FRAMEWORK FOR FUTURE ALLIANCE OPERATIONS

2018

For almost 70 years, NATO has helped provide security and stability in an often unsecure and unstable world. As we look to 2035 and beyond in the Strategic Foresight Analysis (SFA) 2017 Report, we see more uncertainty and challenges ahead. We should take an active role to shape the future, as it will be the legacy we leave behind. Simply put, we must do what we can today to help the next generation uphold and defend the core values that we hold dear as an Alliance. This is our shared responsibility, and one we should not take lightly. We must not be afraid of the future. We must embrace it.

NATO needs to continuously and simultaneously operate and adapt to remain fit-for-purpose, now and through the foreseeable future. To that end, the Framework for Future Alliance Operations (FFAO) advises NATO Nations and Partner Nations on both Warfighting and Warfare Development. This document helps to inform the Alliance of opportunities to improve its defence and deterrence posture together with its ability to project stability, ensuring it remains continuously proactive, ready, and responsive. Perhaps most importantly, this document describes how NATO forces can keep the edge and retain the ability to defeat our potential adversaries on the battlefields of the future.

We would like to express our personal thanks to all those who provided their wise counsel, including Member and Partner Nations, Alliance leadership, Commands, Centres of Excellence, industry, academia, think tanks, and all others who supported this effort. Thank you!

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EXECUTIVE SUMMARY

1. Since its creation in 1949, NATO has provided security in the Euro-Atlantic area and contributed toward the further development of international relations built on trust. It has also worked to develop a common understanding of difficult global security problems and promoted conditions of stability and well-being. Today, NATO faces a wide-array of complex challenges from many directions. As NATO prepares to meet the future head on, forces should continually seek opportunities to ensure they remain proactive, ready, and responsive. This document provides best military advice that identifies the required characteristics and abilities of forces that need to be available to the Alliance to retain the military edge and prevail in future operations, address challenges, and seize opportunities of the future.

2. Building on the foundation of FFAO 2015, this edition includes new discussion on the nature of war and character of conflict, Instability Situations, legal and ethical questions, and opportunities. The FFAO 2018 also includes an overarching Central Idea, refined Strategic Military Perspectives, Enabling Elements, and refined Military Implications. In addition, this document includes new emphasis on nuclear issues, terrorism, human captial, mission command, cross-domain operations and effects, full-spectrum cyberspace operations and space issues, and new disruptive technologies including artificial intelligence as a game-changer.

3. Overall, the future security environment through 2035 and beyond will be dynamic and ambiguous. Increasing complexity and uncertainty will present NATO with a range of challenges. Taking into account the anticipated characteristics of conflict in the future, a series of Instability Situations are defined that could result in an Alliance decision to employ military forces. These Instability Situations range from high-end conflict to natural disaster and are used as lenses through which to analyse and assess what characteristics and abilities forces will need. In addition, developments in areas such as artificial intelligence, autonomy, and human augmentation/ enhancement, raise novel legal and ethical questions. NATO needs to consider how these developments might be affected by the application of the Law of Armed Conflict. However, along with these challenges and questions, the future will also offer opportunities for NATO, especially in the areas of technological advances, relationships, and influencing the human environment.

INSTABILITY SITUATIONS*

- **WMD Proliferation/Threat/Use**
- **Conventional War**
- **Threat Escalation**
- **Hybrid War**
- **Irregular War**
- **Terrorism**
- **Global Commons Disruption**
- **Critical Infrastructure Attack**
- **Information Warfare**
- **Cyberattack**
- **Governance Challenges**
- **Endangerment of Civilian Populations**
- **Mass Migration**
- **Pandemic Disease**
- **Natural/Man-made Disasters**

**** Not exhaustive***

4. NATO must be fit-for-purpose, now and through the foreseeable future. As described in the Central Idea, NATO forces must have five key characteristics that will guide Warfighting (the way forces fight) and Warfare Development (how we shape forces to fight in the future). Forces will need to be credible, networked, aware, agile, and resilient. Credibility is an essential component to deter adversaries and prevent conflict. Networking, enabled by interoperability, helps NATO to act in concert with a variety of partners to address security threats holistically and also improves interaction among NATO bodies. This includes building trust with traditional and non-traditional entities, such as non-defence industry. Awareness enables accurate and timely decision-making, whereas agility gives forces the ability to maintain responsiveness and operate and adapt at the same time. Finally, resilience is required to withstand and recover from strategic shocks or operational setbacks. In addition, there are enabling elements crucial to success, but outside the direct control of the military structure, such as strong and sustained public and political support. Military leaders will need to inform and advise key stakeholders within Nations to ensure that these necessary enabling elements are in place, thereby setting conditions for success in future operations.

CENTRAL IDEA

To keep the military edge and prevail in future operations, NATO forces must continually evolve, adapt, and innovate and be *credible, networked, aware, agile, and resilient.*

5. Military Implications are intended to inform Alliance Transformation, including the development of policies, long-term requirements, and capabilities. These Military Implications fall in the main ability areas of Prepare; Project; Engage; Sustain; Consult, Command, and Control (C3); Protect; and Inform. The application of new technologies will drive most of the changes within these areas. Enhanced C3, a mission-command approach, and improved situational awareness could allow NATO to outpace the decision cycle of any potential adversary. Forces should become more precise, where required more lethal, and able to create cross-domain effects, with an increased emphasis on cyberspace and space in the future. Innovation is crucial to keeping the military edge, therefore personnel must adopt a mind-set that encourages learning, development of new ideas, and change. Militaries should put significant effort into the development of their human capital, especially leader development. Overall, forces must be able to work with partners and deliver effects to accomplish the core tasks across the full range of Instability Situations.

6. FFAO 2018 does not predict the future, but indicates what forces might need to be and to do. Although uncertainty remains, what is certain is that if NATO does not look to the future, it will never be ready for it. As forces accomplish the missions of today, they must remain vigilant to the many difficult challenges, threats, and opportunities that lay ahead. Building a force for the future will not be an easy task, as things worth doing rarely are. NATO's strength lays in its cohesion; if its forces want to keep the military edge and prevail in future operations, together as an Alliance, they will need to continually evolve, adapt and innovate and be credible, networked, aware, agile and resilient.

INTRODUCTION

BACKGROUND

7. As described in the 1949 Washington Treaty, the fundamental and enduring purpose of NATO is to safeguard the freedom and security of all its members by political and military means.[1] The shared political will of the Alliance directs the military instrument of power. North Atlantic Council (NAC) political guidance establishes the overarching Strategic Concept, Level of Ambition, and political-military objectives.[2] NATO military forces execute the three core tasks (collective defence, crisis management, and cooperative security) and a 360-degree approach through strong deterrence and defence, projecting stability (which includes the fight against terrorism), and dialogue with partners as well as potential adversaries. Military commanders develop strategic and operational concepts of operation, objectives, and effects for their forces.

8. The Long-Term Military Transformation (LTMT) programme is the Allied Command Transformation (ACT) process for anticipating and preparing for the ambiguous, complex and rapidly changing future security environment. The first component is the Strategic Foresight Analysis (SFA). The second component is this Framework for Future Alliance Operations (FFAO). The LTMT programme informs political guidance, decisions, and actions that are required to prepare the Alliance for the security challenges of the future.

AIM

9. As a part of Warfare Development, this document provides best military advice that identifies characteristics and abilities of forces that need to be available to the Alliance to retain the military edge, address the challenges, and seize the opportunities of the future.

SCOPE

10. Using the SFA report as its foundation, the FFAO recommends abilities that NATO forces should develop through 2035 and beyond. The Strategic Commands[3] completed the first edition of this document in 2015. The Military Committee (MC) concluded that the FFAO can be used to inform the NATO Defence Planning Process (NDPP) and expand it into the long-term. The MC also concluded that the Strategic Commanders should develop the next iterations of the SFA and the FFAO

[1] NATO, *The North Atlantic Treaty 1949*, (22 May 2017).
[2] NATO, *Strategic Concept 2010*, as approved at the Lisbon Summit.
[3] Allied Command Operations (ACO) and Allied Command Transformation (ACT) are the two Strategic Commands.

in time to inform the subsequent cycles of the NDPP. The North Atlantic Council noted these conclusions on 20 November 2015.[4]

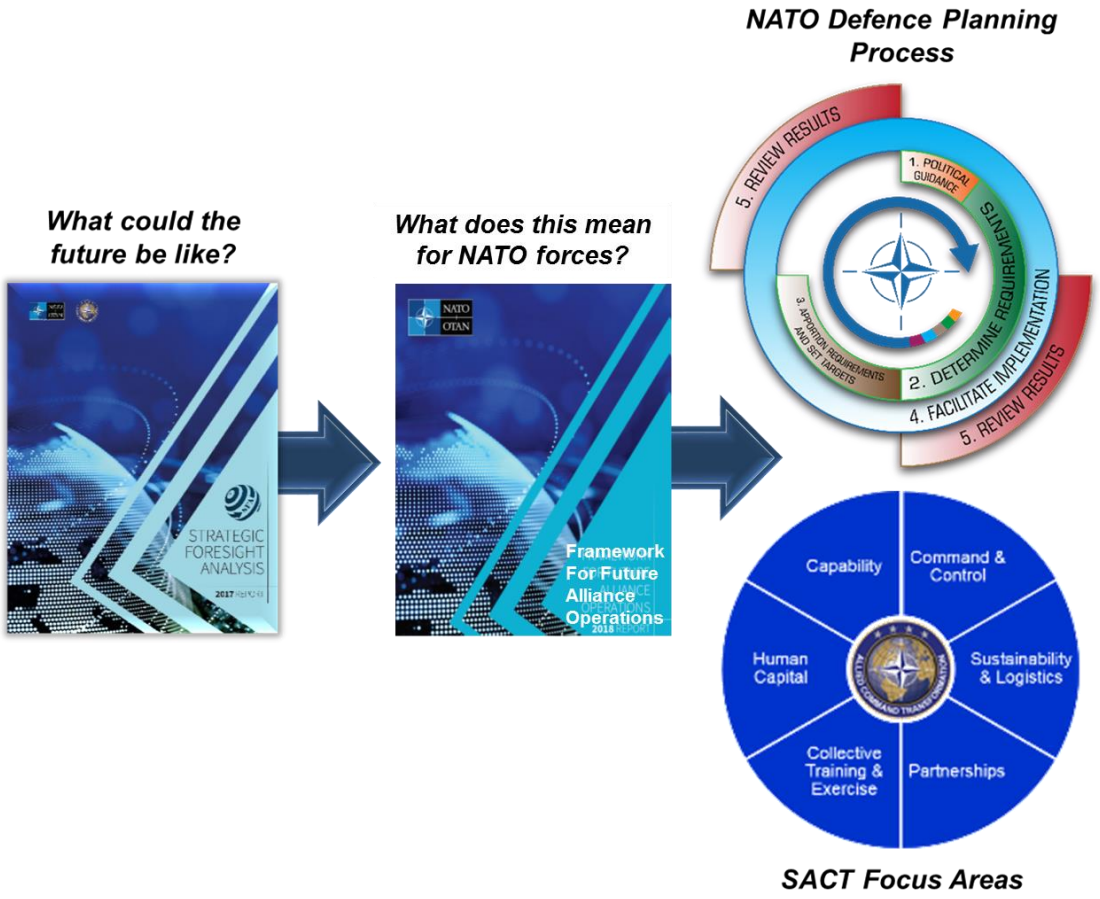

Figure 1, ACT Long-Term Military Transformation Process

11. This document represents an analysis and assessment based on joint professional military judgement and is unique because it bridges issues from the strategic to the tactical level and results in defined military implications for capability development. It is neither an intelligence estimate, nor an approved NATO policy. The intended audience is primarily decision makers, defence planners, and staff within NATO, its Nations, and Partners Nations. However, as this document is publicly disclosed and widely distributed to stimulate discussion and debate, a wide variety of stakeholders may find it useful. This includes academia, industry, think tanks, researchers, and the public. This document is unique in that it brings together ideas from 29 NATO Nations and partners, and provides a vision of the future.

[4] MCM 0199-2015, *Military Committee Advice on the Utilization of the Framework for Future Alliance Operations (NU)*; PO(2015)0624 North Atlantic Council Notation (NU).

12. The FFAO describes what NATO forces need in terms of future abilities.[5] Abilities are defined as critical attributes needed to achieve success in the execution of a future military activity. Abilities describe what NATO should be able to accomplish to cover the full range of the Alliance military missions and to guarantee NATO military effectiveness and freedom of action. In this context, abilities are not intended to restrain formal capability development processes. This document does not prioritize the abilities NATO forces will need, as prioritization is part of a classified process. Due to the nature of forecasting, it will be necessary to continually review, revise and challenge the conclusions herein as events of the future unfold.

13. This document can be used to inform both NATO and its member Nations in:

a. political discussion and policy development;

b. the assessment of the future operating environment and security situation;

c. the development of national security and strategy documents;

d. capability and concept development;

e. defence planning and scenario development;

f. education, training, exercises and evaluation.

14. This cycle of the LTMT programme is oriented on 2035. This date is outside of the current procurement cycle, yet not so far in the future that conclusions become implausible or unrealistic. This document is designed to complement, rather than compete with, other products developed by NATO and countries.

KEY ASSUMPTIONS

15. The team that helped develop this document assumed that NATO foundational documents would remain unchanged, including the core tasks described in the Strategic Concept. The team also assumed that the SFA, and other references used in development of the FFAO, are valid indicators of the future.

METHOD

16. ACT developed this document in concert with Allied Command Operations (ACO). The project used a qualitative, focus-group methodology that brought together military and civilian subject matter experts through a series of workshops, independent reviews, and experimentation (e.g., Urbanization, Protection of Civilians experiments). From 2016 to 2018, the programme of work included four workshops:

[5] See *Annex F.*

one in Switzerland focused on gap analysis; one in Poland focused on Chapter 1; one in Italy focused on Chapter 2; and one in Norway focused on Chapter 3. Each workshop averaged around 100 subject matter experts from the NATO Command and Force Structure, NATO Nations and Partner Nations, NATO Centres of Excellence and Agencies, European Union (EU), non-governmental organizations, academia and think tanks, industry, and other stakeholders.

17. The process began with the development of the Future Security Environment and Instability Situations derived from the trends and defence and security implications described in the SFA 2017 report.[6] These Instability Situations provided the basis for Strategic Military Perspectives, and Military Implications. None was prioritized; prioritization is under the remit of the NDPP.

18. ACT circulated each chapter through representatives of all NATO Nations and appropriate NATO bodies and included their input and recommendations. Additionally, the document was reviewed through an independent concept test within ACT. Finally, the document underwent a line-by-line review by the Strategic Commands prior to final signature.

CHANGES FROM FFAO 2015

19. The FFAO 2015 was a first-of-its-kind document within the Alliance. In a short period, it grew in importance and served to inform discussions concerning the future. As such, in the revision of this document, the overall intent was to retain the best parts of the previous version while applying lessons learned, clarifying key concepts, filling known gaps, and covering new topics.[7]

20. Specifically, Chapter 1 was modified to include a description of the enduring nature of war, changes to the character of conflict, legal and ethical questions, and opportunities of the future. In Chapter 2, changes were made to the Strategic Military Perspectives to reflect current thinking. Additionally, this chapter now includes a “Central Idea” and “Enabling elements”. Major revisions to Chapter 3 included the addition of main ability areas, an operational construct, and the refinement of detailed abilities statements.

21. This round of FFAO development included the results of experimentation in some key areas and expanded work with Science and Technology Organization (STO). Therefore, annexes were added to detail key projects that contribute to the findings, clearly define terms and concepts, and add needed depth, breadth, and context to the topics discussed in the base document. Where applicable, the main document references these annexes.

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[6] See *Annex A – Summary of SFA 2017 Report*.
[7] NATO-ACT, *FFAO Lucerne Conference Report 2016*.

CHAPTER 1 - THE FUTURE SECURITY ENVIRONMENT

"CHALLENGES AND OPPORTUNITIES"

INTRODUCTION

22. This chapter provides a current assessment of the Future Security Environment. This environment is the composite of global conditions that may be of importance to NATO military operations in the future. The chapter describes potential future challenges and opportunities, with special focus on the Instability Situations that could cause NATO to employ forces in the future.[8]

23. The SFA describes the Future Security Environment as dynamic, ambiguous, and uncertain. The world is transforming in multiple, yet connected, areas at an exponential rate. The convergence of several political, social, technological, economic, and environmental trends is redefining the global security context. Driven mostly by rapid changes in technology, the world is more interconnected. As people communicate more than ever before, the events and decisions in one region influence the lives of others across the rest of the world. Ageing populations, with their attendant health and pension costs, are gradually straining social welfare systems. Military budgets may be stressed by mounting public debt in both developed and developing economies. The global power shift continues toward multi-polarity. While informational and economic globalization is intensifying, disinformation, polarization, nationalist reactions and anti-globalization sentiments are also growing. Additionally, the effects of climate change are more evident and pervasive than ever before. As these developments increase uncertainty and complexity, they present challenges to the capacity of individual states to manage a mounting set of interconnected problems.[9]

FUTURE CHALLENGES

War and Armed Conflict

24. In the study of war and armed conflict, there are some factors that change over time and others that remain the same. By its nature, war has always been a contest of wills driven by fear, honour and interest.[10] In the traditional definition of war, three key factors interact: (1) primordial violence, hatred, and enmity; (2) the play of chance, fog, and friction; and (3) its use for political purposes.[11] War also occurs within a larger social, political and economic context based on the interplay

[8] NATO-ACT, *FFAO Bydgoszcz, Poland Conference Report 2017*. Please note that the entirety of this chapter was developed using the outcomes of this report unless specified otherwise with notation.
[9] NATO-ACT, *Strategic Foresight Analysis, 2017*, See *Annex A*.
[10] Thucydides, *History of the Peloponnesian War*.
[11] Carl von Clausewitz, *On War* (Princeton; Princeton University Press, 1984).

and balance of the government, people and the military. This will likely remain valid in the future, however, as evidenced by current threats involving non-state actors, the character of armed conflict changes over time. Factors such as technological advances, new concepts of operation (e.g., global strike, hybrid, and cyberspace operations) and shifts in the geopolitical landscape will greatly influence the Future Security Environment.[12]

25. Since its founding, NATO has seen many shifts in the character of armed conflict. Although it is impossible to predict with absolute certainty what the future will be like, analysis indicates that future armed conflict may be characterized by:

a. an increased likelihood of peer or near-peer adversaries;

b. radical, ideologically motivated adversaries who are global in scope and employ an indirect approach;

c. a greater role of super-empowered individuals and non-state actors that produce hard to predict effects;

d. adversaries targeting civilian populations, institutions, and critical infrastructure;

e. an increased overlap between security issues and criminal activity;

f. a compression of the traditional levels of war where strategic, operational, and tactical decision making processes become blurred;

g. an increased connection between events overseas and the homeland;

h. more interconnectivity across the recognized domains of warfare (air, land, sea, cyberspace), as well as space[13] and the information environment (e.g., social media);

i. more difficulty ending a conflict with a decisive battle, prolonging conflict;[14]

j. small units fighting over greater distances;

k. operations in the cyberspace domain, global commons (areas outside jurisdiction of any one nation), densely populated, and subterranean areas;[15]

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[12] Colin Gray, "War – Continuity in Change, and Change in Continuity", *Parameters*. Implications. *See Annex D – Technology Implications.*

[13] As of 2014 Wales Summit Declaration, space is currently not a separate domain recognized, however, NATO nations have different opinions on this and further discussion is appropriate as changes unfold in the Future Security Environment.

[14] Also known as "generational conflict".

l. rapidly emerging technologies that are widely accessible;[16]

m. the use of human enhancement and a rising importance of the human-machine interface;

n. the use of automated and potentially autonomous systems and operations in which humans are not directly involved in the decision cycle;

o. new classes of weapons that can cause widespread destruction or have a widespread effect;[17]

p. a greater number of sensors and the proliferation of the Internet of Things;

q. an expanded access to knowledge, including the ability to conduct large-scale advanced data analytics to gain a military advantage;

r. weaponised information activities intended to influence populations alone or in support of armed conflict.

Instability Situations

26. Instability Situations are defined as generic descriptions of possible future events of critical significance that could reach the threshold requiring the Alliance to use military forces.[18] Instability Situations could occur in isolation but are not mutually exclusive and could occur at the same time, resulting in a compounded effect, or hyper-instability. Analysis indicates there is a wide-range of Instability Situations in the future, including but not limited to:

a. **Weapons of Mass Destruction (WMD) Proliferation/Threat/Use**: Hostile state and non-state actors may seek access to, threaten, or use WMD.[19] This could include the use of Chemical, Biological, Radiological, or Nuclear (CBRN) weapons and in the future, new classes of weapons of mass effect based on emerging technologies and/or easier delivery methods (e.g., swarming, electro-magnetic pulse, tailored biological, nano-weapons).[20]

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[15] See *Annex D – Summary of Urbanization Study*; See OECD Definition of Global Commons.
[16] This could occur in many areas including cyberspace, autonomous systems, robotics, hypersonic weapons, digital data, artificial/sentient intelligence, communication, surveillance, and electronic warfare; See *Annex B – Technology Implications*.
[17] This could include hypersonic, electro-magnetic pulse, tailored biological weapons, nano-technology, See *Annex D – Technology Implications*.
[18] Instability is a state of likely change and not all instability will result in an Alliance decision to employ military forces.
[19] The weapons will like be targeted on areas of vital interest to NATO.
[20] See *Annex B – Technology Implications.*

b. **Conventional War:** Two or more states may engage in war using conventional forces and weapons that primarily target each other's military.[21]

c. **Threat Escalation:** Hostile state actors may use threats or force increasingly over time that destabilise the security environment. This could take the form of increased forward presence, exercises, capability demonstrations, or strategic communication messages. This could provoke responses leading to a strategic miscalculation or increasing the likelihood of a wider conflict.[22]

d. **Hybrid War:** Hostile state actors may use a combination of conventional and unconventional means whilst avoiding accountability for their actions. One of the major characteristics of hybrid war is the leveraging of all instruments of power while limiting the conflict below the threshold of conventional war, thus complicating the timely and effective use of rigid collective defence mechanisms. Hybrid warfare can involve the use of proxies, lawfare,[23] and information warfare with the goal of creating ambiguity and uncertainty.

e. **Irregular War:** A violent struggle between state and non-state actors for legitimacy and influence over the relevant population(s) may occur**.** This could include activities conducted through or with underground, auxiliary, or guerrilla forces to enable a resistance movement or insurgency to coerce, disrupt, or overthrow a government.[24] In these types of conflicts, actors could use information warfare and violence in an attempt to influence the population.

f. **Terrorism:** In an attempt to achieve political, religious or ideological objectives, organizations and non-state actors - some with state-like aspirations - may resort to unlawful use, or threatened use, of force and violence at an increased scale, scope, or duration. Adversaries may use (cyber-) terrorism to create fear in an attempt to coerce or intimidate governments or societies and to gain control over the population. Hostile states may continue to use proxies that employ terrorism to further their own interests.[25] [26] [27] Additionally, a growing overlap between terrorism and organized crime could result in new and different types of instability.

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[21] David Barno and Nora Bensahel, "The Irrelevance of Traditional Warfare?" *War On the Rocks.*
[22] *ICRC, Violence and the Use of Force.*
[23] *See glossary.*
[24] NATO, *AAP-6.*
[25] Melissa Clarke, "Globally, Terrorism is on the Rise*;* Institute for Economics and Peace."
[26] NATO, *AAP-6*
[27] Global Terrorism Index 2015, November 2015

g. **Global Commons Disruption:** Hostile actors may use force to challenge international laws and norms in the global commons.[28] Hostile actors could disrupt space or cyberspace activities by kinetic or non-kinetic means, such as direct attack, jamming, or cyberattacks.[29]

h. **Critical Infrastructure Attack:** Hostile actors could attack key nodes essential to the enduring interests of the Alliance (e.g. energy facilities, ports, undersea cables, internet infrastructure) in an attempt to disrupt vital societal functions and global stability.[30] This could include an attack to deny the use of the electromagnetic spectrum, position navigation and timing, radar, and other key systems. Such attacks can occur as cyberattacks.

i. **Information Warfare:** Hostile actors could deliver messages, themes, and narratives to shape the perception of populations and decision makers and lead them towards choosing a certain course of action. There are various channels that hostile actors can employ (e.g., cyberspace, social media, print, television, radio) to achieve their political-military objectives. There are also different categories of information (i.e., false, half-true, true) commonly used to propagate a storyline.

j. **Cyberattack:** Hostile actors may conduct activities in cyberspace to cause harm by compromising communication, information, or other electronic systems, or the information that is stored, processed, or transmitted in these systems. To reach the level of an Instability Situation, the attack should be of significant scale, scope, or duration to disrupt, deny, degrade, modify, steal, or destroy information resulting in a large-scale physical, emotional or financial impact.

k. **Governance Challenges:** Governments may fail to provide administration and basic functions, which could threaten internal and external security and destabilise the wider security environment. This could be exacerbated by economic instability, either accidental or deliberately induced by a hostile third party. Furthermore, ungoverned spaces may exist where there is no legitimate rule of law. This could result in a security vacuum, thereby increasing the chance of armed conflict, and resulting in fragile, failing, or failed states. This opens an opportunity that criminal organizations and non-state actors may exploit, thus creating more instability.

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[28] See OECD Definition of Global Commons.
[29] Lee Billings, “War in Space May Be Closer than Ever,” *Scientific American.*
[30] Sarah Kuranda, “Experts: Recent Critical Infrastructure Attacks a Sign of Major Security Challenges Coming in 2016.”

l. **Endangerment of Civilian Populations:** Hostile actors, including criminal organizations, may conduct large-scale acts of violence directed against civilian populations, especially in urban environments. These events could include mob violence, post-conflict revenge, insurgency, predatory violence, communal conflict, sexual and gender-based violence, government repression, ethnic cleansing, destruction of cultural property and genocide.[31]

m. **Mass Migration:** Due to economic issues, social inequality, armed conflicts, population growth (or demographic pressure) and environmental degradation, more areas may reach tipping points triggering increased migration. The size of migrant groups and their rate of movement may increase, thus stressing efforts to control migration. Additionally, future migration and population flows could contribute to the emergence of governance challenges. This may result in increased internal tension between government and immigrants or between different subnational groups. Mass migration may be used as an opportunity by hostile actors to destabilize the security environment.[32]

n. **Pandemic Disease:** There exists the possibility of an outbreak of a disease over a wide geographic area affecting an exceptionally large proportion of the population that exceeds national civil response capacity.[33]

o. **Natural/Man-made Disaster:** A sudden large-scale man-made or natural event could result in serious damage, widespread death, and injury that exceeds national civil response capacity. Concurrent small-scale disasters may have an effect similar to that of a large-scale disaster. Climate change will likely increase the frequency and impact of natural disasters.[34]

Legal and Ethical Challenges

27. Numerous novel legal and ethical questions should be discussed today so that forces are prepared for future challenges.[35] How does NATO apply the existing Law of Armed Conflict (LOAC) and other legal and ethical constraints given advances in technology and the rapidly changing character of conflict across the

[31] Stian Kjeksrud, Alexander Beadle, and Petter Lindqvist, *Protecting Civilians from Violence.* NATO Policy for the Protection of Civilians.
[32] Jean-Pierre Lehmann, *Refugees and Migrants: Europe's Past History and Future Challenges*.
[33] Regina Parker, "Prevent Disease to Prevent War," *The Strategy Bridge.*
[34] Peter Baxter, "Catastrophes – Natural and Manmade Disasters," *Conflict and Catastrophe Medicine.*
[35] St. Anne's College, *Human Enhancement and the Law Regulating for the Future*, The Royal Academy of Engineering, *Autonomous Systems: Social, Legal and Ethical Issues*systems-report; Phillip W. Gray, *Weaponized Non-Combatants: A Moral Conundrum of Future Asymmetrical Warfare*,; ICRC, *What limits does the law of war impose on cyberspace attacks?*,

potential Instability Situations, understanding that adversaries may not apply the same rules?[36] Some of the specific questions include the following:

a. **Human Augmentation/Enhancement:** How does human augmentation/ enhancement, including new genetic technologies, align with National and NATO core values? What are the implications of fighting adversaries that use advanced human augmentation/enhancement techniques?

b. **Autonomous Systems and Artificial Intelligence:** How should forces use autonomous systems (including lethal) and leverage artificial intelligence in the future, alone or integrated with traditional systems? What level of autonomous decision-making is NATO willing to accept? How does NATO address adversaries that use lethal autonomous systems?

c. **Information Environment:** How do forces utilise the electromagnetic spectrum? In the cyberspace domain, what constitutes an attack that would warrant a military response? How far should NATO pursue offensive cyberspace operations as an Alliance? How do forces use advanced data analytics and still maintain a balance between personal privacy and the need for timely intelligence? Will data analytics provide legally acceptable targeting information? How do forces accommodate both information security and the need for transparency? How do forces balance freedom of speech with countering extremist messaging? How do forces adapt to loss/compromise of information.[37]

d. **Combatants and Non-Combatants:** The lines between combatants and non-combatants may blur even more than today, particularly in the cyberspace operations. How do forces distinguish combatants from non-combatants in cyberspace operations in the future? What role do forces play when dealing with polarized citizens? How do forces address civilian corporations and private military and security companies supporting military operations? How do forces address situations where non-combatants can become combatants at any moment? How do forces deal with adversaries who continue to exploit traditional safe or neutral zones (e.g., schools, hospitals), including in megacities/urbanized terrain?

[36] LOAC includes principles of humanity, necessity, distinction, and proportionality.
[37] See *Annex B – Technology Implications.*

FUTURE OPPORTUNITIES

Technological Advances

28. Innovation is the adoption of new technologies and new ideas. Innovation and technological changes will offer military advantages to allow NATO forces to maintain the edge. If not capitalized on, NATO forces could lose this advantage to adversaries in the future. Technological advances are likely to be greatest in five broad areas, known as BRINE: (1) Biology, biotechnology and medicine; (2) Robotics, artificial intelligence, new smart weapons and human enhancement; (3) Information and communication technology, surveillance and cognitive science; (4) Nanotechnology and advanced materials; and (5) Energy technology. However, other advances, such as additive manufacturing (3D printing) and hypersonics, could play a role as well. These developments will likely have an impact on organizational structures, culture, and processes. For example, increased automation used properly could result in fewer casualties, and additive manufacturing could increase sustainability and reduce the logistics footprint.

29. Technology advances (e.g., hyper-precision) could optimize effects while minimizing collateral damage and civilian casualties. Increased interconnectivity and interoperability will present an opportunity for forces to improve operational efficiency/tempo, command and control, and decision making processes. Enhanced training, using simulation and augmented reality, could improve the knowledge, skills, and abilities of the force. Technology will change the way people interact which will present opportunities for strategic communication.

Expanding Partnerships

30. Although states will continue to develop new technologies, in many areas the greatest advances will likely come from commercial entities. The degree of civil-military cooperation will vary between nations, but overall, relationships with academia and industry become more critical to maintain the military advantage. This includes sharing information and building trust with traditional and non-traditional entities, such as non-defence industry.

31. Increased interconnectedness and globalization offer military forces new opportunities to build and strengthen relationships of trust.38 Interoperability with partners is key to military success. It is critical in the future to build permanent cooperation with the EU to exploit synergies whilst avoiding duplication and competition. The relationship with the United Nations (UN) will remain key and could be developed further. By taking a proactive stand towards increased partnership and cooperation with other international organizations around the globe (e.g., African

[38] NATO-ACT, *Strategic Foresight Analysis 2015 Update Report*; NATO-ACT, *Strategic Foresight Analysis 2013*. NATO-ACT, *Strategic Foresight Analysis 2017.*

Union or the Association of Southeast Asian Nations), forces could increase their situational awareness, promote regional security, deter conflict, and deescalate conflict situations.

Addressing Instability

32. Because of the likelihood of an increasingly dynamic and dangerous security environment, forces may be required to engage more often to deter, prevent, or help resolve conflicts and improve conditions on the ground. Advances in situational awareness will allow military forces to understand the security environment better and respond more appropriately. Additionally, they may assist non-traditional partners in addressing the root causes of instability. This could provide opportunities to demonstrate the value and legitimacy of NATO to the international community.

Influencing the Human Environment

33. Because operations will more likely occur in densely populated areas and against adversaries that hide within civilian populations, future forces may have more interaction with people.[39] Therefore, what they do or fail to do will have a greater impact on human reactions. Properly cultivated and applied, a warfighting mind-set balanced with a humanistic mind-set could improve how the forces act within the civilian context. If they can influence population and the human aspects of conflict in the right way, it will strengthen NATO legitimacy both domestically and abroad.[40]

SUMMARY

34. Overall, the Future Security Environment through 2035 and beyond will be dynamic and ambiguous, as well as increasingly complex and uncertain. This future will present NATO with a range of challenges and opportunities. Taking into account the anticipated characteristics of conflict in the future, a series of Instability Situations are described, each of which could result in an Alliance decision to employ forces. These Instability Situations range from high-end conflict to natural disaster and are used in the FFAO as lenses through which to analyse and assess what characteristics (Chapter 2) and abilities (Chapter 3) are required in the future. In addition, study of the Future Security Environment, especially in areas of artificial intelligence, autonomy and human augmentation/enhancement, raises novel legal and ethical questions that need consideration today so that forces can still apply the law of armed conflict in new contexts. However, along with the challenges and questions, there are also opportunities that NATO could seize in the future and it should be prepared to do so.

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[39] See *Annex C – Summary of Urbanization Study.*
[40] *U.S. Joint Concept for Human Aspects of Military Operations,* (April 10, 2017); NATO *BI-SC Directive, 040-001 Integrating UNSCR 1325 and Gender Perspective into the NATO Command Structure*, 16 May 2017.

CHAPTER 2 - STRATEGIC MILITARY PERSPECTIVES

"WHAT FORCES NEED TO BE"

INTRODUCTION

35. As described in Chapter 1, some aspects of today's security environment will endure, whilst others will signifigantly change. This chapter will provide an assessment of the implications of the future security environment based on analysis and professional military judgement. Conceptually, this chapter helps bridge today and the future, by describing the Central Idea of the FFAO, Strategic Military Perspectives, and Enabling Elements. The Strategic Military Perspectives represent best military advice detailing what NATO forces need to be in order to execute the three core tasks, address Instability Situations, and seize opportunities in the future.[41]

CENTRAL IDEA

36. As the Alliance continues to maintain its cohesion – its centre of gravity,[42] military forces must develop characteristics and abilities to execute the core tasks to address Instability Situations in the security environment through 2035 and beyond. To remain fit-for-purpose, the Strategic Commanders recommend that the central idea that guides transformation is as follows:

To keep the *military edge* and *prevail in future operations*, NATO forces must continually *evolve, adapt, and innovate* and *be credible, networked, aware, agile, and resilient.*

37. If forces can keep the military edge, NATO will have the advantage over potential adversaries. Keeping the edge means NATO has to be proactive and have the best human capital, technology, education, and training. Prevailing in future operations means that forces are able to accomplish their assigned missions and affect the will of the adversary through a combination of interdomain effects. Through critical thinking, continual evolution, adaptation and innovation, they will learn and grow to conduct future operations more efficiently and effectively. To achieve the central idea, forces will need to be credible, networked, aware, agile, and resilient.

[41] NATO-ACT, *FFAO Rome Conference Report 2017*. Please note that the entirety of this chapter was developed using the outcomes of this report unless specified otherwise with notation.
[42] See *Annex C – Cohesion Perspectives Project.*

STRATEGIC MILITARY PERSPECTIVES

Credible

38. NATO forces are credible when internal and external stakeholders recognize leaders, units, and equipment as possessing the ability to effectively deter and defend against threats from any direction. The credibility of NATO as an Alliance is an essential component to prevent conflict and accomplish the mission. NATO requires credibility at all levels (strategic, operational and tactical) and across all of the core tasks. How potential adversaries perceive political will, cohesion, professionalism, capabilities, readiness, and lethality may determine their course of action. Credibility changes over time and is influenced by many factors, including force quantity, quality, integrity, how well they can achieve dominance/superiority across the domains, and if they can achieve assigned objectives.

39. Fundamentally, credibility depends on the usability, which maximises the freedom of action for NATO political leaders and military commanders within the authorities delegated to them. NATO requires the entire NATO Command and Force Structure to develop and demonstrate capability, preparedness, and readiness. Forces can achieve this through realistic and challenging joint training, education, and exercises across all levels, which develop interoperability and human capital to their fullest. To underpin credibility, NATO must uphold the norms of international law and communicate this clearly and unequivocally to the international community. Furthermore, NATO has to use robust strategic communication, matching what they say with what they do and using actions to communicate the political will of the Alliance. Finally, if an armed conflict occurs, forces must have a high-level of readiness and effectiveness (up to the use of lethal force) in order to produce timely operational results on the battlefield and mitigate risks where possible.

40. The credibility of NATO is underpinned by nuclear deterrence. Credible nuclear deterrence is key to countering future threats, such as the use of WMD. NATO should maintain a robust nuclear capability, strong and swift decision-making processes, and clearly communicate its political will to potential adversaries. NATO forces will need to understand the full implications of WMD use and be prepared to manage consequences rapidly in order to swiftly and decisively restore stability.

Networked

41. Networking is the interaction of the NATO Command Structure, NATO Force Structure, and NATO Nations with each other, Partners Nations and external actors, drawing on each other’s abilities. This is enabled by common principles and standards that contribute to interoperability. NATO forces can network to gain operational efficiencies, including improved operational tempo and command and control. Networking helps NATO act in concert with a variety of state and non-state actors to address future security threats holistically. Networking suggests cooperative, persuasive, persistent and proactive engagement with organizations

and actors, both inside and outside of the Alliance, enabling forces to anticipate crises as well as leverage a wide-range of capabilities. NATO could collaborate with non-defence industry, which could help NATO identify best practices, reduce risk, and increase capacity.

42. Networking helps to create greater credibility, communication, awareness, and agility, and improves resilience by sharing resources. At the appropriate level, forces should establish relationships with a range of partners who could work together to achieve mutual objectives. NATO and these partners may provide complementary support to maximise effectiveness and efficiency. Although Alliance interests will not always be in complete alignment with partners' interests, forces may consider enabling or facilitating partner activities or operations by using assets to coordinate and assist to achieve a common goal.

Aware

43. Awareness means developing a comprehensive, shared understanding of the operational environment, the adversaries, and their actions to enable accurate and timely decision-making. By increasing awareness and developing a shared assessment of current and future challenges and opportunities, the Alliance can improve timely synchronization, plan more effectively, and increase cohesion. Especially, Hybrid warfare methods require the Alliance to gain a broad knowledge and understanding of a wide range of criteria that might fuel a potential crisis or conflict. By identifying the first signals of an emerging threat, the Alliance may help prevent strategic surprise and support timely decision-making. This could enable NATO to act earlier and more appropriately at all levels.

44. In the future, data will increasingly become a strategic resource. Using technology for the collection and processing/analysing of large quantities of information, and the dissemination of the products in a comprehensible and easy to use fashion, will be key to awareness. In addition, forces will have to focus on producing all-source actionable intelligence by enhancing human intelligence collection and human network analysis. Information fusion will be vital to allow leaders to make timely and relevant decisions, exploit possibilities, and address threats at an early stage. Understanding the environment and associated cultures should enable forces to make better-informed decisions concerning military options.

Agile

45. Forces have agility if they can effectively respond to dynamic and complex operational challenges as well as seize opportunities with appropriate and timely actions. NATO may continue to fight highly adaptive adversaries, equipped with a mix of low-tech and advanced technology, that use novel, and ever-changing methods to achieve their aims. To respond appropriately, future forces may need to be multi-purpose by design, capable of conducting many types of operations. They

will need as few operational caveats as possible if they are to maximise utility and agility.

46. Agility also involves organizational structures, processes, and ways of thinking. Adjusting to a complex Future Security Environment may require changes to the recruitment and training of human capital. Forces should demonstrate creativity and mental flexibility in developing solutions to highly dynamic and interrelated problems. Agility also requires timely decision-making by political and military leaders. Use of mission-command leadership allows decentralised, flexible decision-making within the overall commander's intent and enables a manoeuvrist approach. Agility includes the ability of leaders to understand and address increasingly complex questions that may arise with new technologies or methods, including new moral and ethical dilemmas. A robust lessons-learned process leads to continual improvement and is a part of agility. Agility helps focus defence planning on the development of flexible forces and allows creative leaders to be comfortable in situations that are characterized by ambiguity, complexity, and rapid change.

47. Radical, ideologically motivated hostile actors (including terrorists) will employ long-term, indirect approaches to affect NATO populations. Forces should seek to disrupt this strategy by sharing real-time intelligence, denying access to WMD, and supporting disruption of networks and safe havens. Therefore, NATO forces will require great agility to support the fight against terrorism within Projecting Stability efforts while continuing to fulfil the traditional deterrence and defence role.

Resilient

48. A resilient force has sufficient capability, capacity, and will to endure adversity over time, retain the ability to respond, and to recover quickly from strategic shocks or operational setbacks. Many future Instability Situations are global in scope and may demand increased resilience from Alliance forces and the societies and systems they defend. Resilience encompasses many factors including structures, systems, and processes, as well as leadership, motivation, determination, and training.

49. Resilience requires assured access to the global commons and control of lines of communication. In all circumstances, forces must possess the ability to sustain themselves. If necessary, they may be required to coordinate sustainment for local populations. Here, pre-aligned coordination measures between civilian and military authorities are needed. The Alliance may also need to provide decentralised sustainment to all echelons of its dispersed military units by expanding support networks, local contracting, on-site manufacturing, and host nation support. Forces also need robust communications infrastructure to collect, process, and disseminate information throughout a crisis despite potential interruptions.

ENABLING ELEMENTS

50. In addition to the characteristics described above, future forces will need key enabling elements to accomplish the core tasks and address instability in any security environment. One such enabling element is strong and sustained public and political support, which should manifest as forward-looking policies, legitimacy, proper authorisations, robust legal frameworks, strong leadership, and timely decision-making. Another element is national civil preparedness, which if improved, will serve to make the Alliance even more resilient and increase the military potential that a nation could apply elsewhere. Additionally, NATO forces require timely and effective defence/security investments and Defence Planning aligned with the Level of Ambition and leveraging new concepts and technology.[43]

SUMMARY

51. This chapter describes the Strategic Commanders' best military advice to guide transformation and allow forces to adress challenges and seize opportunities of the future. It introduces the Central Idea: *to keep the military edge and prevail in future operations, NATO forces must continually evolve, adapt, and innovate and be credible, networked, aware, agile, and resilient.* These characteristics should guide force development in the future. Finally, the chapter recognizes that there are external enabling elements crucial to success in the future, but outside the direct control of the military structure. NATO leaders will need to inform and advise key stakeholders within Nations to ensure that necessary enabling elements are in place, thereby setting the conditions for success in future operations.

[43] See *Annex B – Technology Implications.*

CHAPTER 3 - MILITARY IMPLICATIONS

"WHAT FORCES NEED TO DO"

INTRODUCTION

52. This chapter provides military-specific deductions, expressed as abilities, that NATO forces should have to accomplish the core tasks in the future. The Military Implications were derived from analysis of the Instability Situations and Strategic Military Perspectives. Where Chapter 2 detailed what forces need to be, Military Implications are specific ability statements of what forces need to do. This chapter also describes an operational framework for future operations.

53. Military Implications are best military advice intended to inform Alliance transformation, including policy development, long-term requirements, and capability development. Simply put, Military Implications are factors that planners need to take into account during detailed long-term planning and decision-making. Although strongly recommended, Military Implications are neither defined requirements, nor are they expressed as required capabilities.

54. In some areas, abilities needed today will remain important to the future force and will endure whilst evolving. Other abilities will come from the need to adapt to threats and the changing character of armed conflict. Finally, some abilities will come from innovative ideas or technology developments that are potential game-changers.

55. These Military Implications are written in a format aligned with the NATO Capability Hierarchy to support defence planning.[44] The NATO Capability Hierarchy describes the Main Capability Areas of Prepare, Project, Engage, Protect, Sustain, Inform and Consultation, Command and Control (C3). Analysis of the Instability Situations indicates that these areas will endure and, therefore, this document mirrors this approach with its description of Main Ability Areas. These areas provide an interconnected network of abilities that allows forces to perform the core tasks and address Instability Situations as needed (see figure 2).

[44] NATO-ACT, *NATO CAPABILITY HIERARCHY.*

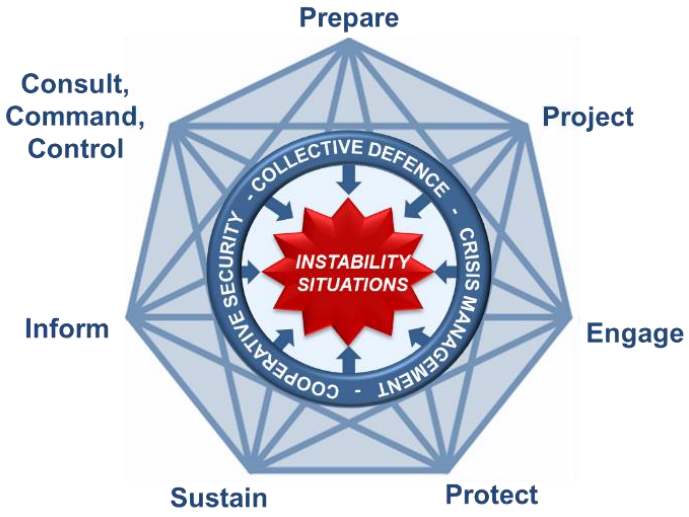

Figure 2, Main Ability Areas

56. In general, NATO military operational activities fall into the Main Ability Areas across a theoretical curve of military intervention (see figure 3).[45] This diagram is only representational and not all operations in the future will necessarily follow this construct. Some Main Ability Areas endure throughout all stages where others occur only in some stages based on the overall intent.

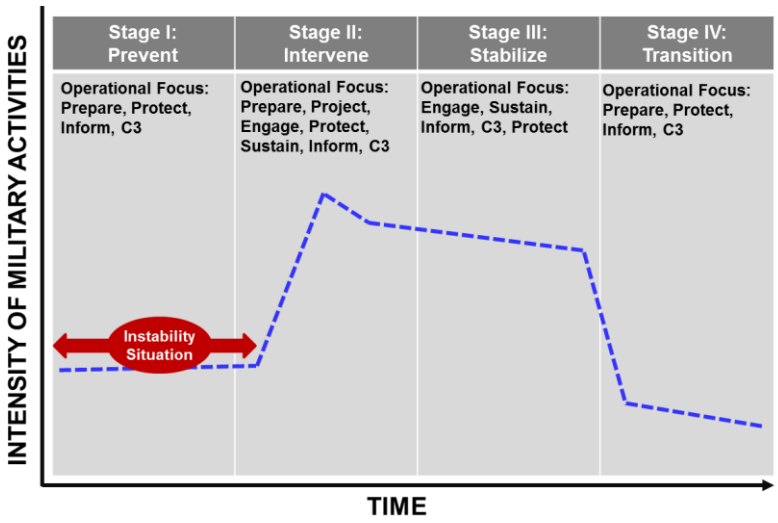

Figure 3, A Theoretical Curve of Military Intervention

[45] This is a conceptual description, some stages my overlap based on the operational contexts of the future, some activities may occur cross-stages; NATO-ACT, *FFAO Stavanger Conference Report 2017*.

57. The primary goal of prevention is to keep Instability Situations from arising and prevent escalation by a combination of diplomatic, informational, military, economic, financial, intelligence, and law enforcement activities. However, if an Instability Situation does arise, forces need to be prepared, trained, and ready to deal with a wide array of challenges and to protect themselves from hostile action. In this stage, it is important to inform key stakeholders to improve awareness, increase resilience, and establish and maintain robust command and control structures. NATO should use consultation mechanisms to maximize trust and cohesion as part of a comprehensive approach along with the other instruments of power.

58. In the intervention stage, forces must respond at the appropriate time to achieve the political-military objectives and desired end-state. This means that they must have the ability to project and engage across all domains, achieve mission goals, as well as protect themselves and civilians. Forces must be able to sustain operations over the long term. During this stage, it is important that strategic communication precedes action and mission command is used to maximize initiative within the commander's intent. As the force achieves its military objectives, there is an opportunity to begin to influence wider issues. The political-military actions that NATO takes or fails to take during this window of opportunity may affect the security situation for years to come. Military commanders must continue to provide advice with the aim of receiving clear political guidance so that they can adapt to conditions on the ground in an increasingly complex future.

59. During stabilization, military forces may gradually return to a prevention role whilst the root causes of the instability are addressed socially and politically. They must have the ability to engage across all domains, sustain themselves, support select non-military efforts, and communicate with key stakeholders to improve capability and capacity. Due to the character of conflict in the future, forces may find themselves in this stage for a long period of time. As appropriate, the next stage is transition which includes redeployment and transfer of authority to other appropriate actors. Due to the complex and dynamic nature of the future, these stages may not be sequential and lines between them may become blurred as operations unfold.

60. Throughout all stages, forces will need to maintain robust command and control structures as well as protect themselves and the civilian population. Over time, the focus returns to prevention and maintaining stability. It is important to note that not all activities that NATO will undertake fall within an operational construct, however clear guidance, detailed planning, and adequate assessments are still needed to generate and employ capabilities.

FUTURE ABILITIES

Prepare

61. Preparation is the ability to establish and sustain sufficient and effective presence at the right time, keeping sufficient flexibility to adapt to possible changes

in the security environment. Preparation takes a significant investment of time and resources, but leads to credibility as a major factor in deterring hostile actors. Preparation is closely related with readiness and responsiveness. Readiness ensures forces are available for the full range of potential missions. Readiness is about having the right capabilities and being trained, interoperable, and deployable. Forces must be maintained in the right operational structures and groupings and at an appropriate notice to move. Responsiveness is about having the right posture, including having the right units, in the right place, at the right time to be able to respond in a timely, appropriate, and credible manner.

62. To prepare for future operations, forces will require proper education, realistic training and exercises; and must train as they intend to fight. This includes simulation, experimentation and testing of new systems, concepts and Tactics, Techniques, and Procedures (TTPs). Preparation should range from training basic military skills to large-scale, high-intensity combined/joint operations against a conventional opponent capable of operating across the entire spectrum. [46] Within this range fall mission-specific exercises and training needed to address various Instability Situations and enable units to reach the desired readiness level. This should include the ability to operate independently in degraded operating environments. Forces could integrate emerging technologies into their training and exercises with a mix of realistic live, virtual, and constructive simulations to improve effects, whilst reducing cost and environmental impact. Finally, to retain the edge, they will need the ability to integrate lessons learned and best practices into preparation.

62. Forces should be able to make creative use of human capital. Because of increased globalization, they should improve their ability to understand cultural differences including language, religion, history, and habits. This may require the ability to integrate additional assets (e.g., reservists) and to draw on national expertise such as governance, healthcare, law enforcement, education, and other specializations. [47] Due to changing demographics, recruitment efforts will face increasing challenges, but automation and artificial intelligence may offer new solutions. NATO forces will require the ability to monitor and exploit innovations in human physical and mental enhancement. This also includes the ability to identify human augmentation applications and risks, including overreliance on technology and to explore impacts of human augmentation on the organization and individuals.[48]

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[46] In the future this might include hybrid, irregular warfare, cyber, anti-access/area denial (A2/AD) in all domains, nuclear, radiological, biological, and chemical, dense urban areas, artificial intelligence, and autonomous systems environment, and counter-lawfare (see glossary).
[47] Includes support through reach-back.
[48] See *Annex B – Technology Implications.*

63. Forces will require the ability to develop leaders with greater (geo-) political, cultural, technological, informational, and social awareness in order to better identify and mitigate risk while capitalising on opportunities. Specifically, this will be important in the areas of autonomy, robotics, artifical intelligence, advanced data analytics, cyberspace, and space systems. Forces will also require the ability to foster a culture of awareness to keep pace with and exploit technological advances. Personnel will need to understand technology and how to integrate it into operations through new concepts, doctrine, and legal frameworks.

64. Within the area of capability development falls military acquisitions and procurement, which should be based on a shared understanding of future trends and an assessment of the implications for millitary forces. NATO will require the ability to coordinate closely with Member Nations to ensure assigned forces are properly equipped, interoperable, and have the necessary capabilities to perform all required tasks. The definition of requirements and development of agile acquistion processes will be critical to capability development and maintaining the technological edge of the Alliance.

65. Within this area also fall the development and inclusion of best practices or innovative ideas into military activities. Forces will need the ability to process and use huge amounts of data and improve a lessons learned network, connecting tactical through strategic levels, to collect, proccess, and share TTPs and best practices. In addition, they will need to maintain or improve interoperability by using common standards and aligning concepts, doctrine, TTPs, and best practices. This also should include the ability to conduct near real-time analysis of NATO operations and lessons learned and the ability to conduct experiments that include new challenges and opportunities (such as artificial intelligence, human augmentation, autonomous systems, cyberspace, hybrid, and space warfare).

66. Cooperation with many types of partners as part of a comprehensive approach to military operations will become increasingly important in the future. This means that NATO will need the ability to be interoperable with Partner Nations and able to operate with international organizations and others.[49] Therefore, forces must strengthen their ability to develop collaborative planning, training, exercises, education, and standardization through functional and regional approaches. This includes the ability to maintain and/or establish formal NATO Partnerships as well as the ability to engage ad hoc partners through regular dialogue, including non-defence industry.

67. Forces must have the ability to operate and maintain installations and facilities. Additionally, they must have the ability to provide strategic assessment,

[49] This includes both governmental and non-governmental organizations.

manage enterprise information and knowledge, as well as direct programme, budget, and finance matters. NATO will require scalable and modular units/organizations that offer maximum agility, flexibility, diversity, and efficiency at the appropriate level of readiness and with a minimum of operational caveats.

Project

68. Project is the ability to conduct strategic (re) deployment and Reception, Staging, Onward movement and Integration (RSOI) in support of Alliance operations and missions. Project ensures the relevant units are in the right place at the right time to accomplish political-military objectives.

69. In the future, forces will need to have the ability to assemble, prepare, move to loading points, and embark at designated points. Even during Instability Situations, NATO must be able to mobilise and mount joint forces globally. In the future, NATO needs to maintain assured access to land, sea, air, and space (including the ability to launch) as a pre-requisite to mounting. Additionally, activities in the cyberspace domain and the information environment will set the conditions to project forces.

70. NATO will need the ability to move troops or equipment over strategic distances to a place or position at the right time to conduct operations. Consequently, NATO joint forces must be able to deploy, sustain, and redeploy where and when needed. Equally important will be the need to guarantee access to sufficient strategic lift. Additionally, it will be necessary to rapidly deploy advanced units and liaison capabilities in order to project timely physical presence and prepare the ground for follow on operations. Finally, forces may need to leverage civilian expertise, including critical enablers and civilian crisis response teams, to facilitate and enhance NATO deployment/redeployment.

71. The Alliance will need to plan and provide RSOI-facilities (in concert with host nations) to support the timely transition of deployment, including personnel, equipment, and materials. Forces should also work with Member Nations, Partner Nations, and non-NATO entities to provide robust and flexible reception and staging.

72. Future forces will need to maintain or establish a sufficient network of enabling infrastructure, bases, logistics, and other support facilities on NATO territory. In addition, there will be a need for expeditionary bases, ports, and airfields in remote and/or contested locations. They will also need to have the ability to rapidly repair ports and airfields, and return them to an operational status.

Engage

73. Engage can be described as performing the tasks that contribute directly to the achievement of mission goals, including all abilities required to defeat adversaries. Engage is important because it is the fundamental value-adding

function of a military force. The ability to engage is fundamental to the credibility of deterrence.

74. To accomplish the core tasks in the future, forces will need to be able to manoeuvre jointly to gain advantage over an adversary, maintain access to the global commons and conduct the full range of operations. This includes the ability to counter and defeat a conventional adversary through large-scale and high-intensity operations. Also, the ability to affect the adversary on day one and gain and maintain superiority or dominance accross domains is critical. The overall aim is to create a cross-domain effect on the adversary.

75. Forces must be mobile and able to operate across all domains and in many different types of environments (e.g., arctic, virtual, space, littoral, megacities, subterranean).[50] In the same way, they should be able to conduct geographically dispersed operations across large areas. This includes the ability to quickly employ discreet units with small-footprints in uncertain or contested environments. Furthermore, they will need to conduct operations with enhanced manoeuvrability including all necessary enablers and supporting elements.

76. To remain flexible, forces must be able to operate in a wide-range of contexts (within host-nations, with traditional and non-traditional partners,[51] or in stand-alone military operations). They will need the ability to engage in the full spectrum of cyberspace operations in order to maintain freedom of action and influence, including new and emerging areas. Finally, this includes a broad array of theatre entry options including forcible entry in an area of potential instability and the ability to gain lodgements where necessary.

77. Forces must manage the efficient application of joint effects to deny, degrade, or destroy adversary formations, facilities, and infrastructure throughout the operational area, thus enabling decisive manoeuvre whilst avoiding collateral effects.

78. Joint Effects require the ability to maintain and use a broad range of conventional capabilities while taking advantage of new technologies. This could be realized by considering the holistic requirements of conducting Joint Targeting, which includes trained and qualified personnel, robust intelligence, as well as interoperable Communications and Information Systems (CIS) and targeting software within NATO and the Nations. Forces must be adequately trained and qualified to perform the entire targeting cycle process and have the supporting intelligence to perform target system and target audience analysis. Investment in CIS that allows close cooperation and information sharing will enhance NATO ability to conduct targeting. An emphasis should be placed on using extremely precise, discriminatory systems to

[50] See *Annex C – Summary of Urbanization Study.*
[51] This could include partners in the future such as private companies.

deliver effects, including at long range, and in a communications degraded environment. Where possible, forces should continue to field standardized munitions that can be employed from different national platforms and systems. To work within financial constraints, Nations should develop lower cost-per-kill weapons (e.g., directed energy).

79. There are certain concerns for the future. Units will likely seek to create effects in mega-cities or densely-populated areas which pose a challenge as targeting must be performed with minimum possible collateral damage. They must find the right balance between given tasks and rules of engagement to accurately deliver effects at the proper time and place. Forces should have the ability to conduct counter irregular and hybrid warfare campaigns, potentially over long-durations, in forward deployed, austere environments.

80. Forces must maintain a robust, networked targeting ability to leverage persistent, discriminatory sensors in order to enable enhanced intelligence estimates as a move toward hyper-precision. The Alliance should acquire and employ scalable, multi-role weapons that can be both lethal or non-lethal depending on the situation. To demonstrate transparency where necessary, and to support follow-on actions, precise and timely battle damage assessments is required. NATO forces should maintain freedom of action in the electromagnetic (EM) spectrum, and have advanced EM protection, EM support, and EM attack abilties. They should innovate and invest in new technologies to improve engagement capabilities as well as exploit remotely-controlled, automated, and potentially, autonomous systems.

81. Due to the increasing ability of hostile actors to influence populations, forces need the ability to detect and characterize threats accurately, and counter with non-lethal effects. They must better use all available channels to counter hostile actors and coordinate timely joint effects through joint targeting. To this end, they will need to integrate and synchronize information activities to create effects on perceptions, and shape opinions and decision making. Additionally, they should work with other actors to provide the military contribution towards a comprehensive approach, promoting internationally-accepted norms (e.g., gender related, building integrity). [52] Some Instability Situations, including pandemic and mass migration, may require forces to employ innovative methods in order to support wider international objectives and priorities.

[52] NATO/EAPC Po*licy for the Implementation of UNSCR 1325 on Women, Peace and Security and Related Resolutions* (PO(2014)0253) and the NATO/EAPC *Action Plan for the Implementation of UNSCR1325 and Related Resolutions* (EAPC(C)D(2014)0019).

Sustain

82. Overall, sustainment is the comprehensive provision of personnel, logistics, material, medical, and general military engineering support required to maintain combat power throughout all phases of the operation. Sustainment remains important to future operations because it encompasses a broad spectrum of activities that forces need for success in every core task.

83. Overall, forces must have adequate military engineering support to enable operations to gain and maintain freedom of movement and support force protection. Military engineering must be able to work in a multi-disciplinary fashion to support military and civil critical infrastructure (re-) construction operations such as humanitarian relief and support to civil authorities. Additionally, in the future, forces should have the ability to maintain extensive interoperability and integrate with civilian contractors to complement organic military engineering capacity.

84. In the future, networked military forces should have the ability to operate with small multi-capable units in a distributed or logistically autonomous manner. This could be enabled by autonomous systems, additive manufacturing, artificial intelligence, and other emerging technologies. This includes the ability to develop and use more modular and flexible logistics structures with common stock systems and procedures. Also, forces should have the ability to conduct operations from forward areas with limited logistic support and reduced host-nation support. Therefore, they should be able to use sea-based logistics during operations to increase agility and resilience, and manage prioritization of logistic resources.

85. Forces should have the ability to identify and use a network of military and non-military partners to help sustain multi-domain operations with scalable maintenance. Within the framework of Building Integrity, the use local/regional commercial vendors, third-party maintenance and automated health monitoring of equipment in the future (e.g., digital twinning) is required. Here, protection of sensitive data will become increasingly important. Three areas with game-changing potential are the use of additive manufacturing, autonomous repair, and remote expert support. Finally, forces should retain self-reliance on National support whilst remaining agile enough to pool resources.

86. In the future, forces should minimize logistics footprints ensuring uninterrupted logistic support, and where necessary, create backup sustainment systems. This includes the ability to improve sustainment and logistics, leveraging technologies and autonomous systems and, where necessary, balancing the length of logistics chains against operational risk. It also includes the ability to establish, maintain, and use dispersed logistics hubs and the ability to contract local sustainment or use host nation support. Forces should make use of appropriate logistics techniques to reduce, exploit, and convert waste to increase self-sustainment and reduce environmental impact. To capitalise on some of the foreseen future opportunities,

forces should have the ability to reduce unnecessary redundancy and streamline sustainment by leveraging advanced technologies (e.g. advanced data analytics/artificial intelligence/in-theatre manufacturing/3D printing, block chain technology, digital twinning). This also includes the ability to leverage energy efficiency technology.

87. In the future, dispersed operations will require assured access to ground, air, and maritime transportation assets to support in-theatre sustainment and movement. New technologies, such as driverless vechicles, autonomous delivery, better fuel efficiency, and manned-unmanned teaming may change the way this is done. This includes the ability for NATO to coordinate and manage movement and transport with both military and civilian assets while mitigating risks to resilience.

88. In the future, forces will continue to require the ability to implement medical standards/best practices, adopt new technologies, and explore innovative ideas through training and preparation. They will require the ability to improve all aspects of human resilience, including mental health and survivability, so that individuals are able to retain flexibility and cope with the physical and cognitive stressors of the Future Security Environment. In addition, they will require the ability to assist in delivery of effective and efficient care in remote, austere, and degraded environments by managing medical information and employing new technologies (e.g., wearable sensors, personalised medicine, augmented cognition, smart textiles, human-machine critical care teams, and automated surgery). Finally, to provide for the timely evacuation and treatment of casualties and to minimise preventable deaths, forces will require the ability to innovate medical systems (e.g., new training/technology, telemedicine, artificial intelligence, nanotechnology/synthetic biology).

89. Forces may be required to cooperate with other agencies when Instability Situations have a health-related impact. This will require the ability for early detection of infectious diseases via health surveillance systems, and the ability to share health surveillance information with host nations, international organizations, and non-governmental organizations (medical intelligence). The need to assist local medical healthcare systems, sustain force health protection, and operate in an area affected by an epidemic or CBRN situation may become important. Finally, forces may need the ability to take and provide rapid countermeasures (e.g., use of personal protective equipment, decontamination, medication, vaccination, quarantine, and water and food security and hygienic measures).

Protect

90. Protection is minimizing the vulnerability of personnel, materiel, infrastructure and facilities, information and cyberspace, lines of communication and lines of supply, and activities to any threat and in all situations, whilst ensuring the Allies' freedom of action and contributing to mission success. Because of the nature of future threats, NATO must apply a 360-degree approach. Protect also requires a multi-dimensional approach – from the strategic to the tactical level, against the full spectrum of threats, both at home and abroad.

91. To allow mission success, NATO must be able to protect its centre of gravity – the cohesion of the Alliance – and retain the political will to operate.[53] Future missions will continue to require close cooperation with partners and forces must be able to protect and sustain the relationships with these partners. In addition, some future Instability Situations may overwhelm local authorities and may exceed the capacity of civilian response and thus threaten mission success. Forces should be able to assist local authorities in protecting critical civilian infrastructure and key services including governance, health, emergency, security/law enforcement, finance, transportation, power, communications, utilities, and food production.

92. In the future, the global commons and Alliance lines of communication could be increasingly contested by hostile actors and competitors. Therefore, the proliferation of anti-access technology and the congestion of the global commons will create significant challenges for Alliance power projection and sustainment. Forces will need the ability to retain assured access to the global commons and continued use of its lines of communication. They also need to create and protect a permissive environment for operations despite anti-access and area denial (A2/AD) methods.

93. Force protection and base defence will continue to be vital to the success of expeditionary operations. Due to an increasing terrorist threat, force protection may also become more relevant at home. Consequently, forces will need the ability to establish superior force protection measures, physical security, and access control to minimise risk to own troops, military equipment and capabilities (including strategic reserves). Forces must be able to avoid, minimise, and mitigate negative effects of operations on civilians, and protect them from conflict-related violence.

94. For their projection, engagement, and sustainment, forces will need the ability to protect critical military and civilian infrastructure, logistic facilities, vital networks, natural resources and essential lines of communication. They should also be able to assist local authorities and operate in a manner that seeks to preserve civilian property that is culturally and historically important (e.g., national monuments and icons).

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[53] See Annex C.

95. In the information age, the availability of accurate and reliable information from trusted sources is essential for both civilians and the military. As a consequence, NATO will need the ability to validate its own information and to protect it from manipulation. Also, forces will need the ability to protect the EM environment to allow the guaranteed use of it and to detect, investigate, and defend against all forms of EM attack. Similarly, they will need the ability to protect the cyberspace environment and to detect, investigate, and defend against all forms of cyberattack. This includes the protection of command and control systems and tools used in the decision-making process. As the cyberspace domain continues to evolve, NATO may be required to take a more active role (e.g., protection of critical infrastructure and services, safeguarding data) to minimize impact on civilian populations.

96. The usage and/or proliferation of WMD requires the ability to counter the threat and protect the force. This includes the possible development of yet unknown WME (e.g., electromagnetic pulse, nano, custom biological) which may become available to hostile state and non-state actors.[54] Forces should develop new countermeasures and training to counter new classes of WMD/E as technology evolves. Forensic methods, technical exploitation, and other internationally recognized attribution methods should be used to identify the threat and assist political decision-making and inform appropriate responses. In particular, the ability to address the re-emerging threat of nuclear weapons, offensive CBR programmes, and hostile acts in cyberspace and space is of growing importance.

97. Forces must have the ability to protect themselves from extreme environmental conditions, address health and safety issues, and minimise their environmental impact.

98. The future will likely bring a wide range of new threats coming from emerging technology or from new, creative, and innovative tactics, techniques, procedures, capabilities, or doctrine. Without incurring the cost of research and development, hostile actors can capitalise on technological advancements and translate them into capabilities that threaten the Alliance. Examples of areas where technology could revolutionise warfare are sub-surface and subterranean operations, swarm techniques, space based weapons, directed energy, autonomous systems and sensors, quantum computing, unmanned systems, electromagnetically launched projectiles, renewable energy, artificial intelligence, additive manufacturing/3D printing, biotechnology and nanotechnology. Forces must be able to identify, monitor and understand these new threats, and develop protective measures.

[54] Including CBRN material and accidental release or deliberate misuse of toxic materials.

Consult, Command, and Control (C3)

99. C3 is the comprehensive system that allows NATO commanders to exercise authority over and direct assigned and attached units in the accomplishment of the mission. C3 is the backbone of all military operations, it adds to relative military strength, and helps commanders make the most out of their people, information, materiel, and time. How well this functions depends on human factors, such as strong leadership, timely decision-making, and relationships built on trust. In the future, the strategic, operational, and tactical levels will remain relevant, but will be more integrated and interconnected. Forces need the ability to accelerate and persistently synchronize the Observe, Orient, Decide and Act (OODA) loop of each level to out-pace the adversary and improve the coherence of long-term strategy with day-to-day operations. In the right context, centralised planning and de-centralised execution gives commanders the freedom of action to execute the mission and find innovative solutions in extreme and dynamic environments. From the tactical leader to the strategic commander, command will remain both art and science.[55] The science of command will be reinforced by new opportunities offered by the advent of disruptive technologies and development of a better understanding of an increasingly interconnected world. The art of command will remain the main challenge, therefore, Nations must invest in human capital and develop innovative leaders as the main factor.

100. Overall, future C3 requires the Alliance to possess resilient, adaptable and interoperable C3 systems. Due to the complex and dynamic future battlefield, commanders will increasingly need to exercise authority and give direction using a mission-command philosophy to enable disciplined initiative within the commander's intent. Forces will also need the ability to observe, orientate, decide, and act across all domains to conduct fully integrated operations using a comprehensive approach to achieve the desired effect.

101. In the future, forces will need the ability to integrate C3 in a rapid manner. They will also need to leverage advanced data analytics to develop operational and environmental situation awareness to assist leaders in their decision-making processes. This also includes the ability to understand complex problems rapidly in support of the planning process, course of action development, and risk assessment. Furthermore, the development of attribution, joint targeting, and engagement lists must occur at a pace that will allow commanders to quickly engage targets (e.g., time-sensitive targeting). This system must be robust, reliable, secure, and include the following attributes real time battle assessment, automatic back up, stand-alone capability, automatic reconstitution following degradation, mobility to allow the commander to move on the battlefield, reach-back, and an ability to integrate with

[55] Carl von Clausewitz, *On War* (Princeton; Princeton University Press, 1984).

partners and other key stakeholders. Here, the volume of data involved will likely require the use of analysis tools that may include artificial intelligence.

102. This area includes the ability of C3 systems to support mission command style decision-making and assist leaders in achieving clarity concerning complex problems, including the use of automated analysis and artificial intelligence. These tools should have an increased ability to synchronize the different stages of the OODA loop quickly to improve responsiveness. To help political-military decision-making, these tools also need to allow military forces to connect and interact with the political level and allow for the delivery of best military advice quickly and concisely through consultation. Hence, leaders at all levels need to gain a comprehensive understanding of the operational environment (including culture, ethnicity, religion and other considerations such as diplomatic, information, and economic issues). These tools should include human-artificial intelligence teaming, war-gaming, modelling, simulation, and behavioural studies, big-data analysis, amongst others.

103. Forces will need C3 systems to provide robust awareness and a 360-degree, 24-7 operational picture, across all domains. This may include interfacing with non-military organizations such as local governments, non-governmental organizations, and business enterprises. In the future, dominance in the EM spectrum and access to robust and secure communications systems across all domains is required. Additionally, forces need to possess sufficient bandwidth to allow for uninterrupted information flow between the tactical, operational, and strategic levels of command. This includes the ability to use civilian communications networks and systems. They also need to be able to operate in communication degraded or denied environments by adapting procedures. Because of the many advances expected in technology in the period of 2035 and beyond, personnel will need the ability to understand, acquire, and make use of the most advanced communications technology to maintain a military advantage (e.g., blockchain) whilst maintaining interoperability. To accomplish dispersed operations over long-distances, military forces will need assured global communications to facilitate real-time reach-back and enable the chain of command to execute C3.

Inform

104. Inform is establishing and maintaining the situational awareness and level of knowledge required to allow commanders at all levels to make timely, informed, and responsive decisions. Inform is important because it helps build a shared understanding and it affects all other Military Implications. Informing includes the ability to access, store, classify, disseminate, and filter information. Informing occurs both in peace time and during conflict or crisis.

105. In order to enhance mission success, NATO will need to refine its collection methods by leveraging technology and improving its ability to obtain timely information via Joint Intelligence, Surveillance, and Reconnaissance (JISR). To

counter adversaries' advances in stealth, camouflage, concealment, and deception techniques (especially in cyberspace, urban, and subterranean environments), use of a wide variety of sources will help meet information requirements.[56] NATO will need the human capital to collect and integrate information from many traditional and non-traditional sources (e.g., national, commercial, human, open-source, social media, and others) which will greatly improve detection of influence activities, especially in the early stages of development.

106. To develop a common operational picture in the future requires awareness of friendly and adversary cyberspace capabilities and vulnerabilities. Forces must have the ability to develop and execute a cyber-intelligence collection plan to gain situational awareness of the cyberspace environment. In cyberspace, NATO must define its areas of interest, monitor and detect attacks and espionage. State-of-the-art monitoring systems would better enable NATO to conduct cyberspace forensics to rapidly detect anomalies and attribute actions to their sources.

107. In the future, NATO should invest in the ability to use automated processes to collect data. It should also improve the ability to use cost effective technology including autonomous and disposable assets, remote sensors, and intelligence networks to enable early warning. These investments in collection systems would enhance the ability to cultivate all possible sources of information, including human. NATO should develop the ability to pull information from the Internet of Things to a level not currently practiced. NATO may need to support and influence the development of new agreements, legal frameworks, policies, and principles to adapt to new technology.

108. Forces need to receive, convert, and fuse data and information from all available sources into relevant and usable intelligence/knowledge, decision-support and situational awareness products. They should increase the rate at which they process information by using advanced technological methods, including artificial intelligence, virtual reality, modelling, advanced data analytics, and simulation to enhance the comprehensive preparation of the operational environment. The result of processing should be to develop a common operational picture that spans from strategic-level situational awareness down to tactical-level attribution and targeting. Where applicable, forces could collaborate with partners to improve its data processing capabilites.

109. Forces need the ability to distribute timely information and intelligence in an appropriate and accessible form, across and between networks. They also need the ability to convey information and intelligence that has been obtained from other actors (e.g., law enforcement agencies) in a timely manner to those who need it.

[56] See *Annex B – Summary of Urbanization Study.*

Forces will need to better customize products as needed, including visualization for individual users, including the use of new technologies (e.g., Internet of Things).

110. NATO should take a collaborative approach to intelligence sharing that may include common databases, network knowledge, forensics and biometrics in order to better detect threats. Building a repository of shareable information could assist forces in their ability to exploit multi-intelligence sources (e.g., national, commercial, private, and other origins) using advanced data analytics and artificial intelligence. This will allow NATO indicators and warning systems to better identify the early phases of a crisis, enable timely decision-making, and share intelligence across domains at the strategic, operational, and tactical levels. Furthermore, this includes the ability to leverage regional experts to support intelligence collection, liaison, education, and training at all times, including via reach-back.

SUMMARY

111. Military Implications are best military advice intended to inform Alliance Transformation, including the development of policies, long-term requirements, and capabilities. Military Implications are not defined requirements, nor are they expressed as required capabilities. The Alliance may take into account these long-term abilities during defence planning. In the future, the main abilities NATO may require fall into the areas of Prepare, Project, Engage, Sustain, C3, Protect, and Inform.

112. The application of new technologies will drive most of the changes for NATO. A mission-command approach and improved situational awareness could allow NATO to outpace the decision cycle of any potential adversary. They must become more precise, lethal, and able to work across domains, with an increased emphasis on cyberspace and space in the future. Innovation is crucial to keeping the military edge, therefore forces must adopt a mindset that enables growth and change. They must put significant effort into the development of their human capital, especially leader development. Overall, forces will need to develop a wide-range of abilities and work in close cooperation with partners to address Instability Situations and be sucessful in future operations.

WAY AHEAD

113. This document is developed in concert with NATO Nations, NATO Partners, Centres of Excellence, and other key stakeholders as of March 2018. The analysis provided within can and will change as events unfold the future. As such, this document provides a baseline for further discussion and debate, informs decision-making, and helps set the conditions for success. Moving forward, the FFAO 2018 will be used to help inform the development of the MC input to the Political Guidance 2019 and all steps of the upcoming cycle of NDPP.

114. In order to maintain a robust community of interest, scan the horizon, and adapt to unforseen changes, the LTMT programme will hold workshops and develop future-oriented products in the upcoming years. This will culminate in the release of future editions of the SFA in 2021 and FFAO in 2022.

ANNEX A TO
FFAO
DATED MAR 18

STRATEGIC FORESIGHT ANALYSIS SUMMARY

THEMES	TRENDS	IMPLICATIONS
POLITICAL	**1. The redistribution of geostrategic power.** The predominance of NATO and the West is likely to be increasingly challenged by emerging and resurgent powers.	**a.** Challenges to the rule-based world order. **b.** Euro-Atlantic relations and Alliance cohesion challenged. **c.** Increased requirement for cooperation with other actors including rising powers.
	2. Use of power politics. The importance of NATO has increased for collective defence of the Euro-Atlantic region as it is the main framework that maintains a robust and an appropriate mix of nuclear and conventional capabilities.	**a.** Increased potential of confrontation and conflict. **b.** Nationalism and divergent risk and threat perception. **c.** Requirement for a robust and credible defence and deterrence
	3. Non-state actor influence in domestic and international affairs. Non-state actors are expected to exert greater influence over national governments and international institutions and their role is likely to expand.	**a.** Growing complexity due to a wide variety of non-state actors. **b.** Requirement for closer cooperation with non-state actors. **c.** Increased role of private actors for security. **d.** Increasing concerns for the Protection of Civilians.
	4. Challenges to governance. Emerging powers are increasingly challenging established global governance institutions and requesting greater roles. Existing governance structures, particularly in weak and failing states, are not sufficiently addressing the requirements of the broader population.	**a.** Duplication of existing global governance structures **b.** Increased requirement for partnership and inclusive governance. **c.** Projecting stability beyond the Euro-Atlantic region.
	5. Public discontent/disaffection and polarization. In western countries, risks such as undermined legitimacy of the government mandate, political impasse and the difficulty of implementing reforms and social polarization are likely to be increased.	**a.** Lack of trust in governments and institutions. **b.** Increasing polarization in the West and developing countries.
HUMAN	**6. Asymmetric demographic change.** The worldwide ageing populations will cause major challenges for some economies and government budgets. Gender inequality will further destabilise demographic change. However, the population in countries with a high fertility rate will remain relatively young, as seen in Africa, thus creating a youth bulge and potential for migration.	**a.** Ageing populations will strain resources. **b.** Youth bulges leading to instability and migration. **c.** Failed integration of migrants.
	7. Increasing urbanization. Urbanization is increasing at different rates globally, with the highest growth rates in the least developed parts of the world thus creating the challenge of providing adequate basic services and a functioning infrastructure to ensure a minimum quality of life for citizens.	**a.** Increasing urbanization might lead to resource competition. **b.** Ownership and control of critical infrastructure could be contested. **c.** Governance challenged by uncontrolled urban growth. **d.** Dependence of littoral urban areas on sea lines of communication. **e.** Increased urbanization may require NATO involvement in urban areas.
	8. Fractured and/or polarised societies. Polarization of societies has become a worldwide phenomenon; however, western developed nations are particularly vulnerable due to increased empowerment of individuals. Polarization can also exist between countries.	**a.** Polarization causes instability and civil war. **b.** Instability along the NATO border causing large-scale migration to Europe. **c.** Fractures in society might undermine trust and legitimacy.
	9. Increasingly connected human networks. Human networks are expected to continue to be increasingly decentralised thereby allowing unforeseeable threats.	**a.** Increasingly decentralised and diverse human networks. **b.** An increasing need to understand human networks. **c.** The need for influencing human networks with effective and precise strategic communication is increasing.

THEMES	TRENDS	IMPLICATIONS
TECHNOLOGY	**10. Rate of technology advance.** The advances in technology and innovation accelerate as they are fuelled by continued exponential increases in supporting computing power and advances in augmented intelligence.	**a.** Rapid development of technology challenges interoperability. **b.** Increasing legal and ethical concerns. **c.** The rate of technical advancement challenges acquisition and life-cycle management processes.
	11. Access to Technology. The ability of individuals, non-state and state actors to access technology has significantly increased.	**a.** Access to technology enables disruptive behaviours. **b.** Uncontrolled access to technology challenges existing frameworks.
	12. Global network development. Global networks will increasingly enable access to and provide information on commodities and capital assets. Global networks will increasingly be used for dissemination of post-truth information.	**a.** The increasing number of sensors, access to data and global networks generates operational vulnerabilities. **b.** Opportunities to exploit the sensors, data, and global networks. **c.** Adversaries will use global networks for dissemination of false or misleading information.
	13. Dominance of the commercial sector in technological development. The advances in defence technology developments/sales and space exploration/exploitation by commercial sectors have taken away the monopoly that used to be held by governments.	**a.** State approaches are not keeping up with the commercial sector. **b.** The Alliance will lose perishable skills that cannot be easily recovered.
	14. Technological dependencies. Both society, and defence and security, have increasingly depended on certain technologies which have become essential in everyday lives.	**a.** Reliance on certain technologies will create vulnerabilities. **b.** Necessity to protect critical civilian infrastructure. **c.** Over expectations from technological solutions.
ECONOMICS	**15. Globalization of financial resources.** An increasingly interconnected global financial system makes it more vulnerable to attacks by both state and non-state actors.	**a.** Erosion of trust in increasingly fragile financial institutions. **b.** Lack of visibility on transactions supporting criminal and terrorist activities. **c.** Growing interdependencies may reduce potential for interstate conflict.
	16. Geopolitical dimension of resources. Emerging technologies and the exploration opportunities availed by climate change may allow the discovery of mineral and energy resources in previously inaccessible and possibly disputed regions such as the High North.	**a.** Natural resources will play an increasing role in power politics. **b.** Resource-driven crises remain a constant. **c.** Climate change has the potential to disrupt traditional areas of food production as well as offer new opportunities.
	17. Increased inequality. The bulk of the world's population, the middle class, particularly in western society has felt the squeeze due to stagnation in real earnings after inflation adjustments, loss of benefits and overall compensation as the private sector has sought to reduce expenses by outsourcing support and labour costs and shift to part time versus full time employment.	**a.** Differences between the 'haves and have-nots' will increase. **b.** Global inequality will drive migration.
	18. Defence expenditures challenges in the West. A majority of NATO Nations were able to change a decreasing defence spending trend into an increase in real terms in 2016. Political and national will would be required to sustain defence expenditures in competing priorities with limited national	**a.** Increased defence spending due to rising regional tensions and fair burden sharing. **b.** Realignment of expectations with national fiscal priorities.
ENVIRONMENT	**19. Environmental/Climate Change.** The changes in climate will bring challenges and opportunities. The changes to the climate impose stresses on current ways of life, on individual's ability to subsist and on governments' abilities to keep pace and provide for the needs of their populations.	**a.** Increased range of activities in the Arctic due to growing accessibility. **b.** Climate and Environmental challenges to governance. **c.** Increased requirements for environmental awareness. **d.** Impacts of climate change adaptation and mitigation
	20. Natural disasters. Natural disasters will have increasing impact, partly due to overall increases in the severity and prevalence of severe weather events, but also due to changes in the regions and times of the year where these events may occur.	**a.** Increased requirement for humanitarian support. **b.** Unavailability of national military assets due to natural disaster. **c.** Increased requirement to improve resilience.

ANNEX B TO
FFAO
DATED MAR 18

TECHNOLOGY IMPLICATIONS

1. The acceleration of technological advances, commercialization and global proliferation has increasingly challenged the technological advantage of the Alliance. Discovering, developing and utilising advanced knowledge and cutting-edge science and technology is fundamental to maintaining the technological edge that has enabled the Alliance to succeed across the full spectrum of operations over the past decades.

2. Recognizing this pressing need to maintain the Alliance's technological edge, the NATO Science & Technology Board requested the NATO Science and Technology Organization (STO) Panels and Group - a network of nearly 5,000 scientists, engineers and analysts - to pursue Technology Watch for the Alliance. The STO Panels and Group have embraced a culture of continually identifying and documenting potentially disruptive science or technology in Technology Watch Cards, which contain assessments of the maturity of the science or technology and offer commentary on how the science or technology may affect the capabilities of the Alliance. An analytic review of the Technology Watch Cards as of December 2016 identified a list of twelve technology areas that are predicted to have a game-changing impact on future Alliance operations and capabilities (Reference: *Public Release Version of AC/323-D(2017)0006, STO Tech Trends Report 2017)*. Advances in these technology areas could provide an advantage or a disadvantage for NATO military forces in the future. The following list defines the areas and gives some generic examples of the impact they may have in the future battlespace:

a. **Additive Manufacturing** - Additive Manufacturing is the process of making a 3D solid object of virtually any shape from a digital model in ways that are impractical to achieve using conventional manufacturing. Military forces could use Additive Manufacturing for rapid prototyping, in situ production and repair of deployed military equipment, precision, custom and unique parts production.

b. **Everywhere Computing** - Everywhere computing is computing that is available anytime and anywhere. It can occur in any device, in any location and in any format, and its content is interoperable regardless of the operating system. Supported by military mobile networks and mission cloud computing Everywhere Computing has the potential to provide real time decision support to the individual soldier at all times and all places.

c. **Predictive Analytics** - Predictive Analytics is the process of generating understanding and providing insight for inference or forecasts of future states from data with volume, velocity, variety or dubious veracity. Huge

amounts of data in the future battlespace means potential for analytics to deliver insight across all warfighting and defence domains, real time decision support, early indicators and warnings of crises and real-time monitoring.

d. **Social Media** - Social Media refers to the wide range of internet-based and mobile interactions where users participate in online-shared exchanges and contribute user-related content or participate in online communities of mutual interest. Its applications in defence and security include population surveillance, sentiment analysis, knowledge and information sharing, low cost means to stay in touch with families and strategic communications.

e. **Unmanned Air Vehicles** - Unmanned Air Vehicles are vehicles that a person may remotely control or may act autonomously depending on the mission. Applications include allowing for access to unreachable areas, persistent surveillance, endurance, robots in support of soldiers, and cheaper, automated logistics deliveries.

f. **Advanced Materials** - Advanced Materials are artificial materials with unique and outstanding properties. Advanced Materials are manufactured using techniques such as nanotechnology or synthetic biology. Uses may include coatings with extreme heat resistance, high strength body or platform armour, stealth technologies, advanced sensors and decontamination, and bulk production of food, fuel and building materials.

g. **Mixed Reality** - Mixed Reality is the merging of real and virtual worlds to produce new environments and visualizations where physical and digital objects coexist and interact in real time. Applications include heads up or head mounted displays for pilots and soldiers for real-time situational awareness, digital cockpits/windows, realistic training environments or providing hands-free job performance aids.

h. **Sensors are Everywhere** - Sensors are Everywhere refers to the ability to detect and track any object or phenomenon from a distance by processing data acquired from high tech, low tech, active and passive sensors as well as background sensors, essentially everything could be a sensor. Applications include universal air picture, underwater sensor nets, social media exploitation, automated logistics planning, autonomous systems and soldier systems.

i. **Artificial Intelligence** - Artificial Intelligence refers to the ability of machines to match humans in terms of learning, reasoning, planning and acting in complex cyber-physical environments. Potential impact includes replacement of human decision makers, autonomous robot or vehicle control, automated information fusion and anomaly detection, psychological operations and intelligent tutoring for a variety of military and support (medical) missions.

j. **Electromagnetic Dominance** - Electromagnetic Dominance is the ability to use more of the spectrum, to share the spectrum more efficiently, to protect own forces' use of the spectrum and to deny enemy use. The future will bring, among other things, faster, more reliable wireless/radio communications, electronic warfare resilience, secure streaming video and smaller deployed footprint.

k. **Hypersonic Vehicles** - A Hypersonic Vehicle can be an aeroplane, missile or spacecraft. Hypersonic Vehicles can move at a speed beyond Mach 5, the same speed regime as a re-entry vehicle or space shuttle experiences as it reaches the lower atmosphere. Potential applications include fast long-range strike of high value or high threat targets, ballistic missile defence and reusable space transport vehicles.

l. **Soldier Systems** - Soldiers Systems refers to the augmentation of individual human abilities using artificial means such as robotic exoskeletons, smart textiles, drugs and seamless man-machine interfaces. Uses include capacity to endure extreme environments, better health monitoring and care provision and decision making at individual level.

3. The above highlights the Technology Trends observed by the NATO STO. It does not provide an exhaustive list of all emerging technologies but focusses on the technologies, which fall under the purview of the NATO STO Panels and Group, and those that are favourable to international collaborative research. Additional technology trends that are highlighted in national defence technology trends reporting but are not included in the list above include (Reference: *Office of the Deputy Assistant Secretary of the Army (Research & Technology), Emerging Science and Technology Trends: 2016-2045 A Synthesis of Leading Forecasts)*:

a. **Energy** - Over the next 30 years, the global demand for energy will likely grow by 35%. The development of methods like fracking and directional drilling has opened vast new reserves of oil and natural gas. At the same time, renewable energy sources such as solar and wind are approaching cost-parity with fossil fuels. In the past two decades, the cost of power produced by solar cells has dropped from nearly $8 per watt of capacity to less than one-tenth of that amount. Nuclear, while still the subject of intense public debate, is continuing to grow, with new reactor designs promising greater safety and less radioactive waste. While adoption of cleaner energy sources would help combat global climate change, new frictions will emerge over access to rare materials used in batteries, solar cells, and other linchpins of the energy revolution. The fading of fossil fuels also carries significant risk of economic and social destabilization presenting new security challenges.

b. **Smart cities** - By 2045, 65-70% of the world's population—approximately 6.4 billion people—will live in cities. As urban populations swell,

the number of megacities with 10 million inhabitants or more will grow, from 28 in 2016 to 41 by 2030. Mass migration to cities will put significant pressure on urban transportation systems, food and water supplies, power and energy infrastructure, sanitation, and public safety. Information and communications (ICT) technology will support the growth of “smart cities” that use data and automation to make urban centres more efficient and sustainable. Distributed sensor systems will monitor water, power usage, and automatically balance distribution via smart grids. Networked traffic systems and autonomous transportation options will ease gridlock. Rooftop solar panels, micro-wind turbines, thermal power, and other renewable energy sources will provide clean, distributed power generation. At the same time, cities that cannot afford to invest in these technologies (or that lack the political will to do so) could turn into congested, dirty, and dangerous flashpoints for instability and conflict.

c. **Food and water technology** - Over the next 30 years, inadequate access to food and fresh water will become a crisis point in many parts of the world. Over farming, drought, and air/water pollution has degraded roughly 25% of current farmland. Under optimistic forecasts, prices for staple grains could rise by 30% over the coming decades—increases of 100% are not out of the question if climate change, demand patterns, and failed resource management continue on current trajectories. By 2045, 3.9 billion people—over 40% of the world’s population—could face water stress. Technology offers many potential solutions to food and water crises. Desalination, micro-irrigation, water reclamation, rainwater harvesting, and other technologies could relieve pressure on fresh water supplies. Genetically modified crops and automation could improve crop yields and allow farmers to produce more nutrition from less land.

d. **Space** - The space industry has entered a period of innovation and progress not seen since the space race of the 1960s. New technologies such as robotics, advanced propulsion systems, lightweight materials, additive manufacturing, and miniaturization are dramatically reducing the cost of putting people and material into space and opening up new possibilities for space exploration. New entrants to the space market, including SpaceX, Arianespace, and Blue Origin, are disrupting the stagnant commercial launch sector and driving innovations such as re-usable launch vehicles. Over the next 30 years, research and development will enable humans to return to the Moon, explore Mars, and start entirely new space-based industries, such as asteroid mining. While the exploration—and potential colonization—of space has long captured our imaginations, a growing dependence on space-based infrastructure could lead to new frictions here on Earth. As more countries come to rely on space-based assets, the control of space could become a significant flash point. The militarization of space is not out of the question, and anti-satellite warfare could have profound effects on the U.S. Army, which

relies heavily on satellites for secure global communications, intelligence gathering, and coordinating joint manoeuvre.

4. Full versions of the two source documents for this Annex are located at:

a. STO Tech Trends Report 2017: http://www.sto.nato.int/

b. US Army Emerging Science & Technology Trends 2016-2045: http://www.defenseinnovationmarketplace.mil/resources/2016_SciTechReport_16June2016.pdf

ANNEX C TO
FFAO
DATED MAR 18

COHESION PERSPECTIVES PROJECT

INTRODUCTION

1. The Framework for Future Alliance Operations (FFAO) defines the abilities required for NATO Forces to accomplish core tasks in the future. Fundamentally, the Alliance should strive to maintain cohesion – its centre of gravity –to achieve the desired political–military objectives. This project sought to identify factors that would affect Alliance cohesion through 2035 and beyond.

2. The FFAO Cohesion Project targeted students and professionals as the next generation of leaders from different backgrounds (e.g,. academia, military, industry) to understand their perspectives on NATO Cohesion. The primary question that guided this research was: *Which factors are likely to affect NATO cohesion through 2035 and beyond?*

3. The study followed a grounded theory methodology and employed both quantitative and qualitative methods, triangulated with the scholarly literature on Alliance cohesion theory. Between March and June 2017, the Cohesion Project gathered data through a series of focus groups, an online survey, and a workshop prepared in cooperation with the ACT-sponsored Innovation Hub. In total, almost one hundred persons participated in either of ways from throughout NATO and Partner Nations.

COHESION FACTORS

4. The findings of this study indicated that NATO cohesion relies on two pillars: trust and reciprocity. This means the ability of NATO Nations to respond as a group and to develop shared interests, values, and common standards and rules. Cohesion is a manifestation of unity, when members stay together despite differences and look beyond self-interests. The ultimate element of cohesion is the willingness to commit and sacrifice for others; an expression of “something bigger than ourselves”.

5. As to the risks, the findings indicated that in terms of probability, NATO will face a weakening of its core values, accompanied by internal threats to its cohesion. The latter will also have the most severe impact on NATO cohesion. Technology and organizational frictions also emerged as primary areas of concern. The findings further indicated the ways in which five major factors could directly affect NATO cohesion in the future:

a. **External Risks.** The lack of common existential threat to sovereignty and diverging threat assessments is the major negative element associated with the external threat theme. Although findings suggested the failure to activate Article 5 in case of attack as a potential risk, non-Article 5 missions could constitute a major test for NATO cohesion. However, many opportunities to improve Alliance cohesion may emerge in the future. NATO

leadership should seek to develop a common understanding of external threats and a holistic common threat picture. Additionally, future humanitarian/non-military operations could improve cohesion by uniting the countries to pursue common goals.

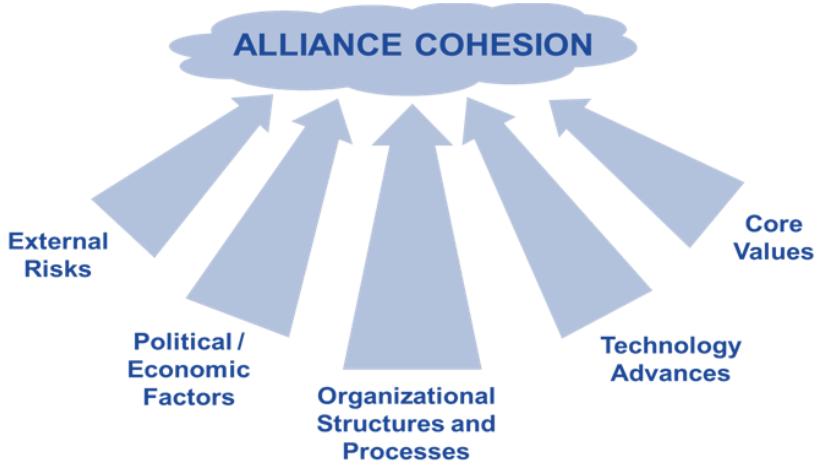

Figure C-1, Cohesion Factors

b. **Political/Economic Factors.** Crisis of political leadership in NATO Nations, together with undermining international institutions and multilateralism, could lead to weakening of the transatlantic bond, disintegration tendencies within the EU, and even withdrawal of a NATO Nation from the Alliance. Additionally, domestic pressures and concerns over sovereignty could supersede the relative value of the good provided by the Alliance and pull limited funds away from NATO. In addition, continued unequal burden sharing could result in larger states lessening their support and will to defend free-riding Nations. However, communication technology tools and the internet, in confluence with the demographic change (generation of millennials), can enhance cohesion by increasing the interconnectedness and interactions between NATO Nation societies to foster solidarity and understanding.

c. **Organizational Structures and Processes.** Bureaucratic politics that hold on to the past could result in slow adaptation of the Alliance to evolving national preferences and interests. Moreover, long decision-making processes and civil-military frictions on both NATO and national levels could negatively affect readiness of the forces and overall operational effectiveness. In addition, cohesion could become more difficult to maintain when members and partners are added over time. However, opportunities do exist. If NATO can transform its organizational structure to be more efficient, flexible, functional, and agile, it would be able to adapt to changing national interests on a day-to-day basis. Additionally, strong leadership in NATO international structures may overcome civil-military frictions. Other opportunities exist in the areas such as increasing the fairness of burden sharing through multinational projects, smart defence, and the shaping of national capability packages.

d. **Technology Advances.** NATO risks losing the innovation game to the private defence industrial sector as in the future, private companies will continue to be ahead of NATO in designing and setting standards for platforms. Additionally, some NATO Nations may be reluctant to share their latest technology, thereby increasing the interoperability gap on the battlefield. However, this factor could favour NATO and presents many opportunities as well. If NATO can develop a well-defined framework to clarify what the countries can do under the NATO flag, it could help address challenges created by the emergence of novel technologies, especially in cyberspace and space. If members share innovation and technology in a networked fashion, it can serve to help the Alliance keep its aggregate technological edge.

e. **Core Values.** The Preamble and Article 2 of the North Atlantic Treaty establish NATO as an Alliance that defends NATO Nations' shared liberal-democratic values. An unknown or unclear purpose of NATO can result in a weakening of public support for the Alliance among NATO Nations and in the disappearence of this shared identity. NATO provides an intangible common good - if the Alliance is successful, "nothing happens". Peace, security, and stability are a non-event and can be easily taken for granted. Additionally, differing perceptions of reality, miscommunication, and disinformation could erode the NATO common identity and shared sense of purpose. Moreover,the uncontrolled growth of populism and radical nationalism, together with a rise of anti-democratic and authoritarian movements, will be a source of friction that could weaken NATO core values. The NATO narrative is extremely important in countering fake news and propaganda that aim to destroy Alliance cohesion and drive wedges in-between members on various issues. Finally, effective strategic communication and public diplomacy targeting NATO Nations should be able to explain the relevance of NATO (how NATO continues to add value), especially to clarify the purpose and the benefits of membership to the less motivated Alliance Nations in terms of reputation, prestige, and legitimacy.

CONCLUSIONS

6. Overall, the purpose of this project was to explore possible future risks to cohesion and to provide NATO and Member Nations with a young-leaders perspective on how to prevent the Alliance cohesion from eroding. Although an absence of external threats to the Alliance is very unlikely, the future risks to cohesion may lie in a lack of mutual understanding of external threats and in priority disagreements among NATO Nations. Even though there was no consensus on the degree to which common values play a role in NATO cohesion, sufficiently aligned interests of NATO Nations, together with a shared purpose of NATO, constitute a definite precondition for a cohesive Alliance.

7. If you have questions or comments concerning this study please contact: SACTSPPSTRTANBranchDistro@act.nato.in

ANNEX D TO
FFAO
DATED MAR 18

URBANIZATION STUDY

INTRODUCTION

1. The UN reports that urban areas world-wide will absorb 3 billion new people in the next generation.[57] Many of these people will go into under-governed, under-resourced and overstretched cities on coastlines. Studies based upon global demographic trends suggest that an increasing percentage of armed conflicts are likely to be fought in urban surroundings. The trends already exist and the continuation of urbanization in the future will only exacerbate the likelihood of NATO involvement in urban operations.

THE FUTURE URBAN ENVIRONMENT

2. The future urban system will be characterized by a high degree of density and complexity expressed through multi-dimensional subsystems. The physical subsystem consists of the complex terrain of an urban settlement, along with the natural environment within and surrounding it.

3. The urban environment has a dense infrastructure, with transport, communications, education, cultural, public safety and utility infrastructure forming a complex matrix of flows, linkages and nodes within a functional subsystem. These enable critical flows of water, fuel, electricity, money, people and goods to sustain the city's function. Distant nodes may have significant influence across the entire city; infrastructure nodes affecting a city may even be located outside the city's boundaries.Functional systems of governance in future urban areas are likely to have their own informal structures. Well-off populations may become independent of the state through internal secession and feral cities may emerge where the rule of law has been replaced by near anarchy and the only security available is attained through brute power.

4. Governance in future urban areas is likely to have its own informal structures. The information subsystem has seen the most significant change since the beginning of the 21st century with the explosion of technology, especially communication technology that increases connectivity within and between cities. This enables rapid exchange of concepts, data, and technology-enabled techniques among urban populations, including criminal and terrorist organizations.

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[57] United Nations Department of Economic and Social Affairs, New York – World Urbanization Prospects dated 2014.

FUTURE THREAT

5. Future threats will incorporate both state and non-state actors, including politically and criminally motivated groups. While many of these threats already exist, future technological developments and the characteristics of future cities will further exacerbate them. Technological advances will enable a proliferation of capabilities such as drones, 3D-manufactured weapons systems, sophisticated IED s and indirect fire weapons. Adversaries can be expected to adopt swarming tactics at the level of individual weapons (swarm weapons) and by applying combat groups that aggregate and disaggregate as needed, massing and dispersing in response to changes in the tactical environment.

6. The city itself, along with its infrastructure and systems, will become a target of enemy action, requiring hardening and protection as well as a degree of specialist knowledge to keep it running. Decoupling humans from weapon systems and increasing electronic connectivity will enable adversaries to disrupt or control larger urban areas with smaller forces.

EMERGING ASPECTS

7. In order to counter the future threat and operate within the future urban environment NATO will need to develop key capabilities, described here within the Joint Functions format of AJP-1:

a. **Command and Control/C3** – a flatter structure enabling rapid allocation of resources to the lowest level; the ability to aggregate and disaggregate forces rapidly; the ability to utilise the urban environment's technology but retain the ability to fight 'unplugged'.

b. **Intelligence** – the management of vast quantities of information; the identification of friend or foe in a densely populated environment; city specific databases built and populated prior to any conflict to include governance structures and key leaders; greater resilience and hardening of ISR assets.

c. **Manoeuvre and Fires** – delegated authority to utilise fires to prosecute opportunities; greater organic ISR capabilities; an understanding of key cultural sensitivities in order to prevent collateral damage to symbolic buildings; three dimensional battlespace management.

d. **Force Protection** – dynamic logistic and headquarters structures in order to reduce known and therefore vulnerable force concentrations; rapidly harden systems against physical, electronic and cyber-attack.

e. **Information Operations** – influence key populations through information operations; operate at the speed of 'social media' to avoid or counter false attribution; withstand cyberspace or electronic attacks.

f. **Sustainment** – avoidance of fixed points of supply; the provision of medical support closer to the site of injury.

g. **Civil Military Cooperation** – an understanding of urban power structures, their leaders and the city management services.

RECOMMENDATIONS FOR NATO FORCES

9. Based on the characteristics of the future urban operating environment, the future threats and the emerging aspects for NATO, the following recommendations have been developed within the DOTMLPFI framework:

a. **Doctrine** - NATO may have to develop an Allied Joint Urban Operations Doctrine that would provide a sufficient level consideration and guidance to the operational commander. This will come into effect only, if the doctrinal gap cannot sufficiently be addressed by inclusion of urban operations specifics into existing doctrine.

b. **Organization** - NATO should: conduct Joint NCS and NFS experiments based on an urban environment, in order to determine the most effective agile organization and force composition; establish an urban operations centre including a specialist intelligence function; continue to maintain relationships with civil authorities to ensure that military operations are integrated into civilian-led contingencies as part of a comprehensive and networked approach; increase the availability and number of stability policing personnel and strengthen the capacity of the already existing military police capabilities.

c. **Training** - NATO training exercises should; replicate the intellectual, physical, psychological and emotional challenges posed by urban operations; include higher levels of civil-military interaction and the integration of external stakeholders. A full training needs analysis should be conducted to include aspects of urban operations, as well as major urban exercises included in the NATO MTEP in 2019.

d. **Material** - The following specific capabilities/technologies should be considered in the development of the NDPP Minimum Capability Requirements (MCR):

- Persistent Deployable C3
- Information Domain Superiority
- Persistent Autonomous Sustainment from the Air
- Persistent Autonomous Air ISR

- Vertical lift and Rooftop Landing System
- Electronic Warfare superiority
- Delegated authority for Strategic and Tactical Messaging
- Cyberspace fires – lethal and non-lethal to deny an adversary freedom of manoeuvre
- Protection against kinetic fires and improvised explosive devices in urban environment
- Effective information management systems
- Effective underground operations
- Technologies to enable military operations among dense civilian populations, including when civilians are manipulated by the enemy
- Enhanced capability, trained animals

e. **Leadership** - Training for future leaders at all levels should include: practical training in how to work with and develop relationships with city officials in order to integrate into the urban and urban littoral system; operate independently in a dispersed manner.

f. **Personnel** - NATO will require: policing-like skills for activities such as crowd control and curfew enforcement but also skills to enable interaction with the civilian population, including local authorities; skills and knowledge to understand and effectively use the new types of sophisticated technologies; a review of national military selection and training practices for those who may deploy to an urban area.

g. **Facilities** - A joint training facility is required to simulate the complexities of the urban and urban littoral environment.

h. **Interoperability** - NATO will need to be interoperable at all levels and additionally its forces should be able to coordinate with coastal constabulary, commerce policing, safety enforcement, patrolling, customs enforcement, raiding, and secure critical infrastructure.

CONCLUSION

10. The future character of conflict in the future urban battlespace has been described by the 5Cs: it will be more Congested, more Cluttered, more Contested, more Connected, and more Constrained. As such, it is critical for NATO to think in

this space, and remain adaptable and resilient enough to operate in the most challenging physical and human environment.

11. Cities will quickly ‘swallow’ and disperse military troops. NATO is unlikely to be able to build up overwhelming force in terms of mass to control these cities and is more likely to require a footprint as small as possible inside the city. Urban operations will require the conduct of concurrent multidimensional military tasks. NATO will require an agile organization that is able to integrate into the urban system, supported by an in-depth understanding of the entire urban environment.

12. NATO Conceptual Study on Urbanization, from which this Annex is drawn, is available in full at: https://urb.transnet.act.nato.int

13. If you have questions or comments concerning this study please contact: natocde@act.nato.int

ANNEX E TO
FFAO
DATED MAR 18

FIRST PRINCIPLES OF FUTURE OPERATIONS

1. In development of FFAO 2018, workshops participants discussed and developed first principles upon which military forces base success during operations to accomplish the core tasks and address instability in the future security environment. These tenets are intended as essential maxims that will help leaders at all levels understand and adopt the key aspects described in the FFAO, as follows:

a. Know your adversaries better than they know themselves.

b. Understand how the human aspects matter.

c. Lead change at all levels.

d. Always drive the narrative, matching what we say with what we do.

e. Work together across all domains, with all partners.

f. Fight to win - improvise, adapt, overcome.

g. Never give up the moral high ground.

2. If you have questions or comments please contact ACT, SA Branch, SPP at SACTSPPSTRTANBranchDistro@act.nato.int

ANNEX F TO
FFAO
DATED MAR 18

GLOSSARY OF WORKING DEFINITIONS

Note: Where possible the FFAO development team applied existing definitions from AAP-6 and recently approved NATO documents.

Ability – A critical attribute needed to achieve success in the execution of a future military activity. Abilities are not intended to restrain formal capability development processes. Abilities describe what NATO military organizations must be able to accomplish to cover the full range of the Alliance military missions and to guarantee NATO military effectiveness and freedom of movement.[58]

Adaptation – Learning and changing to keep pace with the challenges of the security environment.[59]

Advanced Data Analytics – The autonomous or semi-autonomous examination of data or content using sophisticated techniques and tools, to discover deeper insights, make predictions, or generate recommendations. Advanced analytic techniques include those such as data/text mining, machine learning, pattern matching, forecasting, visualization, semantic analysis, sentiment analysis, network and cluster analysis, multivariate statistics, graph analysis, simulation, complex event processing, and neural networks.[60]

Advisory and Compliance – Ensuring, assessing compliance with policies and regulatory requirements, and providing advice on shortfalls and risks.[61]

Agility – The ability to effectively respond to dynamic and complex operational challenges as well as seize opportunities with appropriate and timely actions.[62]

Artificial Intelligence – A branch of computer science dealing with the simulation of intelligent behavior in computers or the capability of a machine to imitate intelligent human behavior.[63]

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[58] *NATO Directive: NATO Capabilities Requirements Management, Version 0.*1, 8 December 2016.
[59] *MCM-0214-2015, Military Advice on NATO's Future Strategy, Posture, and Adaptation*, dated 10 December 2015.
[60] Gartner – IT Glossary
[61] NATO-ACT, *NATO CAPABILITY HIERARCHY.*
[62] Term modified from "operational agility" as described in FFAO 2015. Rationale for this change is that NATO forces should be more than just operational agility, they should have agility at the tactical, operational and strategic levels.
[63] Merriam-Webster Dictionary, "Definition of Artificial Intelligence."

Anticipation – The capacity to anticipate possible future scenarios and thus anticipate required moves in response to them. Anticipation serves to identify threats, challenges and opportunities based on persistent in-depth awareness and understanding that should allow timely response in a complex 360-degree security environment.[64]

Aware – A comprehensive, shared understanding of the operational environment, the adversaries, and courses of action to enable accurate and timely decision-making.[65]

Basing – Providing appropriate basing and cantonments for NATO forces and equipment.[66]

BRINE – (1) biology, biotechnology and medicine; (2) robotics, artificial intelligence, and human augmentation; (3) Internet and Communication Technology (ICT) and cognitive science; (4) nanotechnology and advanced materials; and (5) energy technology.

Building Partnerships – Establishing and developing, at both the operational and strategic level, long-term partnerships and co-ordination mechanisms with external agencies and actors to support on-going and future NATO operations.[67]

Capability – A critical attribute needed to achieve success in the execution of a military activity as developed by the NATO Defence Planning Process. In addition, the ability of an item to meet a service demand of given quantitative characteristics under given internal conditions. Capabilities describe what NATO military organizations must be able to accomplish to cover the full range of the Alliance military missions and to guarantee NATO military effectiveness and freedom of movement.[68]

Capability Development – Identifying emerging requirements and developing, assessing novel solutions to meet NATO's capability shortfalls. [69]

Challenge – To confront or defy.

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[64] Bi-SC TT with ACT in lead: Proposal for Further Enhancing JISR to Improve NATO's Strategic Anticipation (ACO 313261); Functional Assessment Of The NATO Command Structure (NCS), 2016.
[65] Term modified from "strategic awareness" as described in FFAO 2015. Rationale for this change is that while situational awareness is important, NATO military forces should also have tactical and operational awareness as well. Definition derived from AAP-6.
[66] NATO-ACT, *NATO CAPABILITY HIERARCHY.*
[67] NATO-ACT, *NATO CAPABILITY HIERARCHY.*
[68] NATO, AAP-6; NATO Directive: NATO Capabilities Requirements Management, Version 0.1, 8 December 2016.
[69] *NATO ACT, NATO CAPABILITY HIERARCHY.*

Character of Armed Conflict – A set of qualities that make an armed conflict different from other instances of armed conflict.[70]

Characteristic – A feature or quality belonging typically to a person, place, or thing and serving to identify it.[71]

Collection – The exploitation of sources by collection agencies and the timely delivery of the information obtained to the appropriate processing unit for use in the production of intelligence and situational awareness. [72]

Collective Defence – Deterrence and defence against any threat of aggression, and against emerging security challenges where they threaten the fundamental security of individual Allies or the Alliance as a whole.[73]

Consult, Command, Control (C3) – The ability to exercise authority over and direct full spectrum of assigned and attached forces in the accomplishment of the mission.[74]

Communication and Information Systems (CIS) – The secure and effective transfer, processing and storage of information in support to NATO missions. [75]

Consultation – Exchanging Views and conducting deliberations amongst the highest authorities of the Alliance and member nations aiming at harmonizing positions and formulating recommendations on issues of common concern. [76]

Conventional War – Armed conflict between two or more states in open confrontation where the forces on each side are well-defined, generally use conventional weapons and fight using weapons that primarily target the opponent's military.[77]

Cooperative Security – Active engagement to enhance international security, through partnership with relevant countries and other international organizations; by contributing actively to arms control, non- proliferation and disarmament; and by keeping the door to membership in the Alliance open to all European democracies that meet NATO standards.[78]

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[70] Colin Gray, "War – Continuity in Change, and Change in Continuity," *Parameters.*
[71] NATO Directive: NATO Capabilities Requirements Management, Version 0.1.
[72] NATO-ACT, *NATO CAPABILITY HIERARCHY.*
[73] NATO, *Strategic Concept 2010.*
[74] NATO Directive: NATO Capabilities Requirements Management, Version 0.1, 8 December 2016.
[75] NATO-ACT, *NATO CAPABILITY HIERARCHY.*
[76] Ibid.
[77] David Barno and Nora Bensahel, "The Irrelevance of Traditional Warfare?" *War On the Rocks.*
[78] Ibid.

Corporate Management and Support – Providing strategic assessment, managing enterprise information and knowledge and directing program, budget and finance matters. [79]

Credibility – When internal and external stakeholders recognize leaders, forces, and equipment as possessing the ability to effectively deter and defend against threats from any direction. [80]

Critical Infrastructure Attack – Hostile actors could attack physical and virtual infrastructure nodes and installations in an attempt to disrupt vital societal functions and global stability.[81]

Crisis Management – The coordinated actions taken to defuse crises prevent their escalation into armed conflict and conation hostilities if they should result.[82]

Cyberattack – (instability situation) An act or action initiated in cyberspace to cause harm by compromising communication, information, or other electronic systems, or the information that is stored, processed, or transmitted in these systems. To reach the level of an instability situation, the attack should be of significant scale, scope or duration to disrupt, deny, degrade, modify, steal, or destroy information resulting in a large physical, emotional or financial impact.[83]

Defence – Nullifying or reducing the effectiveness of hostile action.[84]

Deployment/Redeployment – Planning and providing strategic lift to support the deployment, sustainment and redeployment of the joint force including personnel and material/bulk material.[85]

Digital Twin – Increased computing power and connectivity are making it possible to virtualise this task by creating and maintaining a digital representation, of any piece of real equipment, and thus of any plant or engine.[86]

Dissemination – Distributing timely data, information, intelligence and specialist and all-source analysis, in an appropriate and accessible form, across and between networks as required.[87]

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[79] NATO-ACT, *NATO CAPABILITY HIERARCHY*.
[80] Credibility was added as a Strategic Military Perspective to address a gap concerning the overall, feasibility that forces could accomplish their assigned missions. Credibility was identified as a key aspect of deterrence at the 2017 FFAO Rome Conference.
[81] Sarah Kuranda, "Experts: Recent Critical Infrastructure Attacks a Sign of Major Security Challenges Coming in 2016,"*CRN.*
[82] NATO*, AAP-6.*
[83] Jason Healy, *The Five Futures of Cyberspace Conflict.*
[84] NATO-ACT, *NATO CAPABILITY HIERARCHY.*
[85] Ibid.
[86] Economist, The Digital Twin.

DOTMLPF-I – Doctrine, organization, training, materiel, leadership and education, personnel, facilities, and interoperability.[88]

Endangerment of Civilian Populations – When hostile actors conduct large-scale acts of violence directed against civilian populations. These events could include mob violence, post-conflict revenge, insurgency, predatory violence, communal conflict, government repression, ethnic cleansing, destruction of cultural property and genocide.[89]

Engage – Ability to perform the tasks which contribute directly to the achievement of mission goals, including all abilities required to defeat adversaries.[90]

Force Escalation – When hostile actors use threats or the use of force increasingly over time that destabilises the security environment that could lead to a strategic miscalculation or increase the likelihood of a wider conflict.[91]

Force Preparation – Training, educating and exercising forces to prepare for the full range of NATO missions and planning for foreseeable contingencies and operations.[92]

Foreseeable – May be reasonably anticipated.

Future Legal/Ethical Questions – A question concerning a developing set of circumstances of events that may require a future moral judgement and decision.

Future Security Environment – The composite of global conditions (e.g., political, military, economic, social, infrastructure, information) that may be of importance to NATO military operations in the future.[93]

Gender – Refers to the social attributes with being male and female learned through socialisation and determines a person's position and value in a given context. [94]

Generation – Generating forces and capabilities with appropriate readiness for the execution of Alliance missions. [95]

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[87] NATO-ACT, *NATO CAPABILITY HIERARCHY.*
[88] NATO Strategic Communications "Commander's Handbook," 2014
[89] Stian Kjeksrud, Alexander Beadle, and Petter Lindqvist, *Protecting Civilians from Violence.*
[90] NATO Directive: NATO Capabilities Requirements Management, Version 0.1, 8 December 2016.
[91] ICRC, *Violence and the Use of Force*.
[92] NATO-ACT, *NATO CAPABILITY HIERARCHY.*
[93] FFAO 2015.
[94] This means also the relationships between men, women, boys and girls, as well as the relations between women and those between men. Notably, gender does not equate to an exclusive focus on women" NATO BI-SC directive 040-001 "integrating UNSCR 1325 and gender perspective into the NATO command structure" 16 May 2017.
[95] NATO-ACT, *NATO CAPABILITY HIERARCHY.*

Global Commons – Geographical areas outside the jurisdiction of any nation.[96]

Global Commons Disruption – Hostile actors challenging international laws and norms in the global commons through threat or use of force (includes space disruption).[97]

Global Strike – A system that can deliver a precision-guided weapon anywhere in the world.[98]

Governance Challenges – When governments fail to provide administration and basic functions that could threaten internal and external security and destabilise the environment.

Hazard Mitigation - Identifying and employing appropriate controls and measures to mitigate occupational (fratricide, transportation, industrial, fire safety) and environmental (meteorological, geographical, disease) hazards inherent in NATO operations.

Human Enhancement/Augmentation - Used to refer to technologies that enhance human productivity or capability, or that somehow add to the human body.[99]

1. Human Capital – The skills, knowledge, and experience possessed by an individual or population, viewed in terms of their value or cost to an organization or country.[100]
2.
3. Hyper-instability - A situation where more than one instability situation occurs at one time thereby compounding the negative effects.

Hyper-precision – A term used in targeting to describe the extremely precise delivery of effects.

Hybrid War – Hostile state actors will using a combination of conventional and unconventional means to avoid being held directly accountable for their actions while retaining the option to employ conventional forces, if directly threatened. One of the major characteristics of hybrid warfare is that it often aims to leverage all elements of power while limiting the conflict below the threshold of conventional war thus complicating the timely and effective use of rigid collective defence mechanisms.[101]

In Theatre Movement and Transportation – Providing movement and transportation within JOA, which includes the whole spectrum of infrastructure, organizations,

[96] OECD Definition.
[97] Gerald Stang, *Global Commons: Between Cooperation and Competition*.
[98] John Prime, "Local Base Is First Choice For New Unit: Air Force Global Strike Command could result in 1,000 or more personnel", The Times (Shreveport), 3 April 2009.
[99] Technopedia. “Human Augmentation.”
[100] Dictionary.com.
[101] NATO, International Staff Memo, IMSM-0043-2016.

facilities, command and control, and equipment that is necessary for the sustainment, deployment and redeployment of NATO forces across the full spectrum of NATO missions.[102]

Inform – The ability to establish and maintain the situational awareness and level of knowledge required to allow commanders at all levels to make timely and informed decisions.[103]

Innovation – Critical and creative thinking that converts new ideas into valued outcomes.

Instability – Being in a state of likely change.[104]

Instability Situations – Generic descriptions of possible future events of critical significance that could reach the threshold requiring an Alliance use of military forces.

Installation Support – Operating and maintaining installations and facilities.[105]

Interoperability – The ability to act together coherently, effectively and efficiently to achieve Allied tactical, operational, and strategic objectives, or the ability of military forces to train, exercise and operate effectively together in the execution of assigned missions and tasks.[106]

Joint Fires – The coordinated and efficient application of both lethal and/or non-lethal Joint firepower to deny, degrade and destroy adversary forces, facilities and infrastructure throughout all dimensions of the operational area thus enabling decisive manoeuvre whilst avoiding unwanted collateral effects.[107]

Joint Manoeuvre – Gaining positional advantage in respect to the adversary from which force can be threatened or applied, thus rendering adversaries ineffective by shattering their cohesion rather than destroying components through incremental attrition.[108]

Lawfare – The use of law as a weapon of war.[109]

Main Capability Areas – Prepare, Project, Engage, Protect, Sustain, Inform and Consult, Command and Control.[110]

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[102] NATO-ACT, *NATO CAPABILITY HIERARCHY.*
[103] NATO Directive: NATO Capabilities Requirements Management, Version 0.1, 8 December 2016.
[104] Merriam-Webster, “Simple Definition of Instability.”
[105] NATO-ACT, *NATO CAPABILITY HIERARCHY.*
[106] NATO, *AAP-6*.
[107] NATO-ACT, *NATO CAPABILITY HIERARCHY.*
[108] Ibid.
[109] Lawfare Blog.

Maintenance – Conducting maintenance and repair either to retain equipment/materiel in a serviceable condition or to restore it to a serviceable condition.[111]

Mass Effect – Grave destructive, psychological and/or economic damage.[112]

Medical Support – Providing medical support to NATO forces and, as appropriate, civilian population at risk across the full spectrum of NATO missions, through the conservation of personnel, preservation of life and minimisation of residual physical and mental disabilities. [113]

Military Engineering Support to Sustainment – Conducting those military engineering tasks that encompass the deliberate, longer-term preparation for, and indirect support to ongoing or future operations. Primarily, this involves management capabilities, providing support and/or improving operational infrastructure, constructions and life support. - using military and/or civilian engineering personnel, equipment and material needed for general engineering support and for support to forces and civilian populations at risk.[114]

Mission Command – When commanders exercise authority and direction using mission-type orders to enable disciplined initiative within the commander's intent thereby empowering agile and adaptive leaders with freedom to conduct of operations.[115]

Mounting – Efficient and effective assembly, preparation and maintenance, movement to loading points and subsequent embarkation within designated mounting areas.[116]

Multi-polar – When the fundamental power structure in an international system dominated by several large powers, and is characterized by antagonism between these.[117]

NATO Forces – Forces assigned to NATO by the Nations to achieve an agreed upon mission. This includes the NATO Command Structure, NATO Force Structure, any standing forces, and the pool of forces Nations could make available to the Alliance.

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[110] NATO-ACT, *NATO CAPABILITY HIERARCHY.*
[111] Ibid.
[112] Strategy page.
[113] NATO-ACT, *NATO CAPABILITY HIERARCHY.*
[114] Ibid.
[115] AJP-1 (D) Allied Joint Doctrine.
[116] NATO-ACT, *NATO CAPABILITY HIERARCHY.*
[117] Eirik B. Lundestad and Tor G. Jakobsen, “A Unipolar World: Systems and Wars in Three Different Military Eras.”

Natural/Man-made Disaster – A sudden large-scale man-made or natural event that could result in serious damage, widespread death, and injury that exceeds response capacity. These events could occur as a culmination of several smaller individual disasters in a way that may have an effect similar to a large-scale disaster.[118]

Nature of War – The inherent constitution of war, its essence.[119]

Networked - The interaction of the NATO Command Structure, NATO Force Structure, and NATO Nations with each other and external actors, drawing on each other's abilities. [120]

Non-state Actors – Non-state actors are non-sovereign entities that exercise significant economic, political, or social power and influence at national and at international levels. Non-state actors include benign and non-benign entities from Non-Governmental Organizations (NGOs), Multinational Corporations (MNCs), advocacy networks, transnational activists, super-empowered or rogue individuals, and terrorist and criminal organizations.[121]

Non-Kinetic Engagement – Shaping and influencing ideas and values, conducting NATO strategic communications objectives, coordinating actions to disseminate information on NATO's role to the civil environment in order to influence the civilian and adversaries' decision-making.[122]

Opportunity – A good chance for advancement or progress.

Operational Framework – The basic structure underlying the conduct of military operations in response to actual and potential instability situations in the future.

Partners – In the broadest definition, partners (lower case "p") includes formal NATO Partner Nations that are signatories to a political agreement and other entities (e.g., contact countries, host-nations, non-governmental organizations, intergovernmental organizations, industry, and academia). These relationships are contextual; see specific agreements for further details.

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[118] Peter Baxter, "Catastrophes – Natural and Manmade Disasters," *Conflict and Catastrophe Medicine*.
[119] Colin Gray, "War – Continuity in Change, and Change in Continuity," *Parameters*.
[120] Definition develop at the spring 2017 FFAO Workshop in Rome. This definition was a replacement for the "Security Networking" SMP discussed in the FFAO 2015.
[121] National Intelligence Council, "Non-state Actors: Impact on International Relations and Implications for the United States", Aug 23, 2007, p. 2.
[122] NATO-ACT, *NATO CAPABILITY HIERARCHY.*

Pandemic Disease – An outbreak of a disease that occurs over a wide geographic area and affects an exceptionally large proportion of the population exceeding response capacity.[123]

Persistent – Daily, routine, even habitual use, that builds enduring relationships, interoperability, efficiency and trust.

Prepare – Ability to establish, prepare and sustain sufficient and effective presence at the right time, keeping sufficient flexibility to adapt to possible changes in the strategic environment. These also include the abilities to contribute to NATO deterrence.[124]

Processing – Receiving, converting and fusing data and information from all available sources into relevant and usable intelligence/knowledge, decision-support and situational awareness products by collation, evaluation, analysis, integration and interpretation through fusion and collaboration.[125]

Project – The capabilities to conduct strategic deployment of both NATO and national headquarters, forces and capabilities in support of any Alliance mission.[126]

Projecting Stability – Proactive activities intended to influence and shape the security environment beyond the limits of Alliance geographical boundaries thereby increasing security and reducing threats.[127]

Protect – The ability to minimize the vulnerability of personnel, facilities, materiel and activities, whilst ensuring the Allies freedom of action and contributing to mission success.[128]

Readiness - Having the right capabilities and forces that are trained, interoperable, and deployable and maintained in the right operational structures and groupings and at an appropriate notice to move.

Reception, Staging, Onward Movement and Integration (RSOI) – Planning and providing RSOI to support the transitioning of deploying forces (personnel, equipment and materiel) arriving in the JOA, into forces meeting the JFC's operational requirements.[129]

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[123] Regina Parker, “Prevent Disease to Prevent War,” *The Strategy Bridge*.
[124] NATO Directive: NATO Capabilities Requirements Management, Version 0.1, 8 December 2016.
[125] NATO-ACT, *NATO CAPABILITY HIERARCHY.*
[126] NATO Directive: NATO Capabilities Requirements Management, Version 0.1, 8 December 2016.
126 Draft MC 0655/1, Military Concept for Projecting Stability, 24 August 2017.
[127] Delivery of Coherence on Projecting Stability – A Process for Military Analysis, IMS CS of 31 Mar 17
[128] NATO Directive: NATO Capabilities Requirements Management, Version 0.1, 8 December 2016.
[129] *NATO ACT, NATO CAPABILITY HIERARCHY.*

Resilience – Having sufficient capability, capacity, and will to endure adversity over time, retain the ability to respond, and to recover quickly from strategic shocks or operational setbacks.[130]

Responsiveness - Having the right posture that includes having the right forces and the right place at the right time to be able to respond in a timely, appropriate, and credible manner.

Security – Ensuring that designated information, materiel, personnel, activities and installations are protected against espionage, sabotage, subversion and terrorism, as well as against loss or unauthorised disclosure. [131]

Stability – A situation where strong, credible, and legitimate institutions and a resilient society create the conditions in which the outbreak, escalation, recurrence or continuation of conflict is within acceptable levels leading to a more secure and less threatening environment.[132]

Standardization – The development and implementation of concepts, doctrines, procedures and designs in order to achieve and maintain the compatibility, interchangeability or commonality which are necessary to attain the required level of interoperability, or to optimise the use of resources, in the fields of operations, materiel and administration.[133]

Strategic Communications – The integration of communication capabilities and information staff function with other military activities, in order to understand and shape the information environment in support of NATO aims and objectives.[134]

Strategic Military Perspectives – Elements of best military advice that provide the central idea and framework of characteristics necessary for NATO forces to execute the three core tasks, address Instability Situations, and seize the opportunities in the future.

Super Empowered Individuals – An actor able to initiate a destructive event, fundamentally with their own resources, that cascades systemically on a national, regional or global scale.

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[130] SACT Food For Thought Paper on Resilience, 28 January 2016. This SMP was modified from the term used in FFAO 2015 to add clarity and as the SMPs in general address characteristics that NATO forces should share, the modified “shared” was deemed redundant.
[131] *NATO ACT, NATO CAPABILITY HIERARCHY.*
[132] Draft MC 0655/1, Military Concept for Projecting Stability, 24 August 2017
[133] NATO, AAP-6.
[134] Military Committee STRATCOM Policy 2017, as a SMP the term “strategic communications” was removed as it was seen as less of a characteristic required by future forces and more of a critical aspect of the central idea as described in Chapter 2.

Supply of Material and Services – Supplying all material and items used for the logistic support and services of military forces, which includes the determination of stock levels, provisioning, distribution, replenishment and Real Life Support Services. This includes a wide range of activities such as combat resupply of all classes material, catering, lodging, map distribution, labour resources, postal and courier services, canteen, laundry and bathing facilities, support to mortuary affairs etc.[135]

Sustain – The ability to plan and execute the timely logistical support of forces.[136]

Terrorism – The use of force and violence against individuals or property at an increased scale, scope or duration in an attempt to coerce or intimidate governments or societies to achieve political, religious or ideological objectives.[137]

Transformation – A continuous and proactive process of developing and integrating innovative concepts, doctrine and capabilities to improve the effectiveness and interoperability of military forces.[138]

Irregular War – Hostile state and non-state actors conducting military activities through or with underground, auxiliary or guerrilla forces to enable a resistance movement or insurgency to coerce, disrupt or overthrow a government or occupying power.[139]

Warfighting – The way forces fight.

Warfare Development – Shaping forces to fight in the future. Specifically, the broad set of activities across functions and tasks, which includes capability development, defence planning, strategy and policy development advice, innovation, outreach, concept development, experimentation, lessons learned, doctrine development, education and individual training, strategic analysis, and wargaming (alternative analysis) in these areas.

Weapons of Mass Destruction (WMD) Proliferation/Threat/Use – When hostile state and non-state actors seek access to, and use WMDs to cause widespread devastation and loss of life against targets such as political leadership, population concentrations, the global financial system, or locations of symbolic importance. [140]

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[135] *NATO ACT, NATO CAPABILITY HIERARCHY.*
[136] NATO Directive: NATO Capabilities Requirements Management, Version 0.1, 8 December 2016.
[137] Melissa Clarke, "Globally, Terrorism is on the Rise," *ABC News*.;NATO, *AAP-6 Edition 2015*, MC-472/1 "Military Committee Concept on CT", endorsed by MC and approved by NAC, December 2015)., (November 2, 2016), Institute for Economics and Peace, Global Terrorism Index 2015, November 2015.; NATO, PO(2015)0045.
[138] NATO, *AAP-6.*
[139] Ibid.
[140] UN, "Weapons of Mass Destruction: Threats and Responses."; NATO, *AAP-6 Edition 2015*.

ANNEX G TO
FFAO
DATED MAR 18

LINKS OF INTEREST

NATO Homepage: https://www.nato.int

NATO Topics: https://www.nato.int/cps/en/natohq/67954.htm

NATO Events: https://www.nato.int/cps/en/natolive/events.htm?event_types=Summit

SACEUR Homepage: https://shape.nato.int/saceur-2

NATO ACT Homepage: http://www.act.nato.int

NATO Futures Work: http://www.act.nato.int/futures-work

List of NATO COEs: https://www.nato.int/cps/en/natohq/topics_68372.htm

European Union: http://europa.eu

Atlantic Council: http://www.atlanticcouncil.org

Other NATO Commonly Used Links: https://www.nato.int/services/links.htm