer that knows what to ask of industry and how best to ask it.
- Industry indicated their interest to understand the long-term direction of travel for each NATO capability area, so that they are better positioned to take informed strategic investment decisions, to offer solutions when needed, and to contribute to addressing the challenges of Alliance transformation.
- NATO should further deepen its engagement with Industry through joint concept development, involvement in exercises, experimentation and war gaming, in order to design future solutions together. Sharing a 'problem statement' with industry and then jointly considering the necessary elements allowing NATO to generate the requirements would potentially result in faster delivery, better and even more affordable capabilities to satisfy the military customer.
- In the specific area of Command and Control, the challenge of managing Big Data and the Federated Mission Networking concept were identified as central areas where industry and NATO must co-operate.
- The length of the NATO acquisition process was criticised. One-size-fits-all procurement strategies may no longer (in fact, already do not) address NATO needs adequately.
- Novel approaches have to be identified in order to inspire industrial innovation. Participants underscored that NATO must be faster and more agile in its procedures, to match the speed of the globalized security and business environment, and of technological advancements, both to counter threats and exploit opportunities.

- Beyond the obvious merits of standardisation (e.g. ease of integration, lower per-unit cost, etc.), participants noted the importance of engaging with industry as early as possible to foster interoperability by design. This could facilitate larger markets for the capabilities in question and improve efficiency of units operating together.
- Participants noted the challenges faced by innovative SMEs (Small and Medium-sized Enterprises, which represent the majority of security and defence firms in most NATO nations) to be able to contribute with defence solutions. Industry participants invited NATO to develop simplified processes and procedures for SMEs, since the current acquisition system is geared to organisations that can sustain lengthy procurement cycles.

The defence industry provides the equipment, the capabilities we need and you have actually provided us with the best equipment in the world and the most advanced capabilities in the world for decades. But we have to make sure that it continues to be like that in a more dangerous and more challenging security environment. And that is the reason why I welcome very much that we this year have the highest level of participation from industry ever at this NATO-Industry Forum reflecting the increased interest both from NATO and from the industry in how we can enhance our cooperation.

NATO Secretary General Jens Stoltenberg address to NATO-Industry Forum 2016

REPORT

Expectations from a NATO-Industry Forum

NATO-Industry Forum represents the pinnacle of the Alliance engagement with the defence and security industry. By bringing together NATO, industry, EU institutions and national representatives for a strategic debate on the critical aspects of the engagement with the defence and security industry. NIF aims at creating an environment in which strategic topics are debated by strategists, for a strategic audience expecting a strategic impact.

"Maintaining a strong defence-industrial base is an investment in maintaining peace"

The last three editions of the Forum have witnessed an increased interest in debating the fundamentals of multinational cooperation, of NATO capability development and of its engagement with industry. The decisions by the Heads of State and Government at the Chicago, Wales and Warsaw Summits have been echoed by high level debates in the NATO-Industry Forum.

NIF builds a healthier and more structured NATO communication with industry, complementing other large events such as the NATO Communications and Information Agency's NITEC and NIAS events, and other alleys such as the NATO Support and Procurement Agency (NSPA), the Conference of National Armaments Directors (CNAD) and its NATO Industrial Advisory Group (NIAG) activities geared toward industry.

Similarly it has elevated the more technically-focussed discussions in formats such as the Framework for Collaborative Interaction with Academia and Industry (FFCI), ACT's Innovation Hub and CNAD's subgroups to the attention of NATO, EU, and industry leadership.

NATO-Industry Forum 2016 (NIF16)

Drawing on the decisions from the Warsaw Summit and the Joint Declaration of the Presidents of the European Council and the European Commission, and the NATO Secretary General, the NIF examined questions related to reinvestment in defence and the predictability of defence budgets that impact the orientation of industry, the alignment between NATO transformation and industry strategic visions, and their impact on the future industry strategies for growth.

General Marc Compernol, the Chief of Defence of the Kingdom of Belgium, and General Denis Mercier, the Supreme Allied Commander Transformation (SACT), opened the morning session highlighting the importance of the NATO-Industry Forum as ***the*** capstone event where NATO, and national political and military leadership meet with industry, academia and think-tanks from Europe and North America, to debate strategies to define innovative solutions to capability needs that will enhance the Alliance's credibility, and ensure that NATO keeps the technical edge, as a vital contribution to the Trans-Atlantic security.

"NATO is just as essential as it was 67 years ago when the North Atlantic Treaty was signed"

The morning breakout sessions, co-chaired by Allied Command Transformation and the NATO Industrial Advisory Group, examined Alliance capability priorities and command and control, including ways to improve joint NATO-Industry awareness of possible future needs and opportunities.

Lieutenant General Jeff Lofgren, ACT Deputy Chief of Staff, Capability Development, together with Mr. Paul "Donnie" Gilley, Managing Director, Mission Development and Integration Corporate Engineering, Technology and Operations from Lockheed Martin Corporation, co-chaired the Breakout Session 1 on 'NATO Capability Priorities'. This session explored ways to improve NATO and Industry mutual awareness of possible future needs and opportunities to improve the quality, effectiveness and availability of defence capabilities.

The Session on 'NATO Command and Control' (C2) addressed ACT's C2 Focus Area and the developing C2 Concept for 2030 and Industry engagement, and was co-chaired by a team composed of Rear Admiral Önder Çelebi, Turkish Navy, ACT Assistant Chief of Staff, Command & Control, Deployability & Sustainability, Mr. Johan Goossens, Head of ACT Technology and Human Factors Branch, Mr. Leendert van Bochoven IBM Global Lead for National Security and NATO, Member of the IBM Industry Academy, and Mr. Marc Cathelineau, Senior Vice-President EU-NATO-UN, THALES.

The sessions were aligned with the general aim of the NIF to define ways to improve NATO's awareness of the technological opportunities, and in return, industry awareness of possible future military needs. Increased awareness on both sides is expected to stimulate NATO and industry to engage in more cooperation, to better harmonise requirements and investments, resulting in improved affordability and interoperability of the capabilities with a strong focus on C2 issues and federated networking.

The afternoon session was opened with the State of the NIF report by General Mercier in which he recognised systems engineering as key in the development of future capabilities and the importance of enhanced relation with Industry on the road to transformation.

NIF continued in the format of two plenary sessions, moderated by Catherine Herridge, FOX News Chief Intelligence Correspondent. The first session examined how NATO current and future capability development must push limits, drive change, and be proactive with opportunities for National and NATO capabilities, while maintaining the Alliance's warfighting edge. The second plenary session detailed strategies for global success as revealed by senior industry executives.

Early Engagement of Industry in NATO Capability Development

- Participants agreed that NATO should leverage industry's innovative capacity during the earliest phases of capability development. This declaration confirms the importance of the Framework for NATO-Industry Engagement (FNIE), which has resulted in Industry having multiple points of entry to work with NATO. NATO strives to increase its understanding of industrial possibilities, in order to position itself as a knowledgeable customer, fully aware of what to ask from industry. This may require an evolution of the NATO-Industry relationship from the current, mostly transactional, model to a more strategic, continuous dialogue, capable of influencing NATO defence planning. While there has been progress in this area, significant work remains to be done.

"Defence industry is not selling products to customers – it is delivering capabilities to sovereign countries"

- Diversifying the interaction with Industry, from solely defence Industry to security and even commercial markets, and bringing their views upstream into the concept development work – an area where Industry traditionally has not participated – would help bring innovation into Alliance transformation. Industry can help the Alliance develop future game-changing concepts and adapt the operational functions. By better working together in the capability development process as appropriate, the trust between NATO and Industry can be built and reinforced. Industry will have a better understanding of NATO priorities and in return NATO will benefit from innovative technologies and new ways of doing business.
- Industry's role in strategic foresight analysis, which is a precursor of the cyclical defence planning process, has already been explored and is valued. It could be further improved by including inputs from Industry strategists. The intent for the next NATO Strategic Foresight Analysis update is to include key technology trends where contribution from Industry will be sought. ACT currently is identifying the appropriate mechanism to solicit strategic-level contribution from Industry, with a focus on technology, business processes, and human capital.
- Industry has indicated their interest in better understanding the long-term direction of travel for each capability area, which would allow them to adjust their investment plans to be better positioned to offer solutions, when needed, which address future Alliance challenges. **"Our priorities for investments are crucial for our countries as well, not only for the business."**
- Several participants noted that developing a common lexicon and sharing threat scenarios would help ensure a common understanding between NATO and Industry. A more dynamic and open engagement with Industry, including non-defence companies, around the priorities of the Alliance, will remain essential to encourage technical and procedural innovation.
- Industry's early engagement in defence planning shall be inclusive, transparent and fair, without compromising future participation in any competitive procurement process. Industrialists expressed their difficulty to engage with NATO in pre-acquisition phase over classified information while such a dialogue exists within Nations to some extent.
- According to one industrialist "The defence industry is not selling products to customers – it is delivering military capabilities to sovereign countries" conveying the view that the defence and the commercial markets are different and driven by distinct rules of which NATO has to be mindful.

- The participants agreed that the majority of the capabilities are procured by the nations, therefore NATO should be seen as an opportunity to access the nations, **"as a window to nations"**. This implies that closeness to national ministries of defence is equally relevant for Industry as is the engagement with NATO.

Improving NATO-Industry Common Understanding and Development of Joint Solutions

- **"My job as military is to go to war. Your job as industry is to make it easy for me."**
- NATO should further deepen its engagement with Industry through joint concept development; involvement in exercises; experimentation and war-gaming; in order to better design future solutions. Sharing a *problem statement* with Industry and then jointly considering the necessary elements for allowing NATO to generate the requirements is anticipated to result in faster delivery, and better and more affordable capabilities to satisfy the military customer.

"We need to segregate the discussion on the current fight from the one on the future fight"

- Alliance transformation recognises that future solutions will likely be based on networked systems of systems and based on open architectures. The engagement with Industry should include more experimentation and war-gaming to better understand how to optimally network these constructs to ensure military superiority. Participants specifically noted the importance of simulation and live-virtual-constructive training as a significant opportunity for increased NATO-Industry partnership. The ACT Innovation Hub was also mentioned as a cost-effective and efficient model for expanded NATO-Industry online collaboration.
- Industry noted the value of witnessing capabilities being operated and having the ability to offer immediate feedback, highlighting the usefulness of the Industry Involvement Initiative for NATO Exercises (I3X). The aim of I3X is to foster innovation by allowing Industry to gain an understanding of how NATO operates.

- "We need to segregate the discussion on the current fight from the one on the future fight." In other words, we need to support and improve today's capability, while understanding and shaping the future, and bridging the two.
- In the specific area of Command and Control (C2), the challenge of managing Big Data and the Federated Mission Networking concept were identified as central areas where Industry and NATO must co-operate. In terms of managing Big Data, participants noted the enormous growth in available data and the importance of managing future data in a different way, incorporating machine learning and automation, as appropriate. The notion of 'cognitive command and control' emerged during the discussion, referring to computer systems that have the ability to reason and learn from both human input and new data. Future C2 may rely more heavily on people and processes as the key differentiator between strong and weak C2.

Innovation

- Innovation was a thread that transcended the entire debate at the NATO-Industry Forum. References were made to the Warsaw Summit text on innovation which represents an incentive to improve the triggering and implementation of innovative ideas, as well as their capture to support NATO transformation.
- Referring to the US Third Offset Strategy, participants understood its three main components: innovation; tactics, techniques and procedures; and repurposing the existing capabilities. It was mentioned that it will not undermine NATO interoperability, as some participants expressed concerns.
- **"We don't lack innovation neither in the military, nor in the commercial – what we lack are resources to capture that innovation."**

"We share the need to build a pipeline of science, technology, engineering and math (STEM) talent so that we can continue to encourage innovation"

- Increasing integration between the commercial and defence sectors is likely to help with constrained defence budgets and bring more innovation into defence. While recognising the relevance of non-defence companies for innovation, ways to attract and exploit non-defence knowledge and expertise for NATO should be considered. Panellists

recognised a need for improved horizon scanning, adapting innovation from non-defence sectors, and increasing Euro-Atlantic indigenous innovation.

Harmonisation of Efforts

- It was recognised that for a significant number of Allies, the national defence procurement plans are heavily influenced by NATO. This influence should be seen as an opportunity to better synchronise national procurement strategies in terms of timing, harmonisation of the requirements and of investment calendars.
- NATO offers an ideal platform for nations to share/pool their efforts, in the context of the current shortage of defence budgets. The positive effects of the Defence Investment Pledge from the Wales Summit were welcomed, and considered as the precursor of more predictable and augmented defence investments.

European Champions

- **"Competition is a way to acquire capabilities that are affordable and performing according to specifications**. But you also need suppliers that have critical mass and the ability to invest in the long term."
- It has been estimated that for Europe to become a more credible defence supplier on the global market, and consequently a stronger pillar of NATO, Europe needs 'champions' – Industry that is competitive, which also has the critical mass able to sustain longer term procurement programmes.
- In Europe it is perhaps no longer possible to achieve that critical mass **nationally** in several capability areas. Therefore "**Competition, critical mass and partnering are key for smart and efficient procurement**."

"Suppliers have to have critical mass and the ability to invest in the long term"

- It was mentioned that even though the European defence market is currently fragmented, by initiating cooperative programmes, that fragmentation will diminish naturally and less painfully than if directed from the top.

Commercial vs. Defence Industry

- **"Defence industry plays in a different market, which is driven by different sets of rules."**
- The defence industry could improve its understanding of agile procurement. The concept of 'sell and forget' does not stand anymore, the capabilities being required are to be serviced during their entire life cycle, and therefore parallels are often difficult to draw with the commercial world.

Trans-Atlantic Defence Industrial Cooperation

- Concerns about protectionism and export controls emerged as themes that may prevent true Euro-Atlantic industrial integration. Participants recognized the need and value of Trans-Atlantic ventures to address defence and security challenges, and international competition. Industry participants noted a potential need for export reassurances to ensure sustainability.

NATO-EU Cooperation

- The joint declaration signed on the occasion of the Warsaw Summit by the President of the European Council, the President of the European Commission, and NATO Secretary General was welcomed by participants who expressed expectations for a closer dialogue and cooperation between NATO and EU.
- Participants highlighted that the EU actions could strengthen the European pillar of NATO, which will inherently become stronger militarily. An action plan to define implementation elements of the provisions of the joint declaration was anticipated to be approved by the Foreign Ministers at their meeting in December 2016 *[the Action Plan was approved on 6 December]*

Improving NATO Agility and Responsiveness in Procurement

- Participants underscored that NATO must be faster and more agile in its procedures, to match the speed of the globalized security and business environment, and of technological advancements, to counter threats and exploit opportunities. Novel approaches have to be identified in order to inspire industrial innovation, not solely in technology, but by including different ways of thinking and conducting business. Some capabilities may be NATO-owned but commercially operated, or NATO leased, or capabilities may be offered as services (CaaS - Capability as a Service). Both NATO and Industry must strive to deliver capabilities that are innovative at the time they are delivered and start being operated, mindful of the fact that the NATO common acquisition process was not engineered for speed.

"There is a need for consistent and sustained investment to support operational readiness"

- Panellists discussed the *investment malaise* of European nations to fund defence, as one of the core difficulties of NATO transformation. There was general agreement that technological and military superiority can no longer be taken for granted, thus reinforcing the need for sustained and coordinated defence investment, especially with the European Union. EU HRVP Mogherini noted that a strong NATO makes Europe safer and EU Commissioner Bieńkowska announced that the EU Commission will act as a facilitator to improve defence cooperation with NATO, including as part of the European Defence Action Plan *[launched on 30 November 2016]*.
- The length of the NATO acquisition process was criticised by many participants. In a very dynamic world a one-size-fits-all procurement strategy no longer adequately addresses NATO needs.

Standardisation and Interoperability

- Beyond the obvious merits of standardisation (e.g. improved interoperability, ease of integration, lower per-unit cost, etc.), participants noted the importance of engaging with industry as early as possible to foster interoperability *by design,* and not as an after-thought. This could also facilitate access to larger markets for the respective capabilities.
- "Standards facilitate the reuse of solutions and of investments"
- Several participants noted the importance of NATO defining the standards before the commercial sector or before other countries define them. Increasing standardisation can reduce the cost of new developments and provide openings for innovation to emerge.

"Standards facilitate the reuse of solutions and of investments"

- Some participants cautioned that increasing standardization might hinder competition by limiting the number of companies that can participate in capability development as being standard compliant. The importance of standardisation 'at the right level' was raised, using standards to define the data highways to connect different systems rather than standardising the systems themselves.
- Standardisation was also seen as levelling the defence industrial playing field and stimulating competition.
- NATO's undisputed role in standardisation makes it the ideal catalyst to generalise standards, through for example the Federated Mission Networking, for the benefits of Allies and Partners.
- In an environment characterised by fiscal austerity, system complexity, and cooperative operations, NATO plays a critical role, particularly for the standardisation of technical concepts, techniques, procedures and doctrines. The direct connection between NATO decisions and national procurement makes it essential for an improved Industry understanding of NATO's priorities and transformational efforts, while recalling that the majority of capabilities are still produced and provided by nations.

Outreach to Small and Medium-sized Enterprises (SME)

- SMEs are commonly seen as more flexible than large companies, and can quickly respond to new or changing requirements. Moreover, SMEs are particularly well-positioned to invest in advanced and innovative capabilities, especially those at the end of the supply chain such as high-technology equipment for command and control. Finally, it is important to develop a mechanism to draw innovation from SMEs into larger defence companies, especially cross border.

- SMEs could also play a role in NATO's transition from risk avoidance to risk management, as they are the perfect place to test new ideas and conduct experiments due to the low cost and ability to quickly readjust or abandon an idea, as necessary.
- Participants noted the challenges faced by SMEs, which represent the majority of security and defence firms in almost all NATO nations, to be able to contribute to defence solutions. In particular, SMEs face difficulties related to the supply of financing in terms of both quantity and speed. Therefore, NATO and Nations could attempt to simplify processes and make it easier and more rewarding for SMEs to participate in capability development.
- Some participants noted the challenge of identifying a concrete business opportunity, which prevents companies (often SMEs) from committing resources in the pre-acquisition phase. NATO was invited to develop a stronger link between the pre-acquisition and acquisition phases while respecting the separation of the two.
- NATO recognizes the challenge faced by SMEs and is looking to develop small, focused events that concentrate on a specific transformation focus area to help SMEs identify concrete business opportunities. Additionally, ACT has established a permanent Brussels point of contact for its Office for Collaboration with Academia and Industry (OCAI) to facilitate contacts with European industry, and is looking to further expand this European footprint in collaboration with the Defence Investment Division at NATO HQ.
- NATO should develop simplified processes and procedures for SMEs, since the current acquisition system is geared to organisations that can sustain long procurement cycles.
- "An SME can develop up to prototype then the prime can scale it up."

"SMEs can develop up to prototype then the prime can scale it up"

The Assistant Secretary General for Defence Investment, Mr. Camille Grand closed the 2016 edition of the NATO-Industry Forum by thanking the Belgian authorities for hosting the event in an outstanding venue. With the promise of a fully-fledged report, he mentioned several directions of interest identified throughout the day's debates: NATO to be a faster and more agile organisation, particularly in procurement; to deepen the engagement with industry; to work together with industry on the twenty-first century standardisation; to foster innovation, and possibly to develop a common innovation plan to support this initiative. He also encouraged more cooperation and dialogue within Europe and across the Atlantic.

The discussions reinforced the value of dialogue with Industry *at all levels*. NATO will only be able to continue to provide deterrence, crisis management, and collective defence if it continues to have a strong defence industry. NATO and Industry play complementary roles maintaining and developing the most advanced capabilities for the challenging security environment.

A list of actionable items have been identified from the very fruitful discussion, and will be taken forward by ACT and the Defence Investment Division. The status of their implementation and/or impact will be reported as appropriate.

For additional information please refer to:

www.act.nato.int/industryforum (IndustryForum@act.nato.int)

https://diweb.hq.nato.int/indrel (Industrial.Relations@hq.nato.int)


NATO
OTAN
ALLIED COMMAND TRANSFORMATION
NATO-INDUSTRY
FORUM 2016
BRUSSELS BELGIUM
NOVEMBER 9

ANNEXES

AGENDA

NATO-INDUSTRY FORUM 2016 OPENING

- Welcoming address by **General Marc Compernol**, Belgian Chief of Defence
- Opening address by NATO Supreme Allied Commander Transformation (SACT) **General Denis Mercier**

BREAKOUT SESSIONS (BOS)

- BOS 1: NATO Capability Priorities
- BOS 2: NATO Command and Control

OPENING REMARKS by **Amb. Rudolph Huygelen,** Chief of Protocol, Ministry of Foreign Affairs, Belgium

STATE OF THE NIF by **General Denis Mercier**

PLENARY SESSION 1 – NATO CAPABILITIES IN THE CONTEXT OF THE WARSAW SUMMIT

Moderator – Ms. Catherine Herridge, FOX News Chief Intelligence Correspondent

- **Gen Denis Mercier, SACT** (included reporting from the breakout sessions)
- **Mr Fernando Abril-Martorell**, Chairman and Chief Executive Officer, Indra
- **Mr Jens Maaløe,** President and Chief Executive Officer, TERMA
- **Mr Antoine Bouvier**, Chief Executive Officer, MBDA
- **Mr Stéphane Burton,** Chief Executive Officer, Sabena Aerospace
- **Mr Keith Webster**, Director, International Cooperation for the Under Secretary of Defense for Acquisition, Technology and Logistics (AT&L), US DOD
- **Ambassador Jorge Domecq**, Chief Executive, European Defence Agency
- **Ambassador Jiří Šedivý**, Permanent Representative of the Czech Republic to NATO
- **Mr Martin Hill**, Chairman, NATO Industrial Advisory Group (NIAG)

PLENARY SESSION 2 – STRATEGIES FOR GLOBAL SUCCESS

Moderator – Ms. Catherine Herridge, FOX News Chief Intelligence Correspondent

- **Ms Marillyn Hewson**, Chairman, President and Chief Executive Officer, Lockheed Martin Corporation
- **Dr Thomas Enders**, Chief Executive Officer, Airbus Group
- **Mr Mauro Moretti**, Chief Executive Officer and General Manager, Leonardo and ASD President
- **Mr Bertrand-Marc (Marc) Allen**, President, Boeing International
- **Mr Hervé Guillou,** Chief Executive Officer, DCNS
- **Mr Roger Krone**, Chairman and Chief Executive Officer, Leidos
- **Mr Camille Grand**, NATO Assistant Secretary General for Defence Investment

NATO AND EU POLITICAL STATEMENTS

- Keynote address – EU Commissioner Internal market, industry, entrepreneurship and SMEs, **Ms Elżbieta Bieńkowska**
- Keynote address – EU High Representative for Foreign Affairs and Security Policy, **Ms Federica Mogherini**
- Keynote address - NATO Secretary General**,** **Mr Jens Stoltenberg**

CLOSING REMARKS

- **Mr Didier Reynders,** Vice Prime Minister and Minister of Foreign Affairs, Belgium
- **Mr Camille Grand**, NATO Assistant Secretary General for Defence Investment

NIF16 RECEPTION hosted by Belgium

- Welcoming remarks by **Lieutenant general Claude Van De Voorde**, Minister of Defence Chief of Cabinet, Belgium
- Welcoming remarks by **Ms Rose Gottemoeller,** NATO Deputy Secretary General

GENERAL READ AHEAD

A stronger defence industry across the Alliance, which includes small- and medium-sized enterprises, greater defence industrial and technological cooperation across the Atlantic and within Europe, and a robust industrial base in the whole of Europe and North America, remain essential for acquiring needed Alliance capabilities. For the Alliance to keep its technological edge, it is of particular importance to support innovation with the aim to identify advanced and emerging technologies, evaluate their applicability in the military domain, and implement them through innovative solutions. In this regard, NATO welcomes initiatives from both sides of the Atlantic to maintain and advance the military and technological advantage of Allied capabilities through innovation and encourages nations to ensure such initiatives will lead to increased cooperation within the Alliance and among Allies. Warsaw Summit Communiqué - July 2016

Alliance Challenges

Today, the Alliance faces a range of security challenges and threats from 360 degrees around its periphery; from state and non-state actors; from military forces and from terrorist, cyber, or hybrid attacks. Our security is deeply affected by the security situation in the Middle East and North Africa, which has deteriorated significantly across the whole region. The challenging security environment of today, and continuing into the foreseeable future, requires the Alliance to accelerate the delivery of innovative, interoperable and integrated military capabilities to secure military superiority. Industry plays a critical role in Alliance transformation as a foundation of Alliance credibility.

At the 2014 Wales Summit, NATO recognized the need for future-focused adaptation, politically, militarily and institutionally. The Alliance not only acknowledged new security challenges, but also proactively adopted measures intended as game changers for the future.

One year later, NATO issued the Framework for Future Alliance Operations (FFAO), a comprehensive analysis of possible future threats. FFAO identifies five Strategic Military Perspectives offering broad guiding principles to inform the NATO Defence Planning Process (NDPP): operational agility, security networking, shared resilience, strategic awareness and strategic communications. All are seamlessly integrated in the Alliance adaptation effort and all are linked to the NDPP headings: prepare, project, engage, sustain, protect, inform and Command and Control (C2).

Defence Investment Pledge

The Wales Defence Investment Pledge, reaffirmed at Warsaw, is a commitment by Allies to reverse the trend of declining defence budgets, to move toward achievement of 2% of GDP for defence within a decade and to dedicate 20% of defence expenditures to new equipment and research and development.

According to the Stockholm International Peace Research Institute (SIPRI), in 2015 there were signs that the austerity-driven decline in military spending in Western and Central Europe that has held since 2010 may be coming to an end. While military spending in Western Europe continued to fall (by 1.3 per cent in 2015), for the first time since 2009 the number of countries in Europe that increased expenditure was higher than the number of those that reduced spending. The three biggest spenders in Western Europe—the UK, France and Germany—have all signalled a growth in spending in the coming years and the projected aggregate of NATO-Europe spending on defence for 2016 is projected to increase by 1.5%. The Defence Investment Pledge has started to produce the desired results, though there is still a long way to go.

After Warsaw

The Warsaw Summit, 8-9 July 2016, was a key milestone for the Alliance. Allied leaders agreed to augment Alliance defensive capacity in the face of rising threats, including from hybrid warfare and a resurgent and unpredictable Russia. The main focus of the Summit was on strengthening the Alliance's deterrence and defence and also to project stability to NATO's wider neighbourhood. This reinforcement of the commitment to deterrence and collective defence provides a strategic direction for the Alliance.

At Warsaw, Leaders decided to strengthen the Alliance's military presence in the east. They also agreed to develop a tailored forward presence in the south-eastern part of the Alliance. Allies declared Initial Operational Capability of NATO's Ballistic Missile Defence, pledged to strengthen their national cyber defences, and recognised cyberspace as an operational domain. Leaders agreed the importance of projecting stability through support for partners – including agreement to start training and capacity building inside Iraq.

Finally, NATO and the EU signed a joint declaration taking their partnership to an ambitious new level, including promotion of a strong defence industry and greater defence research and industrial cooperation within Europe and across the Atlantic.

Capability Priorities

Since NATO's inception, Allies have relied on strategic, operational, and tactical military advantage. Industry is a crucial contributor to Alliance's capability development and there is an increasing need to share innovation, identify new ideas, assess them and implement the most promising ones through appropriate national or multinational initiatives.

However, the current security environment poses an increasing challenge for the Alliance to maintain its edge. This is, in part, due to the discovery, availability and innovative use of high- and low-end technologies by both state and non-state actors.

New technology is globally available and is developing at a rapid-pace. Commercial technology is being adapted for military purposes, particularly in the areas of electronics, communications, and information technologies. While one may think of dual-use technologies by design, others 're-purpose' and re-direct existing technologies to a military application: e.g. the design and use of improvised explosive devices in Afghanistan and hybrid warfare tactics used in Ukraine and elsewhere are cases in point.

Furthermore, advancements in connectivity make access to technological breakthroughs easier, faster and cheaper. The novel use of technology as well as the use of novel technologies, combined with the wider use of commercial and dual-use technologies, challenge the rhythm and the depth of traditional military technological advantages. These trends are not favourable to maintaining our military edge, nor are they likely to revert; what was once an element of deliberate strategy has, over the course of the last decades, evolved into a *presumption* of technological superiority. We are living in a world where a non-state actor can acquire sophisticated unmanned systems with which it can improvise weapons, making use of cloud computing and social media to assemble sophisticated command and control.

This changing environment requires a fresh look at how new technologies are developed, and how existing technologies are employed. Additionally, national efforts and closer collaboration with Industry, aggregated at the level of the Alliance to identify necessary capabilities and pursue new technologies should become the norm.

Of all the capabilities required, Command and Control (C2) is particularly critical since it is the glue that connects and synchronizes NATO, National, and Partner efforts. Despite decades of effort to advance interoperability, recent operations and exercises demonstrate that C2 challenges remain. Future C2 architectures will need to be designed for the emergence of big data and quantum computing, and shift from linking assets together to cloud-like "systems of systems" able to flexibly integrate future capabilities. This C2 vision reflects the developments in both defence and non-defence industries, thus offering a significant opportunity for closer NATO-Industry collaboration to solve complex new problems.

Close Industry Engagement

"Involving it earlier to inform NATO's defence planning is the pinnacle of our efforts regarding industry, and it is going to take a major cultural shift to change decades of doing business with industry on a purely transactional basis."

(ASG/DI interview to JANE's Defence Weekly, June 2016)

Technological advancements take place naturally in industry, be it within traditional or non-traditional defence companies, so progressing new ideas is necessary to remain competitive. Often technological advancements have to be accompanied by conceptual and organisational adjustments. A more dynamic and open engagement with Industry, including non-defence related companies, will be essential to encourage technical and procedural innovation

And that is where the NATO-Industry Forum can deliver significant results. Sponsored by the NATO Secretary General, and co-organized by the Supreme Allied Commander Transformation and the Assistant Secretary General for Defence Investment, the NATO-Industry Forum has become the capstone annual event where NATO leadership, and National and EU politicians meet with industry, academia and think-tanks to debate strategies and define innovative solutions to multi-national capability needs. The 2016 edition of the Forum will build upon the recent decisions of the Heads of State and Government taken in Warsaw.

Industry is not only a pillar of Alliance credibility, but also plays an essential role in Euro-Atlantic security and stability – working to develop solutions that lower the threshold of conflict. NATO's ability to provide situational awareness of an adversary's intentions and the deployment of defence systems that diminish or neutralize initial aggression can help govern the political and military outcome from the very beginning of a conflict. Current and future acquisitions, exemplified by Ballistic Missile Defence, Allied C2 Systems, Alliance Ground Surveillance and Alliance Future Surveillance and Control, among others, were developed to improve situational awareness and security, and to lower the possibility of conflict.

The 2016 Forum will reiterate the need for synchronisation and non-duplication of the work with EU; it will attempt to stimulate the reinvestments in defence, and identify initiatives to support the optimal use of the recovering defence budgets, particularly regarding C2 and other priority capabilities.

Bringing together top leaders from industry, NATO and European institutions, NATO-Industry Forum 2016 is offering the needed environment to make the dialogue with industry a reality.

Hosted by Belgium, this edition of the NATO-Industry Forum will take place in Brussels, on 9 November 2016.

The relationship with Industry is essential to inform and shape capability design, de-risking, and delivering. A more dynamic and open engagement with industry, including non-defence related companies, is also essential to encourage technical and procedural innovation, and identify key technologies that could impact the way we conduct warfare in the future.

SACT's Direction and Guidance on ACT-Industry Engagement – March 2016

NATO CAPABILITIES - READ AHEAD

Strengthening cooperation to retain NATO's warfighting edge

OBJECTIVE

NATO serves as an integrator, providing a comprehensive perspective and linking different processes into a single, logical thread to maintain the Alliance's warfighting edge. Industry is a key player in many Capability Development areas and strengthened cooperation would be beneficial for both sides. To this end, we are exploring ways to improve mutual (i.e. NATO-Industry) awareness of possible future needs and opportunities to improve the quality, effectiveness and availability of national capabilities.

BACKGROUND

Today, faced with an increasingly diverse, unpredictable, and demanding security environment, NATO remains determined to defend its territory and protect its populations, projecting stability beyond its borders, and continuing its political, military, and institutional adaptation.

The complexity and uncertainty of the security environment is not expected to diminish in the near-term, thus NATO needs to make best use of all available resources to be ready to fulfil its mission. Industry is a pivotal player in this battle, providing NATO Nations with fit for purpose capabilities, thus a strengthened relationship among industry, Defence Investment international staff and ACT is essential for bolstering existing support to NATO from a capability development point of view.

The changing security environment has required the Alliance to refocus its efforts to cope with the complexity of current challenges, while keeping an eye on the future. ACT has been conducting work in several interconnected areas, including those with a Capability Focus:

- Security Foresight Analysis (SFA);
- Framework for Future Alliance Operations (FFAO);
- Technology Trends Survey (TTS);
- Capability Focus;
- Long Term Aspects (LTA); and
- Solutions (e.g. AFSC).

Over the last six months, ACT undertook a thorough analysis of all work strands related to Capability Development to streamline the entire mechanism and link various processes into one logical thread: from driver identification and analysis, to requirement identification and prioritization, to solution identification and generation.

This single logical thread is based on a multitude of actors, processes, interests and comprehension of the challenges. In order to optimize NATO's ability to deal with complex and quickly shifting security challenges, the Alliance must harness all available efforts and drive coherence into capability development.

NATO needs a renewed commitment from Industry, taking into consideration the potential opportunities and constraints this revitalized relationship will provide.

CAPABILITY FOCUS

Prepare: Improving the ability to carry out required training and exercises to ensure the ability to conduct full spectrum operations (Collective Defence, Crisis Management and Cooperative Security). Improving efficiency and effectiveness to address budgetary constraints.

Command and Control: NATO is implementing a fully interoperable Air Command and Control System (ACCS), which will provide a modern, fully integrated set of tools to support all air operations. The system is composed of both static and deployable elements that will be used both within the NATO Command Structure and by individual Allies. With the further inclusion of command and control functionality for ballistic missile defence, a fully integrated system for air and missile defence at the tactical level will be fielded.

To ensure NATO is able to share information on 'Day 1' of operations, whether for humanitarian aid or peacekeeping operations, NATO is developing guidelines to ensure that any future coalition is network enabled.

Federated Mission Networking is set of instructions to help build networks based on established and preapproved hardware, software instructions and procedures. The ability to share command and control and other relevant data from the beginning is a force multiplier and allows NATO or another coalition leader to effectively deploy assets from the beginning of an operation.

Inform: As one of the most visible and tangible examples of what cooperation between Allies can achieve, the NATO Airborne Warning & Control System (AWACS) provides NATO-owned and operated airborne command and control, air and maritime surveillance, and battlespace management capability. To provide a foundation for NATO's Joint ISR ambition, the Alliance is currently developing a JISR Project aimed at providing the following three pillars: Training and education; Doctrine and procedures; and Networking environment. NATO communication and information systems (CIS) will guarantee efficient collaboration and sharing of ISR data, products and applications among Allies.

Protect: NATO must continue to develop the capability to defend NATO European populations, territories and forces against ballistic missile attack as a core element of its collective defence. With respect to deployed forces, the Alliance has a requirement to further develop its capacity to defend against the threat of chemical, biological, radiological and nuclear weapons. The Alliance ability to prevent, detect, defend against and recover from cyber-attacks must be improved; including the ability to enhance and coordinate national cyber defence capabilities, bringing all NATO bodies under centralised cyber protection, and better integrating NATO cyber awareness, warning and response with member countries. The Alliance Maritime Strategy reiterates NATO's commitment to helping protect vital sea lines of communication, maritime approaches to NATO territory and maintaining freedom of navigation. This includes surveillance, information-sharing, maritime interdiction, effective mine counter-measures and other force protection activities and contributions to energy security, including the protection of critical infrastructure.

Engage: The ability of the Alliance to deliver Joint Fires, particularly from the Air, requires continual development of enabling and self-protection capabilities. An example of this work is the Letter of Intent for Multinational Co-operation in the Area of Airborne Electronic Attack and Escort Jamming, signed by Poland and Turkey at the Warsaw Summit.

Sustain (including Deploy): Air-to-Air Refuelling has previously been a focus of the Alliance, therefore, considering the renewed emphasis on high-end capabilities to counter the Russian threat, it should come as no surprise that it remains a key enabling capability. There is also a renewed emphasis on Deployable Medical Facilities and associated capabilities – including ongoing capability development requirements driven by NATO's recent operational experience in Afghanistan. Air and sealift capabilities are a key enabler for operations and allow forces and equipment to be quickly deployed wherever they are needed. While there is significant national procurement, many Allies also have pooled resources, including with partner countries, to acquire new capacities through commercial arrangements or through purchase, giving them access to additional transport to swiftly move troops, equipment and supplies across the globe.

BIOGRAPHIES

Paul Gilley

Lockheed Martin, Managing Director for Mission Development and Integration

Responsible for generating input and insight into critical mission needs and operational gaps, helping Lockheed Martin identify IRAD investments that will develop capabilities to address customer's most critical needs. Paul holds a graduate degree from the Georgia Institute of Technology.

Career:

Formerly in the US Army

2002 – Joined Lockheed Martin in 2002.

Managing Director, Mission Development and Integration, Corporate Engineering, Technology and Operations, Lockheed Martin.

Lieutenant General Jeffrey Lofgren

ACT, Deputy Chief of Staff Capability Development

Lt Gen Lofgren acts as the Allied Command Transformation's Director for NATO capability development providing guidance, direction and coordination to a directorate consisting of 26 branches that are functionally grouped to focus on NATO Defence Planning, Capability Engineering and Innovation, Command and Control, Deployability and Sustainability capabilities. The general supports the commander with emphasis on improving alliance interoperability in order to enhance NATO's operational capabilities to meet NATO's current and future requirements. Lt Gen Lofgren holds a Bachelors in Mechanical Engineering from the US Air Force Academy and Masters in Aerospace Science Technology from Embry-Riddle Aeronautical University and a Masters in National Security Strategy from the National War College.

Career:

1984 – Joined the US Airforce as trainee pilot.

1986 – Instructor Pilot

1993-1998 – Various Officer positions.

1999-2012 – Various Commander positions both in the US and abroad.

2014 – Deputy Commander, US Air Forces Central Command, ACT

NATO Command and Control (C2) - READ AHEAD

AIM

Command and Control (C2) is often described as the backbone of NATO's political and military capacity, ensuring that collective effects are greater than the sum of individual parts. Emerging security challenges, socio-cultural change and technological innovation require a flexible and agile C2 capacity so that the combination of people, processes and technology are optimized for future challenges. To this end, we are exploring ways to improve mutual (i.e. NATO-Industry) awareness of possible future needs and opportunities to improve the quality, effectiveness and availability of C2 capabilities of NATO nations.

NARRATIVE

ACT sees Command and Control as a continuous, force-multiplying capability for networking a federation of NATO, Nations, Partners and other organizations to achieve comprehensive effects and cost-effective "day zero" readiness by combining a well-trained force with simplified structures, distributed processes and innovative technology.

Command and Control implies a comprehensive Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) framework addressing the complete spectrum of collecting, decision-making, effecting and connecting activities. As such, Communications and Information Systems (CIS), Joint Intelligence, Surveillance and Reconnaissance (JISR) as well as emerging Cyber capabilities are included.

FUTURE OPERATING ENVIRONMENT

To support long term Military Transformation, NATO has produced two fundamental documents to prepare for a complex and rapidly changing security environment. The Strategic Foresight Analysis (SFA)[1] establishes a common perspective of future challenges. Using SFA as the foundation to derive military implications, the Framework for Future Alliance Operations (FFAO)[2] outlines how Alliance forces might transform, proposing capabilities that may need to be developed. The following five themes capture the C2 implications identified in the SFA and FFAO:

- ***Complexity in Future Operations*** requires more agile and scalable C2 structures that leverage advances in technology such as federated information clouds and advanced computing power to achieve continuous strategic awareness and improved decision-making.
- ***Congested & Contested Battlespace*** requires improved real-time understanding, faster anomaly detection, continued interoperability improvements among NATO, Nations, Partners and other organizations, plus more dynamic planning and execution.
- ***Dynamic Communications Environment*** requires agile, secure and resilient networks, continuous access to information across the mission space, ability to shape the information environment and enhanced policies and procedures to connect with Partners and other organizations.
- ***Flexible System Design and Enhanced Autonomy*** provide an opportunity for domain agnostic, mission configurable and better integrated manned, unmanned and autonomous capabilities.
- ***Emerging Technologies*** require capitalization on advanced technologies like cloud computing[3], enhanced cryptology, artificial intelligence[4], cognitive computing[5] and advanced analytics[6].

THE CONCEPTUAL APPROACH

To meet the challenges posed by the future operating environment, NATO must establish broader, more persistent and robust C2 networks, integrating people, processes and technologies at all levels from NATO, Nations, Partners and other organizations. The future architecture of these dynamic **network federations** must be broader than just "computer networks" and include networks of experts, networked processes and fully networked capabilities. Our future C2 design must therefore be **agile**, **secure** and **resilient** to provide focussed awareness with an enhanced 360o perspective, supporting political-military decision making and delivering timely effects. As such, **federation** at all political and military levels will **enable NATO to**

[1] Strategic Foresight Analysis, 2015, http://www.act.nato.int/strategic-foresight-analysis-2015-report.
[2] Framework for Future Alliance Operations, 2015, http://www.act.nato.int/ffao-report-2015.
[3] Network-based computing that provides information access on demand to customers from anywhere on a network.
[4] Intelligence exhibited by machines.
[5] Computer-based simulation of human thought using self-learning, pattern recognition and natural language processing.
[6] Grouping of analytic techniques used to predict future outcomes.

maintain its edge and optimize capacity and posture, while achieving the right levels of deterrence, readiness and responsiveness.

To build and grow these **federated networks** by enhancing already established networks in a cost effective manner, integrating emerging networks and creating missing networks, we need to:

- **Network with Nations and Partners through their national HQs** to take advantage of regional expertise yet fuse it with a 360° perspective.
- **Network with the European Union, United Nations and other international organizations** to create and sustain common strategic awareness.
- **Network with non-traditional entities** such as academia, industry and other experts to broaden the perspectives on rapidly changing technology and processes and their impact on people.
- Use non-traditional sources like **publicly available information** to understand the security environment from this perspective to enhance our strategic awareness.
- **Fuse our intelligence, operations and planning analysis with publicly available information** on a greater scale to enhance our understanding of the strategic environment.
- **Transmit information over broad networks** by providing multiple means to distribute information thereby improving our resilience.
- **Employ advanced technologies** to handle large amounts of information and aid our people in analysing, understanding and sharing it while keeping the human at the centre of decision-making.
- Use **cloud federations at multiple security levels** to horizontally and vertically network information to reduce ambiguity and leverage commercial advances.
- **Integrate Cyber** as a domain into our future C2 architecture from the onset.

All these efforts aim to accelerate decision-making and achieve intended effects.

DESIRED END-STATE

C2 as a force-multiplier established – NATO, Nations, Partners and other organizations are federated based on persistent relationships across all functions and employ greater use of publicly available information, which is further fused with intelligence to achieve enhanced strategic awareness, responsiveness and readiness. Applying these structures, processes and standards will ensure the total operational effect will be greater than the sum of its parts.

Day zero readiness and responsiveness achieved – Rather than reinventing C2 structures at the start of every named operation, C2 in the Alliance is continuous and comprehensive, establishing enduring trust and eliminating artificial differences through uninterrupted relationships.

Global reach established – A global, secure, and resilient federated cloud network will provide universal communication and freedom of movement in and through cyberspace by operationalizing the domain and capitalizing on industry innovative technologies in order to achieve Cyberspace Superiority.

Collecting activities optimized – Sensing capabilities are synchronized, continuous information sharing is established and open source "big data" is exploited by technology to aid our people in providing planning and operational options to decision makers. This makes information a strategic asset to create comprehensive and persistent situational awareness leading to Information Superiority.

Decision-making accelerated – Through the use of horizontally and vertically federated networks the processes are simplified, structures are optimized and decision cycles shortened. These along with widespread utilization of "Mission Command" principles and improved human sense making enable the Alliance to achieve sustained Decision Superiority.

Effecting activities synchronized – Coordinating and controlling effects is a key C2 function, to make sure all effects, both kinetic and non-kinetic, are optimized and synchronized to minimize collateral damage and achieve Execution Superiority.

CONCLUSION

Pursuing the vision and concepts presented here will ensure the C2 backbone of NATO is cost-effective, agile, resilient and ready to meet the challenges of the evolving security environment. These efforts will ensure that the Alliance remains relevant and is postured to achieve the desired deterrence based on political and military credibility. Without close cooperation with industry this cannot be achieved.

History and Options for the Future

1980s	2006	2016	Future
Cold War Focus on Collective Defence Large NATO Command Structure (NCS)	Missions (ISAF, OAE, OOC, etc) Focus on Crisis Management NCS: 13,000	Missions (RS, Air Policing, etc) Focus back on Collective Defence NCS: 8,800	Focus back on Core Tasks: • Collective Defence, • Crisis Management and • Cooperative Security

Option 1: Enlarge NATO Again

Option 2: Federate, Share and Win

Command and Control Capabilities

Past	Now and Future
Significant numbers of people in deep structures	Less people and a need for simplified and more dynamic structures

Past	Now and Future
Many manual, ad-hoc or static processes	Automation opportunities, need more dynamic and repeatable processes

Improve human effectiveness through training and focus on networking and persistent relationships to increase organizational trust

Make processes more agile but repeatable by capitalizing on technology while relying on centralized intent with decentralized execution

People ↔ Processes

Effective capabilities require a balance between people, processes and technology

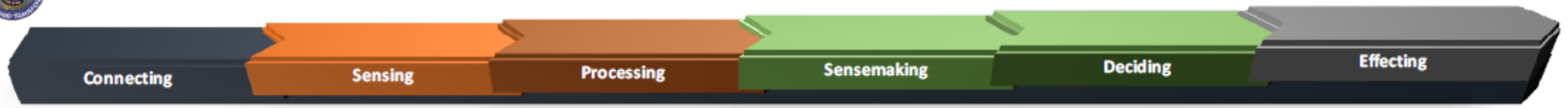
With more parity in technology, a stronger emphasis is needed on well-trained people, simplified structures, distributed processes and innovative use of technology

Technology

Shift from presumed technology dominancy to acceptance of technology parity leading to innovative use of technology as differentiator

Component	Past	Now and Future
Effecting	Driven by military across the board	Classic domains still driven by military, cyber domain strongly influenced by commercial sector ↙
		Sense-making and decision aids shifting to commercial technology ↓
Decision-Making		Partially driven by military, commercial data becoming more important and "big-data" processing more based on commercial technology ↙
Collecting		
Connecting		Communications and information system technology driven by commercial sector ↓

Command and Control Vision 2030



Objectives

Cyberspace Superiority	Data Superiority	Information Superiority	Knowledge Superiority	Decision Superiority	Execution Superiority
Assured Connectivity	Big Data	Continuous Awareness	Shared Understanding	Coherent Decisions	Desired Effects

Desires

Enable Highly Distributed Processes & Organizations	Improve Real-time Data Sharing Between Mission Partners	Create virtual Collaborative Assessment and Fusion Centres	Simplify Human Access to Complex Information	Accelerate Comprehensive Decision Making	Achieve Synchronized & Coherent Effects (Incl Hybrid, Cyber, StratCom)

People

Communicating Collaborating, Sharing Consulting	Observing, Collecting Surveying, Assessing	Analysing, Exploiting Fusing, Mapping Informing	Orienting Understanding	COA Evaluating Planning Tasking	Acting, Executing Protecting, Engaging Influencing, Reporting

Training and Exercising

Processes

Continuous Operations - Cooperative Security - Crisis Response - Collective Defence

Agility in Complex and Congested Battlespace - Resilience - Greater Role for Nations - Greater Emphasis on Comprehensive Approach

Federated and Decentralized C2 Approach - Flatter C2 Structures - Flexible Organizations - Smaller Human Footprints

Technology

Ubiquitous Wireless Protected Core Network Wearables Embeddables New Materials	Social Media, Sensors Biometrics, Micro Drones Autonomous, Swarming Computer Hearing and Vision HP Satellite Navigation, 3D Scanning	Cognitive Computing Predictive Analytics Adaptive Algorithms Semantic Technologies Cultural Awareness	Human Augmentation Smart Agents Predictive Search Context Aware SA Virtual/Augmented Reality	Artificial Intelligence Computer Aided Decisions Human Cognition Enhancers	Social Media, Effectors Autonomous, Cyberspace Hypersonic, Bio-inspiration Lasers, Space Systems 3D Printing, Healthcare

Global information sphere (cloud computing, virtual distributed clouds, multi-level security, Labelling, on demand, analytics)

Global ICT (resilient, interoperable, scalable, agile, secure, mobile, self-healing, on demand, network of things, federated with partners)

Future Environment

Strategic Foresight Analysis (SFA)

Political Theme
Shift of Global Power
Shifting Political Structures
Polycentric World

Human Theme
Changing Demographics
Urbanisation
Human Networks
Fractured Identities

Environment Theme
Environmental/
Climate Change
Natural Disasters

Technology Theme
Technology Accelerates Change
Increased Access to Technology
Centrality of Computer Networks

Economic/Resource Theme
Globalisation of Financial Resources
Increased Resource Scarcity
Decreasing Defence Expenditures

Framework for Future Alliance Operations (FFAO)

Strategic Military Perspective
Operational Agility
Security Networking
Shared Resilience
Strategic Awareness
Strategic Communications

(C2 related) Military Implications

Prepare
Comprehensive Approach to Military Operations
Scalable and Modular Units and Organisations
Creative Use of Human Resources, Human Factors
Mission Command

Inform
Collection
Recognized Pictures
Anomaly Detection
Analysing, Mapping, Sharing

Protect
CIS Security
Cyber Defence
Unmanned, Swarming

Engage
Cyber Manoeuvrability
Rapid Response
Unmanned and Autonomous Systems
Joint/Cyber Influence

Project

Sustain

C2
Resilience, security
Decision Support
Reduced Footprint
Integrated C2

Future Operating Environment (FOE)

Complexity in Future Operations
Congested, Contested and Complex Battlespace
Dynamic Communications Environment
Contested Cyber Domain
Flexible System Design and Enhanced Autonomy
Advanced Target and Objects of Interest for Sensors
Emerging Technologies
New materials and advances in manufacturing
Advances in Direct Energy Weapons

- Ubiquitous Communications
- Plug-and-play Federation of Clouds
- Federated Resilience and Cyber Defence

Connecting

Decision Making

- Human Sensemaking through Artificial Intelligence
- Accelerated Decision Making through Continuous readiness
- Distributed Decision Making with Virtual Collaboration

C2 2030 Concepts

- Artificial Intelligence at the Sensor Edge
- Cognitive Computing and Advanced Analytics
- Continuous and Comprehensive Awareness

Collecting

Effecting

- Federated Operations in Cyberspace
- Synchronised and Comprehensive Effects
- Artificial Intelligence at the Effector Edge

https://tide.act.nato.int/tidepedia/index.php/ACT_C2_Focus_Area_-_Functional_Concepts

C2 CAPSTONE CONCEPT SUMMARY PAPER

PURPOSE: This paper provides a brief narrative of NATO's *Command and Control (C2) Capstone Concept* highlighting the overall vision for future C2 capabilities through 2030 and beyond.

VISION: *Command and Control is a continuous, force-multiplying capability for networking a federation of NATO, Nations, Partners and other organizations in order to achieve comprehensive effects and cost-effective "day zero" readiness by combining a well-trained force with simplified structures, distributed processes and innovative technology.*

BACKGROUND: C2 is often described as the **backbone of NATO's political and military capacity**, ensuring that collective effects are greater than the sum of individual parts. Emerging security challenges, socio-cultural change and technological innovation all demand that this C2 capacity is flexible and agile so that the combination of **people, processes and technology** is optimized to meet future challenges.

When referring to "Command and Control", this concept implies the more comprehensive Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) framework addressing the complete spectrum of collecting, decision-making, effecting and connecting activities. As such, Communications and Information Systems (CIS), Joint Intelligence, Surveillance and Reconnaissance (JISR) as well as emerging Cyber capabilities are included in this concept.

FUTURE OPERATING ENVIRONMENT: To support long term Military Transformation, NATO has produced two fundamental documents to prepare for the complex and rapidly changing future security environment. The Strategic Foresight Analysis (SFA)[7] establishes an institutional foresight to provide a common perspective of future challenges. Using SFA as the foundation to derive military implications, the Framework for Future Alliance Operations (FFAO)[8] outlines how Alliance forces might transform in the future and it proposes capabilities that may need to be developed. Through the analysis of these two documents, the following five themes capture the associated C2 implications:

- ***Complexity in Future Operations*** requires more agile and scalable C2 structures that leverage advances in technology such as federated information clouds and advance computing power to aid our people to achieve continuous strategic awareness and improved decision-making.
- ***Congested & Contested Battlespace*** requires improved real-time understanding, faster anomaly detection, continued interoperability improvements between NATO, Nations, Partners and other organizations plus more dynamic planning and execution.
- ***Dynamic Communications Environment*** requires agile, secure and resilient networks, continuous access to information across the mission space, ability to shape the information environment and enhanced policies and procedures to connect with Partners and other organizations.
- ***Flexible System Design and Enhanced Autonomy*** provide an opportunity for domain agnostic, mission configurable and better integrated manned, unmanned and autonomous capabilities.
- ***Emerging Technologies*** require capitalization on advanced technologies like cloud computing[9], enhanced cryptology**,** artificial intelligence[10], cognitive computing[11]and advanced analytics[12].

OVERARCHING CONCEPT: To meet the challenges posed by the future operating environment, NATO must establish broader, more persistent and robust C2 networks integrating people, processes and technologies at all levels from NATO, Nations, Partners and other organizations. The future architecture of these dynamic **network federations** must be broader than just "computer networks" and include networks of experts, networked processes and fully networked capabilities. Our future C2 design must therefore be **agile**, **secure** and **resilient** to provide focussed awareness with an enhanced 360o perspective, support political-military decision making and deliver timely effects. As such, **federation** at all political and military levels will

[7] Strategic Foresight Analysis, 2015, http://www.act.nato.int/strategic-foresight-analysis-2015-report.
[8] Framework for Future Alliance Operations, 2015, http://www.act.nato.int/ffao-report-2015.
[9] Network-based computing that provides information access on demand to customers from anywhere on a network.
[10] Intelligence exhibited by machines.
[11] Computer-based simulation of human thought using self-learning, pattern recognition and natural language processing.
[12] Grouping of analytic techniques used to predict future outcomes.

enable NATO to keep the edge, optimize capacity and posture while achieving the right levels of deterrence, readiness and responsiveness.

Building and growing these **federated networks** means enhancing already established networks in a cost effective manner, integrating emerging networks and creating missing networks, to do this we need to:

- **Network with Nations and Partners through their national HQs** to take advantage of regional expertise yet fuse it with a 360o perspective.
- **Network with the European Union, United Nations and other international organizations** to create and sustain common strategic awareness.
- **Network with non-traditional entities** such as academia, industry and other experts to broaden the perspectives on rapidly changing technology and processes and their impact on people.
- Use non-traditional sources like **publicly available information** to understand the security environment from this perspective to enhance our strategic awareness.
- **Fuse our intelligence, operations and planning analysis with publicly available information** on a greater scale to enhance our understanding of the strategic environment.
- **Transmit information over broad networks** by providing multiple means to distribute information thereby improving on our resilience.
- **Employ advanced technologies** to handle large amounts of information and aid our people in analysing, understanding and sharing it while keeping the human at the centre of decision-making.
- Use **cloud federations at multiple security levels** to horizontally and vertically network information to reduce ambiguity and leverage commercial advances.
- **Integrate Cyber** as a domain into our future C2 architecture from the onset.

All these efforts aim at accelerating decision-making and achieving intended effects.

DESIRED END-STATE:

C2 as a force-multiplier established – NATO, Nations, Partners and other organizations are federated based on persistent relationships across all functions and employ greater use of publicly available information, which is further fused with intelligence to achieve enhanced strategic awareness, responsiveness and readiness. Applying these structures, processes and standards will ensure the total operational effect will be greater than the sum of its parts.

Day zero readiness and responsiveness achieved – Rather than reinventing C2 structures at the start of every named operation, C2 in the Alliance is continuous and comprehensive, establishing enduring trust and eliminating artificial differences through uninterrupted relationships.

Global reach established – A global, secure, and resilient federated cloud network will provide universal communication and freedom of movement in and through cyberspace by operationalizing the domain and capitalizing on industry innovative technologies in order to achieve Cyberspace Superiority.

Collecting activities optimized – Sensing capabilities are synchronized, continuous information sharing is established and open source "big data" is exploited by technology to aid our people in providing planning and operational options to decision makers. This makes the data a strategic asset from which we create comprehensive and persistent situational awareness leading to Information Superiority.

Decision-making accelerated – Through the use of horizontally and vertically federated networks the processes are simplified, structures are optimized and decision cycles shortened. These along with widespread utilization of "Mission Command" principles and improved human sense-making enable the Alliance to achieve sustained Decision Superiority.

Effecting activities synchronized – Coordinating and controlling effects is a key C2 function, to make sure all effects, both kinetic and non-kinetic, are optimized and synchronized to minimize collateral damage and achieve Execution Superiority.

CONCLUSION: Pursuing the vision and concepts presented here will ensure the C2 backbone of NATO is cost-effective, agile, resilient and ready to meet the challenges of the evolving security environment. The concept optimises our people and resources by utilising innovative processes, procedures and technologies to maintain our strategic advantage. All these efforts combined will ensure that the Alliance remains relevant and is postured to achieve the desired deterrence based on political and military credibility.

BIOGRAPHIES

Marc Cathelineau
THALES, Senior VP for EU-NATO-UN

Responsible for EU & NATO relations for THALES. Marc is an Associate Professor at HEC Paris, teaching international negotiation to MBA and Executive MBA students. He has written two books entitled *Negotiate to Win* (1991) & *We are all Negotiators* (2007). He holds an MSc in Engineering from ENSAM, Paris. He also has an MBA from HEC Paris. He has completed military service in the French Air Force. He holds the decoration of "Chevalier of the National Order of Merit".

Career:
1982 – Various positions at THALES
1994 – Chairman & CEO, founder of THALES International Offsets
2002 – VP International Development & Financing, THALES
2008 – VP Corporate Marketing & Sales, THALES
2010 – Senior Vice President EU-NATO-UN, THALES
2011-16 – Chairman of External Affairs Commission of the Aerospace and Defence Industries Association of Europe (ASD).
2011-13 - Sherpa for French Defence Industry ahead of the Lancaster House Treaty.

Rear Admiral Önder Çelebi
ACT Assistant Chief of Staff, Command & Control, Deployability and Sustainability

Önder graduated from the Turkish Naval Academy in 1990 and gained a postgraduate degree in IT in 1996 from the USA. He then pursued further study at the Turkish Naval War College in 2000.

Career:
1990 – Assistant CIC Officer, TCG Anitepe
2003 – Naval Concept Staff Officer to Turkish General Staff
2004 – Principal Warfare Officer and Executive Office, TCG Yildririm
2007 – Commanding Officer, TCG Salihreis
2010 – DCOM NATO Maritime Interdiction Operations Training Center
2016 – Rear Admiral, Assistant Chief of Staff, Command & Control, Deployability and Sustainability

Johan Goossens
Head of ACT's Technology and Human Factors Branch

During his time in the service, Johan worked on the multinational Air Command and Control system EIFEL in Birkenfeld, Germany as a programmer/analyst. He left the Royal Netherlands Air Force in 1988 to pursue a civilian career at NATO Headquarters SACLANT in Norfolk, VA.

Johan holds a degree in Computer Science. Has received the prestigious NATO Meritorious Service Medal And Golden Badge of the Estonian Ministry of Defence.

Career:
1981 – Joins Royal Netherlands Air Force
1988 – SACLANT CIS Division, Software Section Chief
1993 – NATO Liaison Officer for joint maritime Command and Control System
1998 – User Domain Support Branch Head ACLANT System
2006 – Head of ACT's Technology and Human Factors Branch
Acting Chair of the FMN Capability Planning Working Group, Co-Chairman of NATO's Architecture Management Group and Co-Chairman of the NCI Agency's Internal Architecture Design Review Board

Leendert van Bochoven
IBM, Global Lead for National Security
Responsibilities include all liaison with the EU and NATO around issues of security.

Member of the Board of Directors of AFCEA and Member of the American Defense Industries Forum in Brussels, Leendert holds a Business Economics degree from the Erasmus University in Rotterdam. Responsible for the solutions approach for Network Centric Operations as part of the IBM Defence team since 2003. Leendert has been with IBM since 1998 and was previously a Director at the Baan Institute Business School.
Career:
1998 - Executive at IBM
2009 - NATO & EU Lead for IBM
2015 - Member of IBM's Industry Academy
2015 - Global lead for National Security, EDA & NATO.

OPENING REMARKS BY SACT

Messieurs les Ambassadeurs, Excellences,
Amiraux, Généraux, Mesdames et Messieurs,
Distinguished guests,

Thank you General Marc COMPERNOL for your kind welcome words, and thank you for the outstanding support of the Belgian authorities and their staffs to help the NATO Assistant Secretary General for Defence Investment, Camille Grand, and myself co-organize the NATO Industry Forum in such exceptional conditions.

This year's NATO Industry Forum is again sponsored by our Secretary General, Jens STOLTENBERG, and is attended by representatives from the European Union, the European Defence Agency, industries, academia, National Armament Directors, Chiefs of Defence, Military and Permanent Representatives to NATO, and the NATO Industrial Advisory Group – all together representing 35 nations and 83 industries.

There could be no greater proof, that the NATO Industry Forum has become the annual capstone event where NATO, and National political and military leadership meet with industry, academia and think-tanks from Europe and North America, to debate strategies aiming to define innovative solutions to capability needs that will enhance the Alliance's credibility, and ensure NATO to keep the military edge – as a vital contribution to the Trans-Atlantic security.

NATO Industry Forum has become the annual capstone event

Building capabilities that fit NATO's purposes requires deep strategic foresight, and an understanding of the technological trends that will affect the future operating environment. The aim is to ensure that NATO remains a pre-eminent, powerful and efficient organisation now and in the future by leveraging all capabilities necessary to keep military superiority.

But NATO cannot do this alone. Building the 21st century defence forces that will make the Alliance's defence and deterrence posture credible, can only be achieved through a close cooperation with industry.

Therefore, regarding Industry, the final communiqué of the Warsaw Summit was very clear: "A stronger defence industry across the Alliance, which includes small- and medium-sized enterprises, greater defence industrial and technological cooperation across the Atlantic and within Europe, and a robust industrial base in the whole of Europe and North America, remain essential for acquiring needed Alliance capabilities."

Industry is therefore a crucial contributor to Alliance capability development and there is an increasing need to share innovation, identify new ideas and concepts, assess them and implement the most promising ones through appropriate national or multinational initiatives.

Modern threats have no boundaries. It is also true for the accessibility of new technologies, and there's a fierce competition between a wide span of actors in the race to be a step ahead of any potential adversary. But there is no one organization in the world that has more powerful industry if we combine the competences of our 28 (soon 29) nations plus many Partners. It is an incredible strength!

This sets the scene for this year's Industry Forum. We need to challenge our current processes to foster innovation and deliver the right capabilities on the right time to mitigate identified shortfalls. And we need to network our competences and look ahead to assess the decisions we make today.

Thank you again for your presence, and I'm looking forward to our candid discussions in the breakout and panel sessions.

I wish us all a very fruitful forum, thank you for your attention.

STATE OF THE NIF

Ambassadors, Excellencies, Admirals,
Generals, Ladies and Gentlemen,
Distinguished guests,

Thank you Mr Huygelen, for your opening remarks on behalf of Minister Reynders, we are very honoured by your presence among us today, and thank you for the outstanding support of the Belgian authorities and their staffs to help organize the NATO Industry Forum in such exceptional conditions.

The Egmont Palace is today's home of the Belgian Ministry of Foreign Affairs, it also has a rich history and witnessed many historical and other important events. It is certainly an inspiring location for this year's NATO Industry Forum.

At the Industry Forum this year we are honoured by the presence of so many distinguished guests. And I would like to add, in light of the US presidential elections results, and since my Command is the only NATO command located in the US, in Norfolk, VA, that I strongly believe in the strength of the transatlantic link. And this transatlantic link is, and I believe will remain, the foundation of our shared security, prosperity, and values.

The Forum takes place 4 months after the historical Warsaw Summit where adaptation and resilience were at the top of the agenda.

As we progress with NATO's adaptation, we scrutinize the future and make sure that today's political and military decisions, take into account the requirements of tomorrow. The capabilities we discuss today, have to meet the challenges posed by the future security environment.

But first let me invite you for a short journey in a not too distant future.

In 2031, the Northwest Trade passage through the Arctic has opened, but one nation seeks to deny access to this route. This nation deploys naval vessels and a complex web of air and missile defence systems in international waters and the adjacent littorals. To complicate matters, the aggressor nation employs civilian fishing vessels, believed to be proxies, to harass shipping vessels. Then tragedy strikes, a NATO flagged frigate, collides with a civilian fishing vessel. The adversary launches limited conventional attacks using autonomous swarming drones. Supported by a large part of the international community, NATO formally invokes Article V (Collective Defence) and mobilizes, but an A2AD (Anti Access and Area Denial) network stands in the way.

Due to the heavy cyber-attacks against NATO's land-based operational headquarters, airborne and maritime command and control assets assume decentralized, operational control of forces in a network that can be re-configured in real time if necessary. NATO conducts multiple strikes against targets on the ground, in the air, in the sea, and cyber space as integrated cross-domain operations. Through a networked system of systems, the operation begins. Dynamically, forces share awareness, from the strategic to the tactical level, to create a common understanding and enable distribution of command and control. NATO operations are heavily supported by stand-off stratospheric drones and satellite communications.

Although many current systems – special forces, maritime forces, manned or unmanned air-assets - are on this battlefield, the difference is that they are networked into an integrated whole. By being able to decide and act faster than the adversary, manned and machined formations overwhelm it. Once the adversary's network of systems is disrupted and degraded, they are unable to achieve their strategic goals. This entire battle from crisis to resolution has been faster than NATO has ever seen before.

In light of such a fictitious scenario, I am sure that you all possess unchallenged expertise in one or more of the above mentioned domains. However, to achieve this level of ambition, it is clear to me that we must change our way of thinking.

You have probably noticed that I have purposely not mentioned specific platforms (aircraft, ships, missiles, tanks or others) – because we must no longer think in terms of platforms dedicated to one specific and sometimes narrow oriented purpose. No single platform can counter on its own integrated systems.

What we have in mind and want to develop is a different approach aiming at thinking in terms of mobile ad-hoc networks (systems of systems), in which each element is able to sense, connect, process, make-sense and, eventually assist the commanders to decide and deliver the required effect.

You all have parts of that puzzle for this vision to materialize.

Today we can link very different platforms, in the civilian World, Apple Smartphones, Android tablets or Windows computers – whether they are brand new or outdated – not directly to each other, but indirectly through the Internet to exchange huge amounts of data.

But we're still in the age of connected platforms in Defence – let's move to the 21st century!

We are still in the age of connected platforms in Defence – let us move to the 21st century!

The question is how to build a network of connected objects, able to collect and share data and to allow distribution of operational control, a network that will enable our forces to keep the edge now and in the future against any adversary in a complex environment, as was fictively presented in the scenario?

But first, we need to look at where we stand now, and what we need to do to prepare for this new and future operating-environment?

Last July, our heads of State and government met in Warsaw, at a defining moment for the Alliance, a moment when our security and our values face significant challenges.

Considering the recent evolution of the security environment in and around the Euro-Atlantic area, our political leaders took decisions to maintain our ability to tackle challenges and threats from a 360 degrees dimension, not only geographically speaking but also in terms of the wide range of actors and threats involved in potential crises.

These measures have two main objectives: strengthening our defence and deterrence posture and projecting stability across NATO's borders. In this context, it is essential for the Alliance to keep its military edge through innovation with the aim to identify operational game changers and implement advanced and emerging new technologies applicable to the military domains.

This is why the relationship with Industries is essential to inform and to shape capability design. A more dynamic and open engagement with industries, including non-defence industries, will give us the prospective of the art-of- the-possible.

We must describe to the industries the problem we're trying to solve, for them to provide us with the potential solutions. I did not say solution! It is of course a two way street. We will inform industries of our analysis of the ever evolving future security environment in which we will conduct operations, and industries will inform us of the potential long term technological solutions they foresee to mitigate the shortfalls we have identified in terms of capability requirements.

We will need to weigh the options between "off the shelf capabilities" and "new capabilities development". We need to switch from a "platform approach" to an "operational function approach". All platforms, air assets, ships, missiles, and ground forces

are to be considered as connected objects. The added value will not be in the platforms themselves, but in their built-in capacity to be connected – to fulfil an operational function.

This requires a change of mind set. Systems engineering will be key in the development of any future capability.

A perfect example is the Alliance Future Surveillance and Control (AFSC) capability, aimed to replace AWACs in the +2035 timeframe. I won't develop now but we will be able to come back on this topic during the discussions.

Now that we have set the scene of what we need, and must do together, what have we already done to prepare for this?

This year was an unprecedented year for industry engagement, thanks to the strong impulse received at last year's industry forum. Allow me to mention 4 key initiatives on which we will keep building.

First, our common effort with the NATO industrial advisory group (NIAG) under the Conference of National Armaments Directors (CNAD). ACT and the NIAG are working on key areas, such as: Command and Control, Logistics and Sustainment, Capability shortfalls, Concept Development & Experimentation & Exercises.

We expect concrete recommendations on "global ubiquitous communications", "federated resilience and cyber defence", "artificial intelligence" or "federation of clouds". I want to take advantage of the participating industries present today to thank their leadership for their support to NATO through the NATO Industrial Advisory Group.

Another example is our annual Industry Involvement Initiative in Exercises (I3X) which was just completed last week. It involved 21 members of industry having a close look at NATO's current challenges in Command and Control during the Trident Juncture Exercise (in Naples and Stavanger). We received very positive feedback from both industry and NATO participants and we will continue to work to improve I3X.

Another line of effort this year has been to better develop our outreach with industries across the Euro-Atlantic area, including new, non-traditional, and small or medium sized industries (SME).

That is why I extended the activity of ACT's Office for Collaboration with Academia and Industry (OCAI) in Norfolk, with a permanent point of contact in Europe for greater reachability. Yet, together with my co-organizer Camille Grand, NATO Assistant Secretary General for Defence Investment, we decided to go even further and connect our Office for Collaboration with ACT in Norfolk, with a new footprint I want to set up in Brussels, together with the Defence Investment Division in the NATO Headquarters, and involving others such as the Science and Technology Organization, and the NATO agencies. We hope that structure will allow us to work better and communicate more coherently with industry.

Industry is an essential partner to ensure the credibility of our posture today and tomorrow!

At this year's Chiefs of Transformation Conference (COTC) in Norfolk in December we will test the potential of new technologies (such as cognitive computing) that will impact and in fact are already impacting defence capabilities.

The COTC allows us to engage more with small and medium businesses, and even beyond the traditional defence industry. ACT has set up an Innovation Hub in Norfolk – to enable free and unclassified exchanges on social networks and build strong communities of interest using online workshops. In today's and tomorrow's efforts, NATO's relationship with industry will continue to play a key role on the road to transformation. A more dynamic and open engagement with industry, including non-defence related companies, will remain essential to encourage technical and procedural innovation. We need to continue on this path, reinforce and consolidate our cooperation – and making the tools necessary to offer quick practical solutions to new capability requirements.

I would like to stress again that Industry is an essential partner to ensure the credibility of a posture today and tomorrow!

Thank you for your attention.

PLENARY SESSION 1 - NATO CAPABILITIES IN THE CONTEXT OF THE WARSAW SUMMIT

Read ahead

"Delivering imaginative, innovative and integrated solutions based on a comprehensive description of future trends and measured effectiveness transforming Nations and NATO capabilities to maintain our warfighting edge."

Current and future capability development must push limits, drive change, and be proactive with opportunities for National and NATO capabilities, to maintain the Alliance's warfighting edge. In order to implement a vision of "imaginative" and "innovative" capabilities, we must embrace change, identify new 'out of the box' ideas, and adapt our way of working to exploit conceptual efforts in collaboration with the science and technology community, Industry, academia, and NATO Centres of Excellence. Allies have a single set of forces, therefore the coherence and complementarity with the European Union must be enhanced as declared at Warsaw, supporting the Alliance's ambitions as expressed in the Strategic Concept.

NATO has devised a series of solutions to address the decline in defence budgets, which include the Defence Investment Pledge, the Framework Nations Concept and Multinational Approaches/Smart Defence. Additionally, NATO has developed roadmaps to assist Allies in meeting their capability planning objectives that could influence national investment, and research and development decisions. While initial results are encouraging, more remains to be done.

Closer cooperation among the military, Industry, and the private sector will help find innovative and affordable solutions to meet the current and future security challenges. Since the collapse of the Soviet Union and the Warsaw Pact, twenty-five years ago, NATO has proved resilient to changing international power structures, and this upcoming decade will test that ability again.

Integrated Solutions

"Integrated" means expanding beyond interoperability in the development of systems of systems. "Solutions" indicate that NATO capabilities aim to cover all DOTMLPFI[13] dimensions and be coordinated with Nations and other NATO bodies and organisations. Efforts to promote transformation should be based on identified future trends, including those from the Strategic Foresight Analysis and Framework for Future Alliance Operations, among others, and should be harmonised with short, medium, and long-term national plans.

By connecting Technology Trends Surveys and Long Term Aspects of NATO capability development as strategic and visionary perspectives to the five steps of the NATO Defence Planning Process, the Alliance increases the chance of developing and delivering enduring capabilities that are 'future-proof'. This can inspire National capability development, thus achieving synchronization with Alliance plans. Our future forces should be seen as a 'combat system', seamlessly integrating platforms, sensors and mission assets in cloud-like architectures. This vision for the future relies on an even closer engagement with Industry.

Command and Control

As NATO's capability backbone, Command and Control (C2) is the main driver for Alliance Transformation. Future C2 architectures must be derived from advances in Federated Mission Networking (FMN), which is a conceptual framework

[13] Doctrine, Organisation, Training, Materiel, Leadership, Personnel, Facilities and Interoperability

consisting of people, processes and technology allowing the Alliance to plan, prepare, establish, use and terminate mission networks in support of operations. FMN will streamline C2 and decision-making in future operations through improved information sharing, providing the agility, flexibility and scalability needed to manage emerging requirements of any mission environment.

Future C2 architectures must also be capable of managing big data – at a high volume, speed and diversity – in a cloud which is fed and accessed by relevant stakeholders, including NATO organisations and nations, and non-NATO entities, across the Alliance and its missions. NATO's future C2 will provide authorities with the necessary global situational awareness to support faster and more efficient decision making at all levels and throughout the Organisation.

All these considerations should be examined in the context of innovation as a persistent need, preserving intellectual rights, continuous cyber threats, and interconnectivity that is essential for all mission environments.

This Plenary Session will explore the following key themes and questions:

- **Joint efforts to address long-term capability priorities.** How feasible is it to initiate joint efforts, between NATO and Industry, to address the validity and the comprehensiveness of NATO's long-term capability priorities? Are industry priorities aligned with those of NATO, and vice-versa?

- **Engagement with Industry.** Early engagement with Industry can help NATO shape the future more accurately while allowing Industry to understand strategic military objectives. This collaboration could allow NATO to deliver the right capabilities for the expected challenges. Currently NATO is updating its defence planning process, to introduce long-term aspects to capability development, to take into account, to inform and to attempt to harmonise long-term national developments. Where would industry see itself as playing a role, and how much is industry willing to share from its own long term plans?

- **Research & development cooperation and innovation**. Interoperability and its natural pre-requisite, standardization, are essential for future Alliance success. How can research & development cooperation enable success? And what methods and solutions could be imagined, individually, multi-nationally or collectively, to boost the investments in innovation?

- **Innovation in capability development.** Leadership in innovation has shifted from the defence and security sector to the commercial sector. What is missing in the current innovation process and what else do we need to do? How can we trigger the disruption needed for long-term transformation? What can Industry develop on their own and share, and what are the domains where NATO could help?

BIOGRAPHIES

Fernando Abril-Martorell
Indra, CEO
Fernando holds a Business Degree from ICADE, and an LLB also from ICADE. Abril-Martorell set about improving the partnerships and diversity of the company. Focussing primarily on building long-term relationships with historic customers. 2015 marked a year of restructuring, particularly with regards to business in Spain and Latin America. Abril-Martorell wants a focus on high-end products and "strategic partnerships" that can improve their visibility and landing into markets. Abril-Martorell has reformed the corporate governance structure of Indra to provide greater flexibility and reduce the number of lifetime posts and positions.

Fernando sits on a number of boards. (Director of Foresta Private Equity II, Board of Directors of Ence)
Career:
1987 - J.P. Morgan
2000 - COO Telefonica Group
2005 - CEO of Credit Suisse in Spain and Portugal
2011 - CEO of Promotora de Informaciones
2015 - CEO of Indra Sistemas

Jens Maaløe
TERMA, CEO
Jens holds an undergraduate degree and a PhD in Electrical engineering. TERMA and Jens have focussed on the development of STEM skills by investing in education.

A member on numerous Danish industrial boards and collectives (Deputy Chairman of the Danish National Innovation Foundation, Member of Board of the Defence and Aerospace Industry in Denmark, Board of Directors of NKT Holdings A/S and NKT A/S., Board of Directors of Grundfos Holding A/S and Grundfos A/S, Board Member of Poul Due Jensens Fond, Board Member of Topdanmark A/S, Board Member of Federation of Employers Provincial Industry, Board Member of Danish Trade).
Career:
1983 - R&D Manager, Head of Sales and Executive VP of NKT Electronics (1983-1995)
1995 - Senior Management of Tele Denmark
1997 - President & CEO of NetTest A/S
2003 - President & CEO of TERMA A/S

Antoine Bouvier
MBDA, CEO
Antoine holds a bachelor degree from the Ecole Polytechnique and a Masters from the Ecole Nationale d'Administration. Bouvier has highlighted many times the problem of national production lines and the need to work on specialisations in a cooperative manner. He has pointed to the success of the UK-FRA cooperation with MBDA in designing and delivering new missiles as a partnership that could be replicated.

Career:
1998 - President of ATR GIE
2001 - Executive Vice President of Commercial Helicopter Division of Eurocopter (now Airbus Helicopters)
2002 - CEO of ASTRIUM Satellites (now Airbus Defence and Space)
2007 - CEO of MBDA

Stephane Burton
Sabena Aerospace, CEO

Stephane was tasked to transform Sabena Technics, Brussels to stand alone as Sabena Aerospace and achieved this in 2014/15. The new focus of Sabena Aerospace was new and emerging markets, particularly across Africa. Sabena is looking to build medical units around its current African bases in Dar es Salaam and Kinshasa. Stephane holds a Masters in Law from UCL, Louvain la Neuve and a Masters in Social, Economic and Tax Law from the University of Ghent.

Career:

1997 - Attorney at Law, Stibbe and Naauta Dutilh
2005 - Legal adviser on TAT Group acquisition of Sabena Technics
2007 - TAT/Sabena Technics Group General Counsel, Head of Corporate & Legal Operations and Human Resources
2008 - Board of Directors of Sabena Technics, Brussels
2011 - Managing Director of Sabena Technics, Brussels
2014 - CEO of Sabena Aerospace

Keith B Webster
Director of International Cooperation for the Under Secretary of Defence (USD) for Acquisition, Technology and Logistics, US Department of Defence

Keith's role is to support USD on all international matters with regards to armaments. Tasked with all aspects of capability delivery. Webster holds an MA in International Relations from Catholic University and a Bachelors from Towson State University. He is a fellow of the Center for International Studies at the Massachusetts Institute of Technology.

Career:

1998 – Strategic Planner for the Defense Security Cooperation Agency
2003 – Principal Director Business Operations in the Defense Security Cooperation Agency
2007 – Deputy Assistant Secretary of the Army for Defense Exports and Cooperation
2012 – Director of International Cooperation for Acquisition, Technology and Logistics, US DOD

Jorge Domecq
Chief Executive of the EDA

Jorge was appointed CEO of the EDA in 2015. Domecq is a senior Spanish diplomat since 1985. Jorge holds a law degree from the University of Sevilla.

Career:

1996 – Director of Private Office of NATO Sec Gen
1999 – Minister Counsellor at the Spanish Embassy, Italy
2004 – Minister Counsellor at the Spanish Embassy, Morocco
2005 – Deputy DG for European and North American Foreign Policy General Directorate
2008 – Director General for United Nations, Global Affairs and Human Rights
2011 – Ambassador of Spain to the Republic of the Phillippines
2014 – Permanent Representative of Spain to the OSCE
2015 – Chief Executive of the EDA

Jiří Šedivý

Permanent Representative, Czech Republic

Jiri has an academic background having studied and taught security studies from 2004. Since 2007 he has taken on representative roles for the Czech Republic. Ambassador Šedivý graduated with a PhD from Charles University in Prague in 1999 in Political Science, having graduated with a Masters in War Studies from Kings College in 1995.

Career:

1999 – External Advisor to President Vaclav Havel
1999 – Director of the Institute of International Relations at Charles University, Prague
2004 – Professor of Security Studies at the George Marshall European Centre for Security Studies
2007 – Deputy Minister for European Affairs, Czech Republic
2007 – NATO Assistant Secretary General for Defence Policy and Planning
2010 – First Deputy Minister of Defence, Czech Republic
2012 – Ambassador to NATO for the Czech Republic

Martin Hill

Chairman of the NATO Industrial Advisory Group & Senior Consultant for THALES

Martin was elected Chair of the NATO Industrial Advisory Group (NIAG) in 2013, having spent four years as its Vice-Chair. Martin was a member of the Royal Navy for eighteen years, and has taught at the School of Maritime Operations.

Career:

1987 – Sales and Marketing for Shorts Brothers
1996 – Managing Director for Thomson CSF
2000 – THALES Manager of FMF Programme for Naval Radars
2003 – THALES Consultant on NATO and EU Affairs
2013 – Chair of NATO Industrial Advisory Group

PLENARY SESSION 2 – STRATEGIES FOR SUCCESS

Read ahead

"Cooperation…begins where competition leaves off." - Franklin D. Roosevelt

Today, the Alliance faces a range of security challenges and threats from 360 degrees around its periphery; including terrorism that has struck hard in many countries; a resurgent and unpredictable Russia employing hybrid techniques (e.g. Ukraine) that undermine the rules-based order in Europe; and instability in the Middle East and North Africa. Recent developments in EU Europe (including the launch of the Global Strategy for European Foreign and Security Policy, the vote on Brexit, Germany's adoption of a civil defence strategy, the impact of the migration crisis) and non-EU Europe (including Russia's snap military exercises and the failed military coup in Turkey) demonstrate that the world is as unpredictable as ever.

Fuelled by rapid social, economic, scientific, technological and environmental change, the Alliance must adapt its strategic and tactical 'way of working' to meet new and emerging threats. Industry plays a critical role in Alliance transformation and is an essential part of enduring Alliance credibility. This Panel will explore Industry leaders' views of the future of capabilities within the evolving security environment.

Warsaw Summit Outcomes

Recognizing these challenges, Allied Heads of State and Government (HOSG) agreed at the Warsaw Summit to augment Alliance defensive capacity. HOSG decided to strengthen the Alliance's military presence in the east, and to develop a tailored forward presence in the south-eastern part of the Alliance. Allies declared Initial Operational Capability of NATO's Ballistic Missile Defence, noted the progress on Joint Intelligence, Surveillance and Reconnaissance (JISR) and Alliance Ground Surveillance (AGS), and decided that airborne warning and control systems (AWACS) will continue to be modernised and extended in service until 2035 when the Alliance needs to have a follow-on capability. Based on high-level military requirements, Allies have decided collectively to start the process of defining options for future NATO surveillance and control capabilities. They also pledged to strengthen their national cyber defences and recognised cyberspace as an operational domain. Finally, NATO and the EU signed a joint declaration taking their partnership to an ambitious new level, including promotion of a strong defence industry and greater defence research and industrial cooperation within Europe and across the Atlantic.

Convergence of Interests: NATO, Nations and Industry

NATO Allies rely on a competitive defence and security Industry – and Industry benefits from strategic guidance and coherent decisions made by nations through NATO. Furthermore, NATO and EU capability development must be harmonized to avoid unnecessary duplication, as explained in the joint NATO-EU declaration signed at Warsaw.

NATO Allies, Industry, and the Alliance have shared interests. National interest is focused on protecting Industry as a source of human capital, security, self-sufficiency, and sometimes as an expression of sovereignty; Industry's interests focus on satisfying shareholders, advancing their global market position, and acting as a reliable social partner; NATO benefits from capabilities that are delivered on time and meet requirements, that are affordable, interoperable and able to secure its military superiority. Understanding the convergence of these critical interests is important for developing a strong defence industrial base in Europe and North-America, for a healthy transatlantic industrial cooperation, and for complementarity of

NATO and EU efforts. All these considerations should be examined in the context of innovation as a persistent need, preserving intellectual rights, continuous cyber threats, and interconnectivity that is essential for all mission environments.

This Panel will explore the following key themes and questions:

- **Impact of defence investments.** Witnessing the first increase in defence expenditure in a decade mostly due to the positive impact of the Defence Investment Pledge, what are industry's views on what (else) could be done in addition to NATO's Smart Defence and multinational cooperation initiatives, to increase the impact of these defence investments? How does industry assess the reverse in declining defence budgets over the past year, and what are their expectations for the future?

- **NATO Capability development, coordination and harmonisation.** Consolidation of demand is praised by industry as critical, while nations are looking for a similar consolidation of delivery, as options to limit variation and thus increase commonality and interoperability. However, examples of such consolidations are not abundant. What role(s) could industry play, particularly in stimulating the consolidation of demand?

- **Multinational cooperation – could NATO move from risk averse to risk management?** Cooperation is often associated with delays, cost overruns, complexity and difficulty – in other words, it is not the most attractive option. Cooperation is often perceived as the last resort and not the preferred solution. What can industry do to support NATO's efforts to make the transition from a risk averse organisation to implementing risk management practices, and to help increase the confidence in multinational cooperation?

- **Incentives vs. interests**. Previously we explored options for dialogue between supply and demand, and for identifying incentives for industry and nations to cooperate. Instead it seems that we should *'identify critical converging interests for NATO, nations and Industry'*. Is this the right approach, and if so, how can we make this a recipe for success?

- **Research and Development Cooperation and Innovation.** R&D *"to maintain and advance the military and technological advantage of Allied capabilities"* could benefit from more (structured) cooperation within the Alliance. While the European defence industrial base is important, the Trans-Atlantic link is essential. Various 'innovation initiatives' could generate increased impact if they were synchronised. What are the options to complement Industry's own research and development with national efforts, and those of NATO? What ingredients are missing for better-structured Trans-Atlantic R&D? How can NATO efforts be better synchronised with national innovation initiatives, such as the US third offset strategy?

BIOGRAPHIES

Marillyn Hewson
Lockheed Martin, CEO
Marillyn ranks as the fourth most powerful Woman in Business (2015, Fortune) and 20th most powerful in the world (2015, Forbes). Ms. Hewson holds a Masters in Economics and a Bachelors in Business Administration both from the University of Alabama. Hewson is credited with purchasing Sikorksy for $9 billion , boosting Lockheed Martin profits. Her choice to sell off the IT wing to Leidos is equally to her credit. Both moves have added almost $10 billion to Lockheed's market value. Hewson is focussed on expanding business into Southeast Asia and India, as both manufacturing partners and customers. Although nearly 80% of all sales remain with the Pentagon.

Marillyn sits on a variety of boards (Dupont, President's Export Council, Aerospace Industries Association, Royal Aeronautical Society, Assoc. Fellow of the American Institute of Aeronautics and Astronautics, International Institute for Strategic Studies, Congressional Medal of Honor Foundation, USO, National Geographic Education Foundation, Directors of Catalyst, Atlantic Council's International Advisory Board).
Career:
1978 - Economist for the Bureau of Labor Statistics
1983 - Senior Industrial engineer for Lockheed Martin
-Since 1983 Hewson has held a variety of Executive roles in Lockheed Martin.
2013 - CEO of Lockheed Martin

Tom Enders
Airbus Group, CEO
Responsible for the consolidation and rebranding of EADS into Airbus, Tom holds a Masters from the University of Bonn and California in Economics, Politics & History. He also holds a doctorate from the University of Bonn on External Security. Enders is credited with introducing Vision 2020 which aimed to make Airbus more flexible in terms of internal structure but also in reducing nation state holdings.

Enders sits on several high profile boards. (UK Business Advisory Group, European Commission's High-Level Group of Personalities on Defence Research, Management Board of HSBC Trinkaus, Steering Committee of the Bilderberg Group, The Atlantic Council's International Advisory Board)
Career:
- Paratrooper in the German Army (Major)

1985 - Parliamentary Assistant in the German Bundestag
1995 - Managing Director and Chairman of Supervisory Board of DASA
1996 - Director of Corporate Development and Technology of DASA
2000 - Executive Vice President and Member of Steering Committee of EADS
2004 - President and CEO of EADS Germany GmbH
2012 - CEO of Airbus Group

Mauro Moretti
Leonardo, CEO
Mauro holds a degree in Electro-Technical Engineering from the University of Bologna. Moretti has led the reorganisation and restructuring of Leonardo, under the industrial plan of "One Company". The aim has been a more integrated industrial hub, structured and focussed on seven operational divisions, selling off the Transport sector of Leonardo.

Mauro sits on a number of boards. (President of Aerospace and Defence Industries Association Europe, Chairman of Italy-Japan Business Group, Italian Industries Federation for Aerospace, Defence and Security, Italian Ferrovie dello Stato Italiane Foundation, Collegio Ingegneri Ferroviari Italiani (Italian Association of Railway Engineers), Unindustria (Industrialist and Enterprise Association of Rome), European Management Committee of the International Railway Union, Member of the Board of Confindustria (Italian Confederation of Industry))
Career:
1991 - Vice-Director of the Technologies and System Development Division, FS Italiane
1993 - Director of the Technological Development and Rolling Stock Division, FS Italiane
1994 - Managing Director of Metropolis, FS Italiane
1997 - Director of Business Strategies & Infrastructure, FS Italiane
2001 - Board of Directors FS Italiane
2001 - Managing Director of Rete Ferroviaria Italiane
2006 - CEO of FS Italiane
2014 - CEO of Leonardo-Finmeccanica

Marc Allen
Boeing, President of Boeing International
Graduate of Princeton University with a Bachelors in Political Science and a Postgraduate degree in Law from Yale University. Marc has been in charge of promoting Boeing in China, where he doubled the pace of delivery. He also worked directly on the US-EC WTO dispute as a legal expert and adviser. Marc is responsible for developing Boeing outside of the US, both in terms of partnerships and support.

Career:
- Law Clark to US Supreme Court Justice Anthony Kennedy.
- Commercial Litigator at Kellogg Huber Law Firm.
- President of Boeing Corporate Capital
- Vice-President of Boeing International
2011 - President of Boeing China (2011-13)
- Vice-President of Boeing's Global Law Affairs
2015 - President of Boeing International

Hervé Guillou
DCNS, CEO

Hervé holds a bachelor from the Ecole Polytechnique, ENSTA ParisTech in Nuclear Engineering and a postgraduate degree from the National Institute for Nuclear Sciences and Techniques (INSTN).

Hervé sits on a number of boards. (President of the CICS, Conseil des Industries de la Confiance et de la Sécurité, VP of SNEF Board of Directors, President of the SNEF Audit Committee, VP of Supervisory Board of the Development Office MAURIC, Board of Directors of COMEX)

Career:

1978 - Direction des Constructions Navales (DCN)
1989 - Direction générale de l'armement
1996 - Managing Director of TechnicAtome (Nuclear Engineering Subsidiary of Areva)
2011 - CEO & Founder of Cassidian Cybersecurity
2014 - CEO and Chairman of the Board of DCNS

Roger Krone
Leidos, CEO

Roger holds a Bachelors and Masters in Aerospace Engineering from Georgia Institute of Technology and the University of Texas. He also holds an MBA from the Harvard Graduate School of Business. He is a licensed Commercial Pilot and certified Public Accountant.

Roger sits on a number of boards. (Fellow of the American Institute of Aeronautics and Astronautics, Fellow of the Royal Aeronautical Society, UK, Georgia Tech Foundation Board of Trustees, Board Member of WETA Public Television and Radio, Executive Council of the Aerospace Industries Association, Aircraft Owners and Pilots Association Foundations Board of Visitors)

Career:

1978 - Programme Manager, Engineer and Finance at General Dynamics
1992 - Director of Financial Planning, McDonnell Douglas
1997 - Vice President and Division Manager, Boeing
2008 - President of Network and Space Systems, Boeing
2008 - Chairman of the Board of Directors of the United Launch Alliance
2014 - Chairman and CEO of Leidos

KEYNOTE SPEECH - ELŻBIETA BIEŃKOWSKA

Dear Secretary-General,

Dear Federica,

Ladies & Gentlemen

I am glad to be here today. I thank the Secretary General for his invitation. This exchange between the industry, EU and NATO is timely at a moment when we must make ambitious moves towards more defence cooperation in Europe. The security challenges that Europe is currently facing are complex. The distinction between internal security and external defence becomes increasingly blurred. And these threats are becoming an everyday reality for EU citizens. They expect us to respond. No Member State is strong enough to meet those challenges on their own.

Europe must become a security provider

Europe must become a security provider. Indeed, Europe's soft power is not enough on the long run without at least some integrated defence capacities as President Juncker said. **This is not in contradiction with NATO.** On the contrary, **a stronger Europe in defence means ultimately a stronger NATO**. We need a pragmatic EU-NATO partnership, in full respect of the decision-making autonomy of both organizations and respecting the principle of inclusiveness. This is also the reason why we are working on parallel tracks: Following the Global Strategy presented by Federica, we are focusing towards an implementation strategy to set the right level of ambition. Federica will develop this. At the same time, we will ensure mutual reinforcement, complementarity and coherence with NATO, notably through the implementation of the EU-NATO Joint Declaration signed in Warsaw in July. These are the first 2 pillars of our action. Federica will develop them.

For my part, I would like to focus on the 3rd pillar, the industry pillar. As already announced, the Commission will come forward at the end of this month with the European Defence Action Plan. We have a clear objective: **to provide support for the whole sequence of defence capabilities development**. Modern military capabilities are often technologically complex and increasingly expensive. This puts strong pressure on national defence budgets which have suffered many years of reductions. So co-operation is the only way forward.

For European defence to be strong, the European defence industry needs to innovate and remain competitive in the global markets. In that perspective, a competitive industrial base is a prerequisite to Europe's strategic autonomy, able to act in **full complementarity with NATO**. The Commission will act as an enabler and accelerator for European defence cooperation, proposing ambitious but necessary elements. The Commission is working in close co-ordination with the European External Action Service and the European Defence Agency. We have also closely involved Member States and the industry in the preparation with a series of technical meetings

The Action plan will have 3 core pillars:

- Funding defence research;
- Fostering investments in defence supply chains; and
- The joint financing of jointly agreed defence capacities through a potential European Defence Fund.

These three pillars are underpinned by making the internal market for defence work more efficiently

Our first proposal is to start with **funding defence research at EU level.** For the first time in EU history, the EU budget would be used to fund this. It makes sense to start with research. Cooperative research is the first phase of future cooperative programmes, industrial cooperation and common equipment. With this proposal, the Commission wants to incentivize cooperation right from the start. The lack of cooperation in defence costs Europe several billions of Euros per year. We collectively cannot afford it! And we are translating this into action already.

We made a proposal for a Preparatory Action on defence research in the 2017 Draft Budget, with €25m in 2017 and an expected total amount of 90m€ over the next three years. I am glad that both the Council and the European Parliament agreed recently to it. This will pave the way for a future financing of **a European Research Defence Programme** in the next EU budget. My intention is to fund research in key defence technologies that are central to jointly agreed capabilities priorities. We can do this in full respect of the whole sequence of capabilities development. The EU–funded research should complement rather than replacing national research defence priorities and spending. It should focus on disruptive technologies and on those technologies where Europe is dependent. **It is indeed an issue of strategic autonomy for Europe**. It should incentivise more European cooperation on new, future defence programmes and lead to collaborative development.

I**n terms of governance, it should** take into account the specificities of the defence market and research which we will test during the Preparatory Action. Industry and Member States will be directly involved in the set-up of priorities. We are aware that the IPR regime is an important element for the participation of the industry. I am convinced that we can find together the appropriate framework to be tested in the Preparatory Action. But, funding defence research is only the first step.

Cooperating on Defence capabilities at the European level is not an option. It is a necessity.

Our second proposal is to **unlock EU Investments in the defence sector**. At the moment, SMEs active in the field of defence have difficulties to access finance and cannot receive support at European level. Yet SMEs are central to the European defence industrial base, as well as industrial value chain and supply chains. Large corporations rely on a large number of SMEs to supply them with innovative technologies or services. In many Member States, SMEs are also the backbone of the defence sector. So we are working with Member States to provide financial tools for such SMEs to modernise their industrial capacities and scale up across borders.

Our third proposal has already been announced by President Juncker. We are discussing with Member States on the possibility to work towards **a European Defence Fund** to support **the joint financing of jointly-agreed defence capability programmes**. Deciding together what capacity is needed is very important. Not only does it give everybody visibility, especially to the industry. It will also allow economies of scale, and avoid redundancies and ineffective allocation of funds while at the same time, ensuring interoperability. There are 154 types of weapons systems in Europe against 27 in the US. There are 37 types of light military vehicle against 9 for the US. Can we still afford this?

So cooperating on defence capabilities at the European level is not an option. It is a necessity. The Fund should therefore bring forward an attractive and innovative financing model to jointly developed common defence capabilities. And of course this has to be done in full cooperation with NATO. But we are at the early stage of our reflection and discussion with Member States on the Fund. We will continue to work closely together.

Ladies and Gentlemen, Europe is at a crossroad on many issues. Defence is one of them. Europe should be able to demonstrate to its citizens that it acts to protect them. It is time to be ambitious. It is time to take practical steps on fostering defence cooperation. Cooperation with NATO is central for success. In particular on the industry and capability fronts, we need to work together. We are not going to put into question the processes and initiatives carried within NATO. We are going to strengthen them with a stronger European dimension.

I repeat it: A stronger Europe in Defence is ultimately a Stronger NATO.

Let us work together.

Thank You

KEYNOTE SPEECH - FEDERICA MOGHERINI

Friends, Jens (Stoltenberg), Elżbieta (Bieńkowska),

First of all, let me say that I really appreciate this opportunity to be here together, to address all of you at this important forum at what is, I would say, a turning point for our common European defence, but also, especially today, for global politics.

Let me say that, at least myself but I guess all of us, had maybe to review a little bit the text of our speeches this morning, checking which parts were still up-to-date and valid, which parts had to be underlined even more and I am glad to say no part of my speech had to be deleted which is I think a good sign. But let me say very clearly that I think that being here together today is more important than ever and I really appreciate, Jens, the possibility of doing so not only for the work we do together but also for the symbol. And sometimes symbols and images and messages are important in today's world. And being here today, working together, EU and NATO on our common industrial basis but also on our common defence across the Atlantic is something that today is more important than ever.

And then it is very important for me to share this opportunity to address you together with Jens and Elżbieta because each of us can provide you with a different perspective on our common work to make the Europe of defence stronger with the assumption that making the Europe of defence stronger is also a way of making NATO stronger.

Elżbieta has just spoken about the European Defence Action Plan, so I will not go back to that in details, that will focus on our industrial base, on innovation, on new technologies. But there is much more on which we are working. The Action Plan goes together with the implementation of our Global Strategy, and also with the follow-up to the EU-NATO Joint Declaration we signed in Warsaw last summer. And these three processes go hand in hand and reinforce and complement each other. And this is why we have been working so much in the last three, four months together with Jens, together with all our teams to make sure that things really are coordinated and proceed in parallel.

Jens always says that a stronger European Union makes NATO stronger. And I obviously share this message very much. And of course, I would like also to share this, on the other side, saying that a stronger NATO makes Europe safer. Obviously, it goes without saying, at least on this side of the Atlantic for sure, that a stronger NATO makes also the US, Canada, all of us, safer.

Making the European defence stronger is also a way of making NATO stronger

We both follow our own path, the European Union and NATO are two different organisations, different in nature, different in mandate, but we run side by side and it is very important that we keep this parallel track very carefully in mind, as we are doing. Last June, Jens was the first person to receive our Global Strategy: I will remember that very well forever, because I gave him a copy just a few minutes after I had presented it to the Heads of States and Governments of the European Union in the European Council. Since then, we have met and consulted constantly, and our teams did, to make both the European Union and the Alliance stronger, with no duplications and in the closest possible cooperation.

Now, the Global Strategy has spelled out a vision for a stronger European Union. And today, we are already turning this vision into action. I will present very ambitious and pragmatic Implementation Plan on Security and Defence to the European Ministers of Foreign Affairs and Defence – one is here with us today, and we are moving fast, for once, indeed it can happen,– not only on defence. The implementation of the Strategy is making fast progress also in other fields, connected with the work we are doing on security and defence, for

instance on building resilience for societies and countries that are around us, or on connecting our internal and external policies, starting from those on counterterrorism or those on migration.

Security today requires much more than the traditional military tools. This is very clear to NATO, this is very clear to the European Union. But we also know very well that development policies – or other instruments that the European Union has in its toolbox - often require to be supported by security and defence tools, and that our civilian and military operations often go hand in hand. So that there is no contradiction between the soft power and the hard power we dispose of. And defence matters: also to a soft power or a traditionally perceived soft power as the European Union and I see a growing awareness about this among our citizens and among our governments.

It will be up to our Member States now to define together what will be our "level of ambition": this means we will define together the concrete challenges we believe it is essential we face together, as European Union, and the instruments that are needed to do so. There is already, as I see, a great degree of unity on our goals and objectives.

And let me also be clear on what we already agreed on - and I had the opportunity to share this with Defence Ministers of NATO just a few weeks ago. We do not want to create another organisation for collective defence – let me be very clear on this. This is simply because we do not need it. NATO remains the cornerstone of European defence, just like it has been for almost seventy years. But there are many challenges that do not, and probably will not in the near future, fall under NATO's mandate which is a very specific one, and need to be tackled as a matter of urgency.

We do not want to create another organisation for collective defence

First, we need to protect our Union through our external action, because tackling terrorism or organised crime outside our borders is absolutely vital to our domestic security in Europe. Second, we need to respond to crises in our neighbourhood, because they affect directly the security of our citizens. And third, we need to strengthen the capacities of our neighbours and partners, because security in our age can only be a collective effort and the security of my neighbour or those countries that are maybe not immediate neighbours in geographical terms but are connected with us through corridors, is also our own security. So through partnerships we can improve our security internally as well.

I believe in this new phase of our global politics, Europe will be more and more an "indispensable power". We see it today, I think, very clearly. There will be a growing request for a principled global security provider. For a super-power that believes in multilateralism and cooperation and partnership. For a reliable partner for peace, for growth and for democracy. There will be a rising call for a stronger European Union in the world. We are seeing this even in those hours.

None of our Member States, as Elżbieta was very well saying, can answer this call alone. Nor the big Member States neither the small Member States. And let me share with you something I repeat very often: I believe EU Member States are of two kinds: the small ones and those which are not yet realised that they are small. We are living in a world that has a different size today.

On the military side, in particular, we cannot rely totally on our American friends to fill the gaps. This would not be realistic, it would not be fair, and it would not be beneficial to our relationship with the United States. This is true today as it was yesterday; this is a part of my speech I have not changed. I have always been convinced that a healthy relationship with the Unites States needs a strong Europe of defence. And maybe we are living for the first time in a historic time when this is clear on both side of the Atlantic. And this opens up opportunities for us.

Because it should be clear to everyone – and it is starting to be clear to everyone – that we can only succeed if we work together as a true Union. This is not something we should believe as an act of faith: our recent experience is what shows concretely that we are stronger together.

I will give you an example: Operation Sophia - on which cooperation with NATO has started, is starting, in, I think, a very useful manner. No Member State of the European Union alone could have set up such a naval mission – saving lives, arresting criminals, enforcing an arms embargo under UN mandate and training the Libyan coastguard and navy, all at the same time in a difficult security environment. And we have set up Operation Sophia in no more than two months, being endorsed by two unanimously adopted UN Security Council Resolutions.

We need to make this kind of effective, practical, useful cooperation the norm and not the exception in the European Union and also, obviously, in cooperation with NATO. To reach this goal, our proposals in the Security and Defence Implementation Plan include also a better use of our rapid response forces, for instance with the flexible deployment of the Battlegroups. I

mention sometime the fact that this could be an instrument to breach UN peacekeeping operations that, as we know, take a bit more time to be built up.

But we are also discussing how to better integrate our civilian and military operations – from the planning stage to the actual deployment – and to improve coordination among our personnel here in Brussels and on the ground. Here again, let me be very clear, we are not thinking of establishing a big shape style headquarter but I can give you a news, the European Union has already five headquarters to run our seventeen missions and operations around the world. So, it is a matter of streamlining, making more effective use of the resources we already have.

But this is not simply about a more coordinated use of our assets. We also need to invest more and better on our industry and on research. Elżbieta mentioned this but this is a world of continent-sized powers, with continent-sized budgets and research programmes. And we simply cannot afford a lack of coordination among our Member States – I think the industry understands this much better than anyone else – so we need your help. We have an immense potential in terms of economies of scale, joint research programmes, and a more predictable time-frame for investments.

So we are exploring a large set of instruments, to make resources available. For instance, a “Coordinated Annual Review on Defence” – what someone could refer to as the "Defence Semester", could facilitate joint programmes among Member States, and a more cooperative way of developing our capabilities. What strikes me always is not so much the spending gap across the Atlantic but the output gap across the Atlantic. We have to work on that, and we have the instruments to do so, especially working together with Elżbieta on the instruments that the Commission can use to incentivise our output.

We could also envisage some kind of financial solidarity for common defence projects, as well as a broader range of collective funding options.

We know that it might take a long time to develop a new technology, or to upgrade a military infrastructure. But that is only another reason for starting immediately without wasting more time. There are many concrete steps we can take right now under the current provisions of the Lisbon Treaty, without opening a huge, theoretical, philosophical, treaty debate. There are instruments that were foreseen in the Lisbon Treaty we never used. My personal impression is that the economic and financial crisis distracted us a bit from what we could have used or done in the field of security and defence after Lisbon but I think that now we have a window of opportunity politically to use the instruments we have.

So concrete steps, pragmatic but concrete does not mean not ambitious, on the contrary. The steps I am taking about can represent a real turning point in the field of defence and security in Europe. They can be the real building blocks of a Europe of defence, finally, after six decades of setbacks and postponements. I do not need to go back to the history of the European Union's work on Defence and Security; you know that better than me. Maybe today we have the potential to use our potential again. Because our citizens need security. If you look at the polls across Europe, issue number one is security, issue number two is economy today, all across Europe. And we know well that security comes for our citizens only if we work together, within the European Union, as a true Union, investing in our Union also as a security Union, and together with NATO in full partnership and in strong friendship. It is what our citizens need, it is what our industry needs – but this is more up to you to tell us, my sense is that it is the case – and it is also, we believe, what NATO to be a force for good, together, strongly together, for our region and for the world.

I thank you very much.

KEYNOTE SPEECH - JENS STOLTENBERG

Deputy Prime Minister Reynders, ladies and gentlemen. First of all I would like to say that I'm very pleased to be here tonight and to meet NATO-Industry Forum and especially to be here together with Federica and Elżbieta because I think that we share this stage reflects the close cooperation between NATO and the European Union but also between NATO, the European Union and the defence industry both in Europe and in North America. And that's exactly why forums like this are so important because this is a way to create a platform for politicians, for decision makers in NATO and the European Union to meet with the defence industry and to sit down together with you and to find out how we can work more closely together because we are totally dependent on you. The defence industry provides the equipment, the capabilities we need and you have actually provided us with the best equipment in the world and the most advanced capabilities in the world for decades. But we have to make sure that it continues to be like that in a more dangerous and more challenging security environment. And that's the reason why I welcome very much that we this year have the highest level of participation from industry ever at this NATO-Industry Forum reflecting the increased interest both from NATO and from the industry in how we can enhance our cooperation. And as you know NATO's main core task is to protect close to one billion citizens living in Europe and North America and I think that on a day like this when the United States has elected a new President that provides me with the opportunity to congratulate Donald Trump as the new President of the United States and I look forward to work together with President-elect Trump in continuing to adapt NATO to a more challenging security environment. And a strong NATO is important for Europe but it's also important for North America and United States because we have to remember that two World Wars have taught us that peace and stability in Europe is important for Europe that's obvious, but it's also important for North America. And we have to remember that the only time we have invoked Article 5, our collective defence clause, was after an attack on the United States and thousands of soldiers from Europe and Canada have participated, contributed to the NATO presence there and more than a thousand have been killed in an operation that was triggered by an attack on the United States. So I think this is a day just to underline the importance of NATO, of strong institutions providing the platform for strong Trans-Atlantic cooperation. Then of course NATO can only be able to continue to provide deterrence, provide collective defence if we continue to have a strong defence industry and I know that this industry is full of people with a lot of skills, competence, ingenuity and you know a lot about what should I say technical measures which is far beyond what I will ever be able to understand. But that's not my task; my task is not to understand all the technicalities of the defence industry.

NATO's main core task is to protect close to one billion citizens living in Europe and North America

My task is to find out how can I as Secretary General and NATO as a military political alliance provide the best possible framework for the industry to develop and to deliver the capabilities we need. And there are many ways to do that but our outline and focus on three areas where NATO plays a key role which is of great importance for the defence industry. And they are in different ways related to defence spending because NATO is decisive when it comes to how much allies spend on defence and on what allies spend and how they spend. And all of this is important for the defence industry. So let me start by defence spending, how much we spend. In 2014 we made a decision in ways to stop the cuts to gradually increase and to move towards spending 2 percent of GDP on defence. And I'm actually very proud to be able to tell you that NATO is delivering, NATO allies are delivering because just a few months after we made that pledge in 2015 we were able for the first time in

many years to have no cuts in defence spending across Europe and Canada combined. It was not a big increase in 2015 but it's a big difference between going down and going up and in 2015 we started to go up across Europe and Canada. Then in 2016 the latest estimates indicates 3 percent real increase and that's something. So we have even stronger increase in 2016. Then of course we have a long way to go and the picture is still very mixed, some allies are lagging really behind but some allies are really stepping up so in total we are moving in the right direction. I'm not underestimating the challenges and I'm not underestimating the efforts we have to put in place to be able to reach a 2 percent target but we didn't promise to reach the 2 percent target immediately. We promised to stop the cuts, to start to increase and to move towards a 2 percent within the decade, and at least we have started to do the first steps in that process. I can promise you that I as Secretary General will in all my meetings with leaders, Ministers, Prime Ministers and also Ministers of Finance continue to focus on the importance of increased defence spending in Europe and in Canada. So all nations reached a 2 percent target, some European allies already do that but many are what should I say still have a long way to go. We will also report on progress or lack of progress on defence spending on the defence investment pledge on our Ministerial meetings and defence spending will be an important issue at the NATO Summit next year where we will also welcome the new elected President of the United States here to Brussels. The reason why I am so focused on this is that it matters. If we are able to what should I say, reach the 2 percent target for all European allies and Canada that will provide 100 billion more U.S. dollars for defence and a 100 billion more U.S. dollars for defence is roughly the same amount for defence spending as France and U.K. combined spend on defence. So that would really add something to the total amount of defence spending. And I would also very much welcome the strong message from the European Union and from European leaders on the need to strengthen European defence also by increasing defence spending. I'm not underestimating the challenges and the difficulties but I'm only telling you that we have started to move and I will promise to continue to be as focused as I've been since I became Secretary General in October 2014 on the issue of defence spending.

If we are able to reach the two percent target for all European allies and Canada, that will provide 100 billion more for defence

Then NATO also plays a key role not only when it comes to the total amount of money we spend on defence but we also play a key role when it comes to on what we spend. And NATO plays a key role in different ways when it comes to on what we spend. We do that, that's okay because I'm looking for another page, we do that page 6 oh that's a good page, I do that because we have as part of the defence investment pledge decided not only to spend more but also to make sure that 20 percent of total defence spending goes to investments, equipment and research and development. Can allies deliver? But we have a long way to go and of course the more we can invest in research and development and on equipment the better for industry because then you have the market and then you have also more investments in innovation. But of course NATO is also important when it comes to on what we spend through our defence planning process and we are now in the midst of a new defence planning cycle. We are sitting down with all the 28 allies and identifying what do we need, what kind of capabilities, what kind of equipment does NATO need and this defence planning process is quite a bureaucratic process but it is extremely important. It's perhaps one of the most important things NATO does and that is to coordinate allies so we really work together and we fill the gaps when it comes to different kinds of defence capabilities and to make sure both that we have enough capabilities but also the right kind of capabilities and some kind of divisional responsibilities between the different NATO allies. When we have finished this defence planning cycle our task, my task, the task of the governments will be to make sure that we implement and that we follow up the guidelines and the defence planning conclusions. This is about for instance a guidance related to capabilities like joint intelligence, surveillance and reconnaissance, precision guided munition and strategic airlift so of course we all understand that it is important that we not only have defence planning but we also as I say, implement and follow the plans we have agreed.

Then also NATO influence on what allies spend and what NATO spends on by our common funded projects; things like AWACS but also the successor the new Alliance Future Surveillance and Control System will be a big investment, big project and we have started to work on that project which shall than succeed the AWACS plane. I actually in a meeting saw that the plan is to have the new system in place by 2035 and for me as a politician that's far into the future; it's after at least the next election. But for people dealing with defence investments 2035 is just around the corner. So, it's the way things work in this industry. Then we also of course will work on projects like missile defence and alliance ground surveillance and other common funded and planned and implemented projects.

The third area where NATO plays a key role in creating the framework for a strong defence industry in Europe and in United States is when it comes to how we spend. And both Federica and Elżbieta have already addressed that issue because there's a gap when it comes to defence spending between Europe and United States. But as Federica said there's also output gap

meaning that we don't get so much out of what we invest being it dollars, no we don't invest dollars in Europe but it is perhaps not yet, euros, pounds and kroner. We don't get as much out of that as we should because the defence market, the defence investments are too fragmented especially in Europe. So spending together is a way to spend smarter and we have to both spend more but we have to also make sure that we spend in a better way. And again NATO can make a big difference by encouraging greater multi-national collaboration and better coordination of allies' requirements. And we all understand that need. In Europe we have 19 different types of infantry fighting vehicle, in the United States they have 1. In Europe we have 13 different types of air to air missiles, the United States has 3 and European nations have 29 different types of naval frigates, the United States has 4. So not only does the United States have more but they have, what should I say, divided into not so many different types while in Europe we have in total less and we are divided into many more types. And that makes it more expensive, it reduces the potential for a common economical scale, it makes training, research and development more expensive and it reduces the competitiveness of our industry. We need competition, we need different industries but we need some greater degree of coordination when it comes to requirements and investments from the European governments so we can get economical scale and reduce the unit costs of the different kinds of capabilities and equipment. And again I can tell you that I understand that this is not easy because I told some of you before that when I was Prime Minister back in 2000 in Norway we had a big discussion about buying 5 new Norwegian frigates for the Norwegian Navy and in Norway we are used to not building tanks we are used to not being, what should I say, advanced when it comes to constructing airplanes but we look upon ourselves as an advanced shipping nation and we have built ships and frigates for decades or actually centuries but then we decided to build the Norwegian frigates at a Spanish shipyard because they actually had the best and the cheapest offer and we decided to go for the best and the cheapest. One of the reasons why I lost the elections back in 2001 was because of that so I understand that this is not easy but sometimes we have to lose some elections and then come back. So there is something in between doing things which are absolutely impossible but also sometimes you need some political courage and to go for the best and the most effective things and then you also increase the competitiveness of your own industry if you are able to challenge and sometimes not only protect them.

We need greater degree of coordination of requirements and investments from the European governments

Then we can also improve the way we do our investments by working more closely with the European Union. And this is really something I welcome that we have been able to strengthen the cooperation with the European Union in so many different ways and not only was I the first to receive the Global Strategy from Federica, but one of the first, as we started almost the same day and we have been together not every day since but I think there's hardly anyone else I met so much as Federica and I also now working more and more with Elżbieta. And I think that reflects a true will both in the European Union and NATO to work together and to overcome some of the obstacles and to find pragmatic solutions for many different reasons but when I speak about defence industry this is also important for your industry. And we know that for instance several European nations are now working together on a multi-role air refuelling tankers that will serve both NATO and the European Union and we know that Denmark is in the lead when it comes to developing precision guided munition together with several other European countries. So there are some examples where we are able to work together and this is also part of what we do together with the European Union.

In July I signed a declaration together with President Junker and President Tusk - it's a declaration about NATO-E.U. cooperation in many different fields. Federica mentioned some of them but one of the areas where we have decided to work together is capabilities and Federica and I are now working on the implementation follow up and we will present our conclusions in December and she told me when we went into this room that we are, what should I say, making good progress

so I always trust Federica so this is going to be good. So, Federica and I are working on the implementation of the declaration and one of the issues we are addressing is exactly how we can also make some progress on capabilities and close cooperation in the development of capabilities between NATO and the European Union. And we are going to present our conclusions in December and we will then start to turn the declaration into concrete actions and the NATO Foreign Ministers will be asked to approve an implementation plan when they meet in December and we are preparing that meeting in December.

So, let me end by stating once again that the defence industry is full of capable people and by harnessing their talents and ideas and by putting the most advanced technologies in the hands of our brave men and women in uniform and by working more effectively together we are all more secure and therefore I appreciate so much this cooperation with the defence industry. Thank you

CLOSING REMARKS – DIDIER REYNDERS

The Vice-Prime Minister and Minister of Foreign Affairs of Belgium welcomed all participants to the NATO-Industry Forum in Egmont Palace new facilities and the old palace, and expressed hope for similar opportunity in the future.

He mentioned that 9 November 2016 was an important day for the Trans-Atlantic cooperation following the election of the new President of the United States of America. The Minister was pleased to extend his welcome to the President in the new NATO HQ on the occasion of the 2017 NATO Summit.

He also highlighted the importance for all Allies to deliver more on security and defence, building upon the process started within the EU. That would include bilateral arrangements such as the Belgium-Netherlands cooperation, but also strengthening the European pillar of defence and the cooperation inside and with partners outside the European Union, as necessary and appropriate. Such a European Pillar will inherently be built upon a solid defence industry, which has to be maintained and strengthened in Europe. The European champions mentioned earlier during the NIF debates, can be exemplified by Airbus considered a true industrial champion in the civil aviation domain. Nations show their commitment through investments, and he mentioned that Belgium will invest 9 Billion Euro to modernize its Armed Forces.

CLOSING REMARKS – CAMILLE GRAND

The Assistant Secretary General for Defence Investment expressed on behalf of NATO co-organisers, the Supreme Allied Commander Transformation, General Denis Mercier, and himself, deep gratitude to Belgian authorities for hosting the NATO-Industry Forum in such outstanding conditions. He thanked participants, and in particular, the panellists, for their most valuable contribution to the debate, from which he highlighted several directions of interest identified throughout the day: NATO to become a faster and more agile organisation, particularly in procurement; to deepen the engagement with industry; to work together with industry in the 21st century standardization; to foster innovation, and develop a common innovation plan to support this initiative. He finally called for more cooperation and dialogue within Europe and Trans-Atlantically.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