

# CONFERENCE SYNOPSIS

2017 International Concept Development & Experimentation Conference  
*Maintaining Advantage in an Era of Global Challenges*  
London, United Kingdom 10-12 October 2017



## Innovative Address

Admiral Manfred Nielson, DEU N, Deputy, Supreme Allied Commander Transformation kicked off the conference by sharing Supreme Allied Commander Transformation's perspectives and the building blocks of an innovative way ahead. Instead of executing the NATO Defence Planning Process by the book, perhaps we need a NATO Defense Discovery Process approach. Our biggest challenge may be how to overcome obstacles in our organizations and ourselves. We cannot limit ourselves to believe innovation relates exclusively to technological advances, but it must also incorporate organizational systems. These must include intuitional adaptation, command structure adaption, and fostering Allied cohesion; these efforts are currently underway. Many nations are setting up Innovation Hubs to reinvigorate civil-military technology collaboration and value creation. A common theme is to develop a corps of entrepreneurs and intrapreneurs to solve high tech problems. Today in cyberspace, nations are struggling to balance defending public and private networks and national exploitation for defence purposes. We should engage with our Partners, build relationships and trust, draw inspiration from each other, stimulate collaboration, share information and provide mutual support. With today's increased security environment demands, we do not have an abundance of time to get it right. This can be accomplished by facilitating and institutionalizing persistent coordination between Allies and leveraging innovative strengths. Allied Command Operations provides requirements, and Allied Command Transformation bundles the whole capability requirement process.



*“It's all about people.”*

## Innovative Perspectives

The innovation perspectives series set the context for the entire ICDE conference. The moderator, Mr. Han de Nijs, HQ SACT, Operational Analysis Branch Head, outlined innovation as a precursor to the event. He challenged the panel and audience to consider innovation; what it is, what it means and how to use it. Our current security environment creates a challenge. Innovation is not all about new ideas, it can involve adoption or adaptation.

*“Sheriffs enforce and shepherds protect. Leaders need to do both.”*

Mr. Chris O'Keefe, founder, Future Partners LLC, provided an industry perspective through his “Think Wrong” presentation. It's not about technology, it's about people. The military is not good at designing people processes that people actually want to use. Why is it so hard to make things that are human-centered: biology and culture? Biology starts with the brain, it forces us to make quick decisions. How do we get from the predictable path to a bold path? Culture leads to groupthink which leads to dogma.

Focus on your people; human-centered design. Don't just focus on framing, try doing. Start designing early. How do you know you have a good idea? There are three basic criteria: Is it financially viable? Is it technically feasible? Do people want it?



Six “Think Wrong” strategies for innovation:

1. Be bold - reframe your challenge
2. Get out - foster curiosity
3. Let go
4. Make stuff - start putting things down on paper
5. Bet small
6. Move fast

Mr. Marcel “Otto” Yon, CEO, German Armed Forces Cyber Innovation Hub, Bundeswehr, provided a governmental perspective. Exponential growth has a significant impact on innovation as a whole. If senior management truly believes in the expected change, it will reduce indifference and encourage development and use of new technologies. The way an organization

addresses these changes can help them focus on three lines of business: 1) engage with start-up eco-system, 2) drive exponential development, and 3) unchain innovation inside the military. Innovation’s main objective is to work with and improve an organization’s culture. It appears that militaries have many talented officers, but the system lacks a mechanism to incentivize this innovation. Therefore, we often turn to employing outsiders or contractors to facilitate or induce this innovation. We fail to maintain this knowledge and talent for organic, iterative innovation. If we work on our culture to create successful examples and build support for these functions internally, we can encourage and create a better environment for innovation. We as NATO and the military are not technology experts, but we are the change experts.

Mr. Vincent Graf, Information and Communications Technology, the International Committee of the Red Cross (ICRC) offered new ideas about collaboration from a Non-Governmental Organization viewpoint. He highlighted ICRC innovation required for them to keep pace with the constant change and adaption while providing mission critical services in areas of both war and peace. The innovation created allowed them to collaborate as private sector entities and balance the risk and mission for new creations. There is a balance of speed with risk of the mission. The first priority is to do no harm. Processes need to include proper training and governance. There will always be competition for resources. Communication is key and you need to have a marathon effect. There are different types of innovation approaches and they should co-exist. Don't forget about the “what’s in it for me?” People make the difference and you need to find out what motivates them. Collaboration and selection of partners is critical. Finally, be ready for hard work.

Recurring ideas from the panelists was that innovation is attainable and delivered across various military sectors. Some insights from the group centered on leadership and the need for executive courage—a willingness to fail—to foster an innovation culture. Furthermore, if senior management believes in the expected change to come, then it will reduce indifference or encourage development and use of new technologies.

### **Keynote: General Sir Chris Deverell, GBR Army, Commander Joint Forces**

The keynote address by General Sir Chris Deverell presented the UK strategic view and operating concept, including the need to gain and maintain the advantage in an era of evolving global challenges and shifting paradigms. The contemporary and future operating environment is characterised by complexity, instability, uncertainty and pervasive information. Adversaries, both state and non-state, will threaten the rules based international order. The distinction between war and peace has blurred while the range, geographic spread, and capabilities of potential adversaries make a distinction between home and overseas operations obsolete. Previously, a first hostile act was a definable act in

space and time. In today's information operations and cyber environment, how would we know the first hostile act hasn't already happened? Global challenges bring influence to bear on adversaries, actors and audiences will be central to delivering strategic, operational and tactical success. The UK's response is international by design, placing NATO at the heart of UK Defence, and securing advantage for the Joint Force.

*“The only way to respond to the vast amount of challenges is for nations to come together. The UK is unconditionally committed to shared defense.”*

As a trading nation with the world's fifth largest economy and 5 million British nationals living abroad, engagements are fundamental to the success of the United Kingdom. Sea lanes and global commerce must remain free-flowing. Domestic and international challenges require multi-faceted responses. Britain's safety and security depend not only our efforts, but working with allies to deal with common threats—we are stronger together. We will continue to work together with the EU, NATO and our European neighbours. We will use our long-term relationships to develop and maintain the alliances and partnerships that we rely on every day for our security and prosperity.

Our special relationship with the US remains essential to our national security. It is founded on shared values, and our exceptionally close defence, diplomatic, security and intelligence cooperation, which are amplified through NATO.

NATO is the cornerstone of U.K. Defence Policy; the only alliance that can generate sufficient mass and integrate the conventional and nuclear forces that might credibly deter the most dangerous threats to our security. We are fully committed to our NATO obligations. The UK is proud of the leading role that our Armed Forces will take in NATO's enhanced forward presence, providing the Framework Battle Group in Estonia on a persistent, rotational basis. We are supporting deployments to Estonia, Poland, Romania and Operation RESOLUTE SUPPORT in Afghanistan.

Joint Force Advantage includes: better, faster understanding and decision making; more responsive execution; sustained and synchronised application of full spectrum effects; the ability better to influence the behaviour of adversaries and other actors; improved global access and reach; better connectivity across Defence, Government and International partners; faster exploitation of emerging technologies; a more diverse, resilient, higher-skilled, and healthier workforce; and improved performance through greater use of simulation in training.

The information age has handed many more options and opportunities to our adversaries, especially when they are not constrained by the norms of an open society and democratically accountable governance. They have greater freedom of action and what this usually conveys is a tempo and the ability to out-manoeuvre us in the virtual, cyber and cognitive domains. They are already exploiting this and therefore so must we. Harnessing information age capabilities is vital if we are to match or overmatch our opponents; this is in addition to, not instead of, traditional physical advantage.

Part of the answer is innovation. Innovation can help us to adapt quickly and cost effectively. Failure to innovate capabilities and how they are employed will see us unable to afford the armed forces required to meet the security challenges of 2030 and beyond. We need to look at the disciplines of artificial intelligence and machine learning, autonomy (including man/machine teaming), data analytics and visualisation, behavioural sciences, and simulation and modelling.

Just as “Fintech” has transformed banking and financial services, we must harness these same tools and techniques in Defence and Security, in what I have labelled “Miltech.” Radical innovative approach to capability development is required. Empowering a culture that is innovative by instinct, maximises our collective investment in science and technology, and research and development to realise inventive solutions which can be delivered rapidly.

Joint Forces Command is also creating its own Innovation Ecosystem, which includes an innovation unit called the jHub. This is a small team of military and civilian staff based in Tech City in London, is designed to bring a start-up character to the business of engaging with potential suppliers, enabling us to find and test solutions which would otherwise remain hidden to the military.

## **Town Hall**

The Town Hall, moderated by Lieutenant General (Ret) Sir David Capewell, GBR RM, opened with statements from the panel members, Professor Sir Lawrence Freedman, War Studies, King's College London and Major General Thomas Deale, USAF, Vice Director, Joint Staff (JS) J7. Admiral Nielson and General Deverell completed the panel.

Professor Sir Lawrence cautioned against groupthink and wishful thinking. We cannot create truths to align with our goals. We need to go fight the war that is ongoing, not the one we have prepared to fight.

***“We will have to do all of this in a resource competitive environment. We will not get a blank check to address the problem until it is too late.”***

Major General Deale characterized the future operating environments as uncertain, complex, and ambiguous, with an increased role of the information domain. This characterization brings a shift from the US's traditional phased approach to conflict to a continuum of conflict ranging from combat to competition short of war. The future battlespace will collapse in both time and depth, greatly increasing the speed of decision and shortening the linkage between tactical actions and strategic outcomes. In addition, competing resources will challenge future operations and there will be no time to “ramp-up” an industrial base. We are not going to be given a blank check until it's too late, and we will fight future conflicts with the forces we have on hand. Gen Deale also highlighted other challenges associated with current acquisition methods and the length of time to test and field emerging capabilities. Highlighting the conference's international development theme, Gen Deale offered our collective “Futures Concepts” work as a way to ensure converging efforts without being derailed by security concerns. As a fighting force, we integrate effectively at the tactical level: in future environments, that integration will also need to be applied to the operational and strategic levels.

The panel took questions and a recurring theme was the need to create a culture change within the military to better enable innovation while reducing the fear of risk. There is an increasing requirement to adapt to uncertainty and a need to think about the battlespace differently. Vitality, we must reduce the amount of time it takes to develop and test as well as successfully repurpose existing technology. Innovation in materiel, as it relates to concept development, should develop parallel or convergent paths with our partners in order to shorten the time while maintaining necessary layers of security. Finally, as we develop and retain a workforce, both military and civilian, training must arm members with the skills needed to deal with the unknown and allow experience to support that skillset.

## **Dynamic Speaker: Dr. Robert Johnson, GBR Civ, Director, The Changing Character of War Centre, University of Oxford, UK.**

During the latter part of the second day of the conference, participants enjoyed a brief on “Hard Truths” from a heralded Oxford professor. The key themes encroached on norms of the military community. Specifically, Dr. Johnson explained that globalization, the influence of identity, and digital technology are reshaping the nature of warfare and thus the way in which political scientists conjure a future international system. The 1990s offered a future described as prosperous and peaceful, one in which we achieved hegemonic stability. We fall into these assumptions because military professionals tend to think toward the war they want to fight and we are overly optimistic. War changes at every encounter. Despite tactical defeats the enemy will still try for a strategic win.

Dr. Johnson asked, “What does the future look like?” He suggested the future would be a world in which the multinational organizations did not have the same impact. There will be a return to unilateralism and bilateral nature.

The speaker identified uncomfortable truths. Our values will change, values change like they have before. Tolerance of civilian casualties will change. Attacks on infrastructure will increase. Governments may lose control of populations. Mid-century the internet service providers will deliver even more. States will not disappear. A diversity of politics will exist.

We also need to be aware of the civil-military gap since the military is subordinate to civil authorities. Politicians take their time to better understand the problem, build consensus and gain public support, the military seeks rapid solutions to crisis and expects setbacks and potential escalation.



Ultimately, there must be a cultural and historical awareness when predicting the future and preparing for the uncomfortable challenges we face. He stressed both the security of Europe and the Alliance would be ineffective without the United States and it is time for Europeans to acknowledge this.

## **Hit Them Where it Hurts: Uncomfortable Futures and Avoiding Groupthink Workshop**

*Facilitator: Mr. Duncan Brown, USA Ctr, Johns Hopkins University – Applied Physics Lab*

*Workshop Lead - Mr. John DeFoor, USA Civ, U.S. Joint Staff J7, Joint Concepts Division*

Presenters identified and outlined: Assumptions underpinning their country's view of the future operating environment; key trends shaping the future employment of the military forces of their country; future military competitions that challenge the way our military forces are structured or operate; major implications of those trends and competitions in terms of the future character of conflict and military missions.

Six presentations to look at key assumptions, key trends, and controversial or missing trends were used as discussion items and to determine overlap in thought. The presentations provided glimpses of national and Alliance views, and were as follows:



- NATO ACT – *Strategic Foresight Analysis* (CDR David Sheriff)
- U.K. – *Global Strategic Trends* (Mr. Simon Cole)
- Australia – *Future Operating Environment* (Gp Capt David Banham)
- U.S. Joint Staff J7 – *Joint Operating Environment* (Mr. Jeff Becker)
- Germany – *Red-Teaming on Potential Strategic Shocks for Western Societies* (Dr. Olaf Thieler)
- U.S. Defense Intelligence Agency – *Game Changers* (Mr. Chris Boggs)

Throughout the workshop and from a point-counterpoint perspective, delegates debated key assumptions, postulated futures, and the implications of those futures in each country's futures planning efforts. Rather than trying to find consensus about the future, this workshop focused on uncovering and understanding different, even opposing perspectives on pressing future warfighting concerns. Workshop delegates differed on future priorities: should we prioritize aggressive states contesting world order or to mitigate or contain the consequences of failed or failing states

due to disorder? Similarly, disagreements about the military implications of each of these topics were explored. For example, a multipolar world suggests more limited strategic objectives, or even political accommodation with potential adversaries, as well as increasing the risk of high-intensity conflict. The group also struggled to agree on the nature of cyberspace and identity for future force development, including the integration of migrants—both cultural and “cyber-natives” into effective alliance military forces.

*“Cyberspace is increasingly becoming more like the land domain—human beings actually inhabit it—rather than being like the air, maritime, and space domains where people only transit.”*

An outline was presented on the framework used by United States to produce of the “Joint Operating Environment, The Joint Force in a Contested and Disordered World (JOE 2035),” which is available at [http://dtic.mil/doctrine/concepts/joe/joe\\_2035\\_july16.pdf](http://dtic.mil/doctrine/concepts/joe/joe_2035_july16.pdf). Listed are emerging trends, and some of the discussion points championed by workshop delegates:

- Science, Technology and Engineering
  - Directed-energy, i.e., high power microwave, electromagnetic pulse, lasers, and hypersonic weapons will become available to many adversaries.
  - Biochemistry and bioengineering will be applied to humans and warfare.
  - 3-D printing of weapon systems and weapon system parts will become ubiquitous and allow non-state actors easier access to new weapons that can cause great damage.
- Human Geography
  - Globalized terrorist and criminal networks will continue to exist and interact with one another when they have common interests.
  - Large cities may become international actors.
  - Globalization continues, economics trumps politics and major war is avoided.
  - Climate change and its potential consequences have not been accounted.
- World Order
  - Nationalism may lead to trade barriers/wars, competition over scarce resources, including human talent, and cyber-espionage/sabotage.
  - Populist movements, extremism and foreign supported groups or proxies will take advantage of the above.
  - The U.S. will be the dominate power in the foreseeable future.
  - China could overtake the U.S. as a dominant power.
  - Russia could become a rogue power with nukes acting like North Korea.
  - The U.S. may become isolationist or continue to be globally involved.
  - Alliance structures will come under pressure and possibly change.
  - Ideology/culture/religion/tribe will trump nation state allegiance unless the nation is under attack.
  - The Westphalian order, i.e., the whole concept of order built around states, will be challenged.
- Character of conflict
  - There is a requirement for a balanced force able to address both high-end adversaries and major conflict, as well as low end threats (nation dependent).
  - Great power confrontation, conflict, and war is back for some nations.
  - A military capable of major sustained combat only will not be properly configured to address the full range of future military missions.
  - Nuclear weapons, nuclear deterrence, and extended deterrence will be more important.
  - Future war will find high end adversaries denying each other’s C3/ISR systems.
  - Other developments that are likely to persist include:

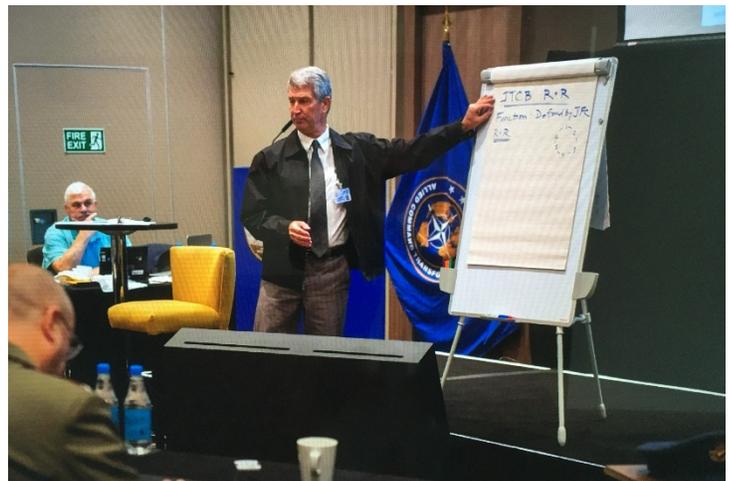
- Cyber will be militarily non-decisive.
- Improving sensors, processing, and rule sets will provide better target discrimination, but not in clutter.
- Some current and foreseeable future competitions:
  - Mines currently defeat mine countermeasure activities.
  - Submarines win out over anti-submarine warfare in the open ocean.
  - Mobile missile launchers in clutter win out over missile hunting systems.
  - Anti-satellite weapons defeat large satellites in predictable locations.
  - Integrated air defenses defeat penetrating aircraft.
  - Missile swarms win out over active missile defenses.

**Deliverable Timeline:** Featured speaker notes, panel member presentations, workshop proceedings and post-event analysis consolidated into a Quicklook report. The Quicklook report should be published in December 2017 and will be emailed to workshop attendees.

## Integration of Lethal and Nonlethal Actions (ILNA) Workshop

*Workshop Lead: Mr. Lou Durkac, USA Civ, U.S. Joint Staff J6, Joint Fires Division*

Part of the Multinational Capability Development Campaign (MCDC) 2017-18, the ILNA project has been tasked with developing structures and procedures to incorporate nonlethal options into broader operational planning within a combined task force headquarters and its sub-components. ICDE 2017 provided the opportunity to discuss shortfalls and solutions within the joint targeting cycle's 6 phases with NATO and international experts to refine procedures supporting organizational structures to ultimately provide commanders significantly more flexible and less destructive options to achieve a desired end state. This user discovery event is part of a fourteen month project to explore pathways for the way ahead.



The ILNA project was initiated to develop a non-materiel framework of standardized repeatable processes, tools, and terminology for the multinational mission partners. This results in an organizational body and associated targeting procedures to provide offensive and defensive, lethal and nonlethal options to commanders at all echelons of command.

To enable a voice for all delegates, a User Discovery Event (UDE) format was used. Facilitators used ePolling, note taking, feedback review, and affinity diagramming devising solutions to incorporate these inputs. Over three days, the seminar conducted silent brainstorming, group discussion, discrete surveys and deep dives to refine facilitators' impressions and help them develop a gap analysis and pursue potential solutions to planning shortfalls. Delegates' input from this workshop will be included in final product development.

***“You need to be ready to drop the bomb and then tweet the effects within minutes.”***

These findings and framework will help maximize a commander and staff's options for planning and executing multinational task force operations by effectively synchronizing lethal and nonlethal actions, simultaneously incorporating commander's intent to reach that end state.

There were multiple outcomes from the UDE session. First, the program managers received necessary feedback from SMEs around procedures linked to the six-phased joint targeting cycle. Second, facilitators were able to validate the UDE process, employing modern tools for survey and content deliberation. Last, the conference set the context for the ILNA working group efforts through 2018.



**Deliverable Timeline:** The results of the ICDE ILNA workshop will support development of an Integration of Lethal and Nonlethal Actions Guidebook to: 1) perform national self-assessment of available lethal and non-lethal capabilities, 2) present that information to a multinational working group in a standardized format, and 3) integrate those capabilities with other nations of the multinational force to develop a coalition capability package. Timeline: Solution Development Workshop #4 in December 2017; Solution Development Workshop #5 in February 2018; 2<sup>nd</sup> Peer Review conducted in March 2018; User Assessment Event #1 in May 2018 at the Joint Fires Symposium in Virginia Beach, VA; and again during the 2<sup>nd</sup> User Assessment Event in October 2018.

## **Disruptive Technologies: Influencing the Conduct of War Workshop**

*Facilitators: Col Alfred Marstaller, DEU F (ACT); Col Robert Kraus, USA F/LTC Timothy Povich, USA A, (NATO-STO/CSO)*

### Introduction

One definition of a disruptive technology is a technology or a set of technologies applied to a relevant problem in a manner that radically alters the symmetry of military power between competitors. An example would be the development and implementation of the tank in World War I. The use of this technology immediately outdates the policies, doctrines and organization of all actors. Disruptive technology is as much a change in thinking defined by experimentation and approach to design process as to creating physical products. These technologies will require new operational concepts to implement them effectively and must be monitored by the CD&E community. Commanders and planners need to be aware of the potential opportunities and risks associated with the use of these new technologies. Concept developers and experimenters must be aware of the changing technological landscape to leverage new opportunities and overcome potential challenges. The disruptive technologies syndicate asked two overarching questions of the participants: 1) What do disruptive technologies mean for the future of warfare? 2) What are the ramifications for defence concept developers?

***“Is a soldier really an elite athlete? No, they are different. There is no even playing field in war.”***

The goal for this workshop was to introduce potentially disruptive technologies in the areas of materials and manufacturing, human performance, hypersonics, and quantum technology to both inform participants about the current state of the individual technologies and potential military impacts as well as to have participants analyze and discuss the connections between emerging technologies and new concepts. The participants explored how these technologies can influence changes in tactics, techniques, and procedures within these topic areas as well as what opportunities and challenges exist for the international concept and development community to foster an innovative environment for disruptive technology development and sustainment. Among the key aspects of these environments are the rate of technology advances and evolution and increased access to these technologies, in addition to the dominance of the commercial sector.

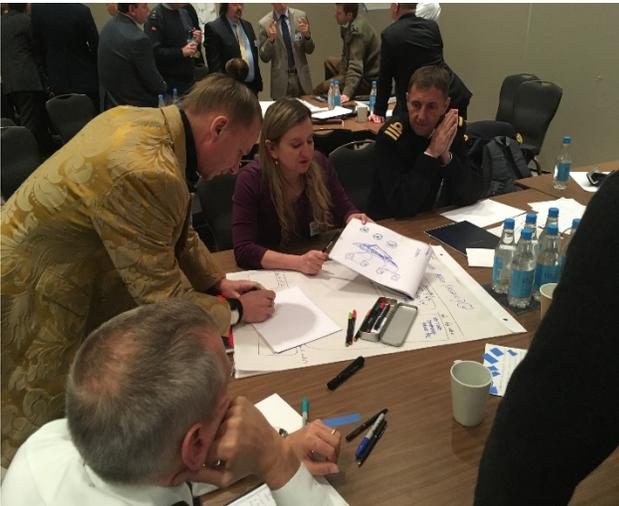
## Impact

The small group activity was a catalyst in driving discourse within and among group participants. The presenters and subject matter experts provided a basis of understanding for the participants and how these processes may assist in developing game-changing technologies. Six small groups discussed the effects of the technologies on warfare and what opportunities, challenges and risks exist for the CD&E community in the given areas. An immediate impact of the sessions was a greater understanding for all participants of the four designated technology areas which may have impacts in the near future. The second impact was the experience gained by the participants in terms of analyzing emerging technologies to determine future impacts. Four workshop sessions were held to learn about and analyse the designated technology areas with a fifth workshop session culminating in a rapid paced idea generation activity which yielded six solutions which directly address problem statements posed by the small groups. The longer term impacts may include informing commanders of force changes in tactics, techniques, and procedures to meet future near and long-term challenges at all three levels of warfare.



## Key Outcomes or future implications

One theme that was central to the syndicate was a need to foster an innovative and collaborative thinking environment in order to create more leading edge and disruptive solutions. A central recurring theme was the need to transition from segmented development offices which can silo information and inhibit innovation. Another prevailing issue identified was the necessity of looking at the time horizons for the impacts of the disruptive technologies, and fort scientists and engineers to better highlight the military impacts of the technologies. Close communication is needed between the CD&E and S&T communities to maintain awareness of upcoming impacts of technologies.



## Way Ahead and Recommendations

The subject of several workshop discussions was the ability to share research findings and lessons learned as a significant benefit to leveraging resources and improving the speed of concept development. Ways of improving communication and sharing information were also recommended, such as the Materials and Manufacturing Community of Interest (CoI) which could serve as a forum for sharing such methods in order to stimulate leading concept development processes and leverage new material solutions to existing problems.

## Deliverables

The post-workshop goals consist of continuing to encourage collaboration among technical peers and conceptual developers and planners in order to facilitate a common understanding of the characteristics of future technologies and development processes. The following products were discussed as post syndicate deliverables:

- Toolkit
- Frameworks

- Enhanced integration between the CD&E Community and the S&T Community with standard technology sessions at future conferences
- Development of six solutions to problem sets which included: methods of increasing technological information sharing; informing investment decision making to realize the values of pooling and sharing resources; gathering innovative ideas from throughout the entire NATO organization; transferring disruptive ideas into CD&E actionable items; and recognizing the value of the human domain in disruptive technologies.

Presenters included:

- *Materials and Manufacturing* (Mr. Steven Savage, Dr. Tim Bunning)
- *Human Performance Enhancement* (Dr. Karl Friedl, Mr. Stefan Reschke)
- *Hypersonics* (Mr. Mike Huggins, Dr. Guido Kurth)
- *Quantum Technologies* (Dr. Gareth Brown)

## **C2 and the Future of Headquarters Workshop**

*Workshop Leaders: Lt Col Jim Hill, GBR A, DCDC SO1 Concepts Land 2 and Mr. Jes Odedra, GBR Civ, DCDC*

The workshop aimed to consider how Defence should best develop and sustain an enduring and agile command and control (C2) capability, noting that exploiting information, being more integrated as a force, and being more adaptable to changing circumstances are the three central ideas of enhancing joint action. The workshop focused upon syndicate activities to consider four key themes: How does our C2 become more Agile? How do we make HQs continuous learning organisations? How do we make our C2 more resilient? What are the C2 implications of future technologies?

The United Kingdom Ministry of Defence (Development, Concepts and Doctrine Centre, Defence Science and Technology Laboratory and Joint Forces Command, Joint Warfare staff) and invited subject matter experts from NATO ACT, C2 Centre of Excellence and academia delivered a workshop, building upon the principles outlined within the Joint Concept Note 2/17, Future of Command and Control. (<https://www.gov.uk/government/publications/future-of-command-and-control-jcn-217>).

The workshop considered that Future C2 must be designed to adapt to a broad range of future crisis and conflict situations, and able to operate with various actors in different configurations across a full spectrum approach. To achieve this will require greater coherence of military C2 structures and processes across government, with those of international partners and, where possible, with non-governmental organisations. The workshop considered how Defence should best develop and sustain an enduring and agile C2 capability.



The workshop was very well supported with broad representation from across the international CDE community. Delegates provided varied expertise and perspectives, from those with significant knowledge of the development of current C2 theory, to those drawing on personal and practical experience. A good blend of ideas were considered, leading to considerable discussion and debate. Utilising centralised briefings, syndicate discussions and cross briefing of outcomes, the workshop considered the following key issues by answering questions for the identified workshop topics:

*Topic One – How Does our C2 Become More Agile?*

- Q1. How might greater adaptability and agility be developed and sustained in future C2 organisations?
- Q2. Is there agreement on how commanders and staff need to change to cope with future situations? If so, via what means might this change be brought about?
- Q3. In working with non-military partner organisations, in what ways might greater coherence of understanding of the situation be developed, and also how might decision making be effectively undertaken?
- Q4. How do we train (individual and collective) for adaptation and agility?
- Q5. How can technical infrastructure, services and applications be designed, procured and sustained to support more adaptive and agile C2 organisations and processes?

*Topic Two – How do we Make HQs Continuous Learning Organisations?*

- Q1. What role should a HQ's leadership play in ensuring that the HQ becomes a genuine learning organisation?
- Q2. How can we reward the people in our HQs for positively contributing towards organisational learning?
- Q3. How can busy HQs find time and resources for organisational learning activities? (Why are HQs so busy, how can HQs better allocate time and resources for organizational learning)?
- Q4. What tools do the optimum learning organisations HQ have at their disposal (e.g. access to business social media)?
- Q5. Leadership will only buy into organisational learning if they can understand its benefit. How do we tangibly demonstrate the value of organisational learning within our HQs?

*Topic Three – How do we make our C2 More Resilient?*

- Intro Q. What types of Destruction, Degradation or Disruption (D3) do headquarters need to have the capability to avoid, mitigate, or restore?
- Q1. Are headquarters currently able to adequately deal with D3?
  - Q2. To what extent can the ability to manoeuvre in the C2 Approach Space counter the adverse consequences of D3?
  - Q3. What is the expected impact of increased automation and autonomous systems on a Headquarter's ability to cope with D3.
  - Q4. Identify C2 Resilience-related metrics that should be employed in Headquarters?
  - Q5. Articulate C2 Resilience-related hypotheses that could be empirically tested with data from case studies and experiments.

*Topic Four – What are the C2 Implications of Future Technologies?*

- Q1. Identify technologies, existing and future, that could improve efficiency and/or effectiveness of a HQ – corollary: identify HQ activities that could be improved by injecting available technology?
- Q2. Identify any extant and/or future technologies that may (fundamentally) change how C2 is being done.
- Q3. What degree of automation would be acceptable, and for what HQ roles? The imperative of technological progress suggest that we automate whatever can be automated and let the human handle what remains. Following this paradigm, a future HQ could be manned primarily by Synthetic Agents (supervised by Human Agents)?
- Q4. Planning and decision functions are very human centered and will remain so in the face of technological advancement in knowledge systems in the near future. So, how do you help command staff develop new problem-solving and thinking skills while at the same time building and implementing knowledge systems that inform and improve staff decision making in such a way that is seamless in use and adaptable to changes or improvements?



Q5. Would you use ASSOCIATE in a HQ? If no, why not? If yes, what are the key benefits of ASSOCIATE, and what HQ activities may be impacted (positively or negatively) by its introduction?

The workshop was used to inform future C2 exploitation work within the UK and also feed in to other national and NATO programmes and events, including: the NATO ACT C2 Focus Area work, preparation of Chiefs of Transformation Conference workshop and NATO C2 Centre of Excellence preparation for TIDESPRINT activities. Findings from the workshop were emailed to workshop delegates on 24 October 2017, and are posted on the TRANSNET site, <https://cde.transnet.act.nato.int/Events/Conf17/Presentations/Forms/AllItems.aspx> in order to inform follow on activities and maximise the value of the event.

**Deliverable Timeline:** The results of the C2 Workshop will be used to inform multiple NATO ACT, UK and other national programs and processes, to include ongoing UK future of C2 exploitation activity, the Chiefs of Transformation Conference, December 2017; NATO TIDESPRINT, April 2018; and NATO C2 Centre of Excellence Symposium, Autumn 2018.

### **International Cyberspace Operations Planning Curriculum (ICOPC) Workshop**

The ICOPC project is a US / NATO ACT led line of effort in the 2017-18 Multinational Capability Development Campaign. The focus of the project is to identify the key tasks, knowledge, skills and abilities necessary for an operational headquarters planner to inject cyberspace considerations into the planning process; develop and prototype a best practice guide for multinational cyberspace planners; and provide a recommended curricula that multinational partners can use to develop planning courses or augment existing planning courses to develop planners with a common baseline understanding of the cyberspace domain and how these considerations should be incorporated into the planning process.

The ICOPC project scheduled a solution development workshop to run concurrently with the ICDE conference in order to leverage the resources and infrastructure supporting the conference. The workshop consisted of a mix of instructional designers and cyberspace subject matter experts. The outcome of the workshop was a draft curriculum for two target audiences, one of senior leaders and one operational planners. The content included the knowledge, skills, abilities, tasks, training objectives, and enabling objectives for the two targeted audiences.

One of the challenges we face is that mission partners do not have a common baseline understanding of the cyberspace domain and how these considerations should be incorporated into the planning process, particularly mission analysis and course of action development.

**Deliverable Timeline:** The ICOPC team will conduct national peer reviews of the draft curricula, adjudicate comments, and conduct initial verification as part of CYBER PHALANX 2018, a European Defense Agency sponsored exercise in June 2018.