EXECUTIVE SUMMARY

2018 International Concept Development & Experimentation Conference
CD&E: Confronting the Challenge of a Disrupted Security Environment
Washington, D.C., United States
30 October to 1 November 2018

Introduction

The Joint Staff hosted the eighteenth annual International Concept Development & Experimentation (ICD&E) Conference from 30 October to 1 November 2018 in Washington, D.C. Headquarters Supreme Allied Command Transformation (HQ SACT), Deputy Chief of Staff Strategic Plans and Policy, and United States Joint Staff (JS), Directorate for Joint Force Development (J-7) cosponsored this the event. The theme was "CD&E: Confronting the Challenge of a Disrupted Security Environment." This conference provided an opportunity for international and Alliance CD&E practitioners to meet face-to-face, work together in workshop venues, and collect outputs for current programmes of work and products. There were 232 conference delegates, from 35 nations, including representatives from the North Atlantic Treaty Organization (NATO), NATO Partner Nations, the European Union, and various industry representatives.

The conference is of great value to the Alliance and partner nations providing a unique opportunity for the international community to discuss the most current issues relating to CD&E in the process of capability development. At the conference, the discussions and interactions established here reinforces the relationships between HQ SACT, Joint Staff J-7, attendees and those in the community of interest for current and future collaborative work.

Plenary Sessions

Mr. Donald Morse (USA Civ), Chief, International Force Development Division, JS J-7, opened the conference by welcoming the attendees. The two co-sponsors, Major General William Hickman (USA A), Deputy Chief of Staff, Strategic Plans and Policy, HQ SACT and Rear Admiral Andrew Loiselle (USA N), Deputy Director Future Joint Force Development, JS J-7, set the stage for the next three days in their welcome remarks. It was noted that the conference allows us to design our force based on the future of our capabilities and concepts we have developed here. The take-away challenge to the group was to be ready to interact, be part of the plan, participate, and share experiences. This will allow the focus on the task at hand to assist in definition, complexity, structure, people development, and the influence of concepts.

Mr. Paul Scharre (USA Civ), Senior Fellow and Director, Technology and National Security Program, Center for a New American Security discussed the non-technical challenges presented by the use of autonomous technology in offensive and defensive situations. He posed the question, "Are we comfortable delegating life and death decisions to machines?" Autonomous technology is developing at a rapid pace but poses moral, ethical, and legal questions that are unanswered and are open to varying interpretations by different nations and cultures. Mr. Scharre postulated that there are situations that require unique human input that cannot be fully automated.

Dr. Ulrike Franke (DEU Civ), Policy Fellow, European Council on Foreign Relations discussed autonomous weapons. Autonomous Weapons Systems (AWS) may instigate a revolution in military affairs. A future example of an AWS, is commonly referred as a "killer robot." Others, such as autonomous unmanned aerial vehicles (UAVs) and surface-to-air missile defense systems, are a reality today. The changes that arise from this new type of warfare include operational (military level), doctrinal/strategic (political level), and societal. By far the most revolutionary element of

AWS will be the ethical question—will humans delegate life-or-death decisions to machines? This will require debate and discussion in not only by elected bodies but also by the public.

Dr. Andrew Moore (USA Civ), Dean, School of Computer Science, Carnegie Mellon University, discussed Artificial Intelligence (AI). The early development of AI systems up to 1997 was based on the model Perceive-Decide-Act. However, this approach was flawed and AI development stagnated until the advent of machine learning. Since the development of the new "AI Stack" (Perceive-Decide-Learn-Act), AI system development has shown broad potential use for both good and bad. Future AI development must effectively leverage human capital and include concepts such as game theory and machine learning in order to make the most use of the "good" and defend against the "bad."

Dr. Kilcullen addresses the panel consisting of (l-r) VAdm Bennett, Dr. Moore, BGen Basinger, and Dr. Franke.

A Town Hall Panel, moderated by Dr. David Kilcullen (USA Civ), included the following panelists: Vice Admiral Paul Bennett CB OBE (GBR N); Chief of Staff HQ SACT, Brigadier-General Derek Basinger (CAN A), Director General Capability and Structure Integration (DGCSI); Dr. Franke; and Dr. Moore

The panel discussed the challenges posed by the revolution in military affairs underway in the fields of autonomy and AI. The programme allowed attendees to engage the panelists on topics raised by the guest speakers and senior military officers. Discussions included: requirement for "human in the loop" during lethal and non-lethal decision-making, the legal, ethical, and moral considerations involving autonomous weapons; advancing "pieces" of solutions rather than trying to solve the whole issue at once. There was a consensus that all stakeholders—military, technologists, ethicists, policy makers, lawyers, and philosophers—should contribute to the debate on design and use of autonomous systems.

General Paul Selva (USA F), Vice Chairman of the Joint Chiefs of Staff delivered the conference keynote about disruptive technology and its impact on military operations. He highlighted military innovation, great power competition, and how disruptive technology is changing warfare. Gen Selva mentioned the timeline for warfare technology changes including stealth, computers, Global Positioning Systems, and compared it to the disruptive technology advances of today. Some technologies we talk about are so important that they are changing the way we fight: Cloud computing and Big Data; connection/transmission at 4G/5G+ speeds; AI; autonomy; 3 Dimensional manufacturing/additive manufacturing. He stated that these issues are not merely a unifying set of technologies, but really "democratizing set of technologies." He stressed two imperatives: advancing the understanding of AI, and breaking down data-sharing barriers. We and our partners must share the data. If we cannot share data, we cannot collaborate and have segmented data. If our perceived battle space is different from your perceived battle space, this is a vulnerability.

Gen Selva steps off the stage to answer NLD LTC Jos Hekking's question.

Mr. August Cole (USA Civ), author, futurist and Senior Fellow, Atlantic Council's Art of Future Warfare Project, discussed the importance of using fiction to envision the future and identify potential blind spots. Sometimes fiction

can be more useful in helping us look at the world in a different way and understanding the globality of conflict, such as the role of hackers and Silicon Valley. He outlined his thesis through his acronym, FICINT (Foresight, Individuals, Community, Inspiration, Nuance, and Technology). To illustrate, he then walked the different terms using fictional movies and books to illustrate his points.

Admiral Manfred Nielson (DEU N), Deputy, Supreme Allied Commander Transformation, provided the conference endnote. He highlighted how Trident Juncture truly hit the mark. Adm Nielson stressed the importance of the willingness to change in in the face of this new technological era. NATO must be willing to accept the inherent risk involved in embarking on fast concept development and experimentation. NATO allies must also be willing to share information necessary to enable these new technologies. Fostering this new technology, allowing experimentation and embracing a culture of innovation will be necessary if NATO is to maintain its technological edge. As the technology evolves, so do the ethical and moral questions requiring consensus across the alliance; keeping in mind that potential adversaries will not be restrained with their use of disruptive weapons.

Adm Nielson addresses the delegates.

MG Hickman provided closing remarks. He highlighted the three working groups: *From Disruptive Technologies to Capabilities: New Concepts for Autonomy, Artificial Intelligence and Data Analytics*, had great speakers and outputs; *Concept Development Management in NATO: "Future Collaboration,"* identified many tasks for ACT, Centres of Excellence (CoEs) and NATO Command Structures; and *Disruptive Thinking: Think Wrong Blitz and Executive Seminar*, taught about Thinking Wrong.

ESP Captain Javier Gamboa, Joint Concept Development Centre, was invited to the stage. He announced Spain will host the 2019 ICD&E Conference, most likely in Madrid next November.

Continuing the closing remarks, RDML Loiselle thanked the delegates for their active participation throughout the conference. He announced the Capstone Concept for Joint Operations is about to be signed and will need to be validated. RDML Loiselle emphasized Gen Selva's speech where we must gain an advanced understanding of AI and the need to share data.

Towards the end of each day, delegates received the Daily SITREP on Experimentation in TRIDENT JUNCTURE 18 (TRJE18). TRJE18 provided an environment for the testing, refinement, and further development of existing or new

Conference delegates networking at the CD&E Exchange.

capabilities. Experiments from NATO entities and Nations were coordinated and integrated into TRJE18. Through risk analysis and selective experimentation injects, adverse impact on exercise objectives were mitigated. NATO ACT Operational Experimentation coordinated over 20 experiment activities within TRJE18 ranging from discovery to validation. Please visit www.act.nato.int/tj18 to learn more about NATO ACT Experimenting in Exercises or to access each TRJE18 experiment fact sheet.

The conference held a CD&E Exchange that provided an informal environment for conference delegates to network, exchange ideas, and introduce current CD&E efforts across the globe. By adopting a mini-expo format, attendees learned of the many NATO Centres of Excellence, the Multinational Capability Development Campaign and other important programs of work.

Workshops

From Disruptive Technologies to Capabilities: New Concepts for Autonomy, Artificial Intelligence and Data Analytics Workshop Led by Colonel Robert Kraus (USA F), NATO Science and Technology Organisation (STO); supported by Commander Joe Strassberger (USA N), HQ SACT Autonomy Programme

The workshop incorporated subject matter experts: Dr. Jason Stack, Office of Naval Research and Mr. Arthur Holland Michel, Center for the Study of the Drone, Bard College (expertise - Autonomous Systems); Dr. David Martinez, Associate Division Head Cyber Security and Information Sciences Division and Dr. Sanjeev Mohindra, Lincoln Laboratory, Massachusetts Institute of Technology (expertise - AI and Data Analytics) Captain Tim Hulme OBE, Development, Concepts and Doctrine Centre and Dr, Robert Davis, Chief Scientist, Geospatial Research and Engineering, US Army Engineer Research and Development Center (expertise - Urban Operations).

New technologies in Autonomous Systems, AI, and Data Analytics have the potential to provide capabilities that will radically change the operational environment – especially in the areas of Cyber, Command and Control, and Urban Operations. To leverage these capabilities, commanders and planners must grasp the potential opportunities and risks associated with the application of these new technologies. The workshop explored the current status of technologies, potential capabilities, and opportunities for concept development. The ideas and outputs from the workshops will inform future STO plans and program, NATP Urbanization Concept implementation, HQ SACT's Disruptive Technology roadmap and Strategic Foresight regional studies.

The Disruptive Thinking seminar takes advantage of the warm weather while running through a hands-on exercise.

Disruptive Thinking: Think Wrong Blitz and Executive Seminar Led by **solve/next**: Mr. Chris O'Keefe (USA Civ) and Mr. Greg Galle (USA Civ); supported by ACT Concept Development Branch Head, HQ SACT.

The Think Wrong Blitz and Executive Seminar introduced NATO delegates to the Think Wrong Problem-Solving System—a flexible system for defining and developing concepts and running experiments. Through a mix of short talks, stories, and hands-on drills, participants learned new language, frameworks, tools, and techniques for conquering the status quo and creating bold concepts to today's and tomorrow's vexing problems. The workshop promoted and explored disruptive thinking, alternative analysis, and problem formulation techniques. It supported the HQ SACT personnel development and staff training which emphasizes innovative thinking.

Concept Development Management in NATO: "Future Collaboration" Workshop
Led by Commander Stefan Meyer (DEU N), Concept Development Branch Staff Officer, HQ SACT; supported by Lieutenant Colonel Uwe Willert (DEU F), Concept Development Branch Staff Officer, HQ SACT

Delegates of this targeted workshop were by invitation only. The workshop provided a needed opportunity for stakeholders to discuss the recently updated "CD&E Handbook" and future management of CD&E after NATO Command Structure adaptation. Discussions addressed management problems and insufficient collaboration between the CoEs, HQ SACT (including Operational Experimentation and Operational Analysis), HQ Allied Command Operations, NATO organizations, member nations and national headquarters. A direct result of the NATO Command Structure Adaptation is the implementation of a TNB staff officer responsible for the communication with the CoE's Concept Development Department. The workshop attendees agreed that an Informational and Knowledge Management system in the broad Community of Interest must be developed and implemented. Workshop proposals for future collaborations were briefed directly to DACT and DCOS SPP.

Understanding the Military Implications of Disruptive Technologies Workshop
Co-led by Mr. Jeff Becker (USA Civ), JS J7 and Mr. Neil Chuka (CAN Civ), DGCSI

Guest speakers included: Dr. Scott Savitz, RAND Corporation (expertise - Maritime Disruptive Technology); Mr. Bryan Clark, Center for Strategic and Budgetary Analysis, (Expertise - Battle Network Competitions); Mr. Warren Connors, Defence Research Development Canada (expertise - Artificial Intelligence and Robotics in Mine Warfare); Mr. Carl Rehberg, Center for Strategic and Budgetary Analysis expertise - (Lasers/Hypersonics/Railguns); Dr. Peter Mason, Defence Research Development Canada (expertise - Quantum Engineering): and Ms. Elsa Kania, Center for New American Security (expertise - Military Artificial Intelligence).

This workshop explored common understanding of the implications of several emerging technologies on how military forces are structured and operated. The audience was divided into two groups: maritime and battle networks. Delegates examined how these technologies may alter warfare, the problems posed for allied militaries, and how to leverage these advantages. The workshop looked for ways to mature and refine these implications, including steps required in the near-term to prepare for these changes. During the conference, Canadian and U.S. workshop presenters provided a baseline understanding of several rapidly advancing military/technical areas.

Workshop discussions developed several observations and insights about how these technologies might change conflict and war within our respective nations. Together, Canada and the U.S. will develop these insights into a summary report that will be used in our respective force design efforts (such as the U.S Joint Operating Environment study), as well as provided to workshop participants.