INTERNATIONAL
CONCEPT DEVELOPMENT & EXPERIMENTATION
CONFERENCE SYNOPSIS

26-29 OCTOBER 2020

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INTRODUCTION

Although originally planned as a special 20th occurrence event in Paris, FRA, the 2020 International Concept Development & Experimentation (CD&E) Conference, was conducted as a virtual event due to the exceptional circumstances caused by the COVID-19 pandemic. The virtual conference took place in various real and digital spaces from 26-29 October 2020.

A specific aim was to explore and exploit virtual opportunities for such a conference and "push the envelope". In the spirit of CD&E, the event was a bold experiment in exploiting the virtual format through a specifically contracted platform (HOPIN) to enable better collaboration and networking opportunities than standard virtual tools provide. This required a dedicated network and platform operations as well as studio team working in the background to enable a successful event.

The conference was designed to cover three different topics:

- "**A glimpse into the future**" (day 1) covering unique challenges to difficult environments,
- "**Experimentation**" (day 2) covering the applications and the processes,
- "From **ideation to concept**" (day 4) covering constructs going forward,

and included instructional workshops (day 3) to enhance individual CD&E practitioner skills creating an interactive environment to build on ideas.

During the conference, many inspiring speakers shared their visions in twelve different sessions and three panel discussions. Furthermore, nine different instructional workshops were conducted simultaneously in two iterations to enhance the participants' CD&E toolkit. Other highlights included networking opportunities and the CD&E Exchange Expo facilitated through virtual booths.

The conference was a unique virtual event that highlighted Allied Command Transformation's (ACT) digital agility and transformational adaption in response to this new normal. The conference demonstrated a successful pathfinder for future NATO virtual events. The conference concept explored many new approaches to engage the virtual audience, including live illustrations to all live sessions, a virtual Expo and networking capabilities as well as prizes and challenges to incentivize active participation.

Of course, due to such an experimental environment, observations and lessons were countless not only regarding the substantive content provided to the audience, the fruitful workshops, but also from an organizational and technical point of view. A few hiccups were unavoidable, however as was emphasised many times during the conference, one cannot innovate or succeed without some failures, the important thing is to fail forward and learn from mistakes. Observations and analysis will be presented in an ACT internal report later in 2020.

With over 350 participants from 39 nations around the world, including Australia, Singapore, Japan, Finland and Brazil, this year's conference iteration had the highest number ever of participants and nations by far. Based on feedback and an initial glance at the conference survey, the event was extremely well received, and more than a few experienced conference delegates even called it the "best virtual event" they had ever attended!

"***Be Bold, Be Curious, Be Creative. Challenge Assumptions and Conventional Wisdom***"
Luke Shabro, US Army Mad Scientist Initiative

CONFERENCE OPENING

KEYNOTE ADDRESS

RADM JOHN TAMMEN , DEPUTY CHIEF OF STAFF, STRATEGIC PLANS AND POLICY, HQ SACT

Noting the impact of COVID-19, RADM John Tammen opened his speech by highlighting the lessons learned and the importance of resilience and adaptation to shock in today's unpredictable environment to better cope with future crises. RADM Tammen stressed the significance of preparation, and how preparation reveals opportunities when shock occurs. He continued on how Concept Development and Experimentation (CD&E) is key to development and ongoing enhancement of NATO's warfighting ability. RADM Tammen spoke about investing a continuous and focused effort in the Alliance, saying "we must exploit the cognitive power of the 30 nations including their Centres of Excellence (CoE)."

RADM Tammen emphasized two topics of focus: Firstly, NATO's Warfighting Capstone Concept (NWCC), Supreme Allied Commander Transformation's (SACT) top priority. NWCC will guide future warfare development of NATO's Military Instrument of Power (MIoP) through a Warfare Development Agenda (WDA). Informed by a 20-year horizon warfighting perspective, this will support designing an effective military power through 2040.

Secondly, RADM Tammen focused on ACT's major effort this year to provide advice to the Military Committee on the implications of Emerging Disruptive Technologies (EDT). The advice was supporting the development of an EDT implementation Strategy and focused towards the impact of seven priority EDTs: Artificial Intelligence (AI), space technology, autonomy, big data and advanced analytics, quantum technology, hypersonics, and bio-technology and human enhancement.

In closing, RADM Tammen highlighted that the COVID-19 pandemic demonstrated how a normal situation can change quickly. What better way to show experimentation and new concepts in a virtual conference than this one! He encouraged the participants to contribute and challenge constructively during the event.

WELCOME REMARKS

COL STEPHAN PILLMEIER, BRANCH HEAD CONCEPT DEVELOPMENT, HQ SACT

COL Pillmeier articulated the unique nature and of this year's conference amongst the COVID-19 pandemic landscape and pathfinder character towards a new normal. "Of course," he said, "we would rather be in Paris, but today we're coming to you virtually from Virginia Wesleyan University (VWU) in Virginia Beach, VA." He particularly thanked Dr. Scott Miller, the President of VWU, for enabling this endeavour in cooperation with NATO, by hosting the operations centre and studio for the event. COL Pillmeier highlighted the significant interest by the CD&E community with more than 360 registrants from 39 countries, expanding beyond NATO countries and time zones, to include Singapore and Australia. He stressed the collaborative character and multi-disciplinary approach through by incorporating and linking military with industry and academia focused perspectives. Noting the uniqueness of the conference, he appealed to the audience to be interactive exploiting the collaborative platform setting, and highlighted networking opportunities and utilizing the "booths" in the CD&E Exchange. He also identified this virtual setting as an educational environment.

A GLIMPSE INTO THE FUTURE (DAY 1)

DETERRING AGGRESSION AGAINST NATO: TOWARD A NEW WARFIGHTING CONCEPT

DAVID OCHMANEK, RAND CORPORATION

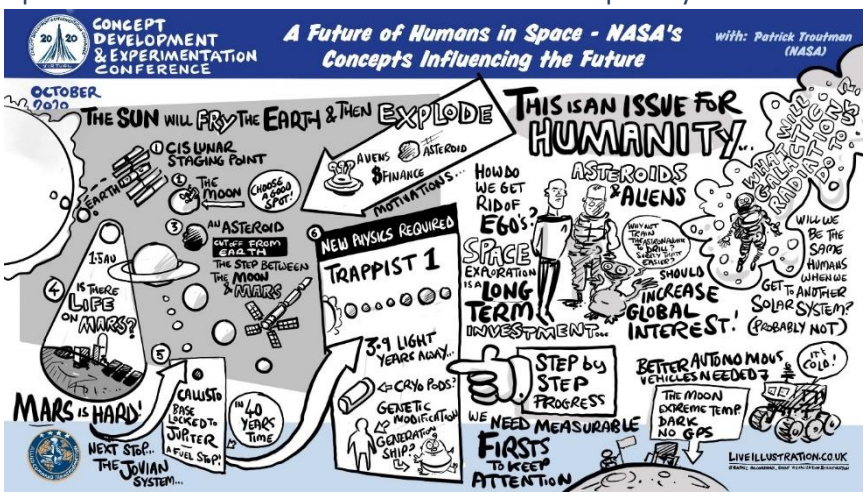
In his presentation, David Ochmanek discussed how to project power effectively into highly contested environments and specifically how NATO should improve defences along its eastern flank. His evaluation indicated that NATO forces presently could be unable to defend the Baltic states against a major aggression; this was due to limitation's in NATO's forward posture. He also added that these limitations are made more challenging by Russian artillery capabilities, which complicate NATO forces' ability to manoeuvre and sustain forward arming and refuelling areas. He stressed that NATO's eastern flank may also lack a current operational concept that enables it to defend against an invasion. David Ockmanek concluded by stating that initiatives to improve NATO's posture and efforts to adopt new approaches to warfighting can fundamentally change the dynamics of a fight from NATO's perspective.

A FUTURE OF HUMANS IN SPACE

PATRICK TROUTMAN , NASA

Patrick Troutman first addressed the importance of space exploration to the audience. Humans will eventually require a second biosphere because our own sun will eventually grow and start warming up the earth. As our current civilization has the capability and resources to do so, we should explore space grasping the opportunity we have now with so much technology and civilization at our fingertips.

He discussed how the ISS is mostly a government funded effort and that we are getting away from the government model to where space exploration is commercially supported by industry. Space exploration, would include humans exploring the moon as next logical step. The lunar south pole is a great place to start because it has an abundance of natural resources like water and sunlight. NASA is trying to create the infrastructure to get there, which includes transportation, habitation, mobility, and power. Beyond the moon it gets a lot harder; nevertheless, lunar space can be a "jumping-off" point for harder capabilities.

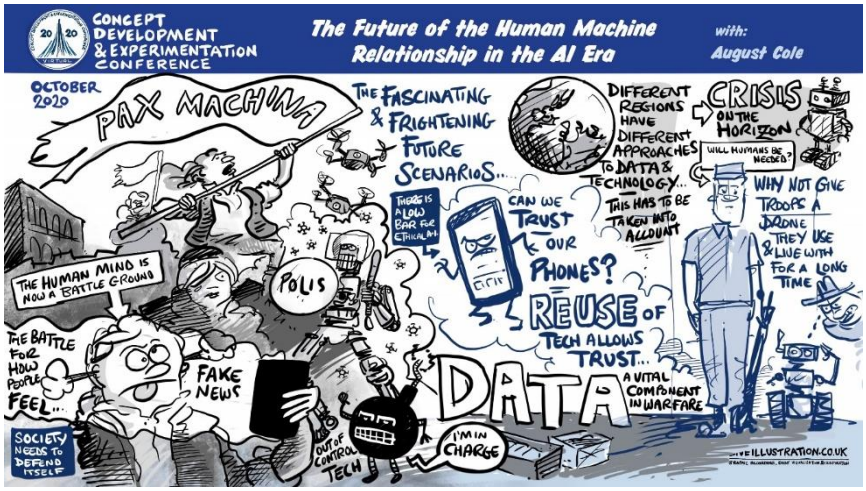


Troutman finally explored concrete milestones: getting to the moon in 2024 through commercial means and subsequently humans in orbit around Mars in the 2030s. He also suggested that space exploration will accelerate once some of the obstacles on earth like climate change, pandemics, and political issues have been overcome. Space exploration is a sort of insurance policy for humanity. It represents an incredible amount of coordination and collaboration with our partners and within the Alliance. It is important to share with the general population why space travel should be pursued.

THE FUTURE OF THE HUMAN-MACHINE RELATIONSHIP IN THE AI ERA, AND THE IMPORTANCE TO NATO

AUGUST COLE, WRITER OF 'FICINT', CO-AUTHOR OF 'GHOST FLEET' AND 'BURN-IN'

August Cole started off with an excerpt from his short story "Known Enemy," that was submitted as part of his contribution to the NATO Operations 2040 study by the NATO Innovation Hub. The story set the scene for his presentation: data is the new ammunition in the future. The exploration of trust



sets the narrative in artificial intelligence (AI) of future conflicts. He provided three ideas to create a framework to discuss the next twenty years. First, the human machine relationship is about trust, but not in machine, actually at the human level. The future of conflict, both at speed and at scale, is not necessarily a question of mass due to AI, miniaturization, other trends, but more from the personalization of conflict. Thirdly, is there no room for failure of imagination. This requires the need for new approaches to foresight like fictional intelligence (FICINT), or the fusion of fiction and intelligence that allows the use of narratives to think about the future of conflict. August Cole argued that there are conventional domains but there is a room for a sixth domain, a cognitive domain. The human mind is a terrain that can be targeted. At a moment in time where we can look at alternative approaches to futures that include the human element with a narrative approach to prepare for the future. In the NATO context of FICINT, for concept development allows the socializing of ideas and focus on human factors.

INNOVATION IN PANDEMIC RESPONSE

LTC PRZEMYSLAW ROMELCZYK, MILITARY MEDICINE (MILMED) CENTRE OF EXCELLENCE (COE)

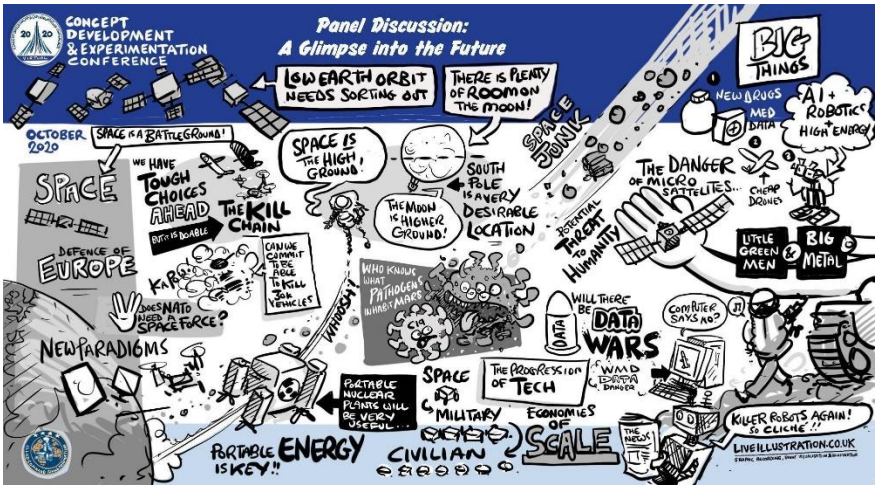
Przemyslaw Romelczyk initially highlighted the reduction of medical care and impact to the medical system due to the COVID-19. He noted how all of these challenges and restrictions presented by the pandemic are actually having the opposite effect in terms of innovations. People are innovating in unexpected ways. He identified three main categories of innovation in response to the pandemic: 3D printing, telehealth, and Artificial Intelligence. Identifying AI as playing a key role in every aspect of the COVID 19 crisis response, he explained the benefits of using advanced technologies to help solve difficult problems. The scope of AI applied to mitigate COVID-19 is constantly increasing.

Emerging innovative technologies offer rapid analysis to early exposure, notifying patients of potential infection up to eight hours before they become symptomatic. Medicine must continue to focus on innovative techniques, especially in the context of a worldwide pandemic. Another point to consider regarding medical data sharing, is balancing medical benefits versus the potential for severe information breaches.

Panel Discussion Day 1: A Glimpse into the Future

Moderated By August Cole, Writer of 'FICINT', Co-Author of 'Ghost Fleet' and 'Burn-In'

Moderated by August Cole, the panel discussion included David Ochmanek (RAND), Patrick Troutman (NASA), LTC Przemyslaw Romelczyk (MILMED COE), and COL Stephan Pillmeier (HQ SACT). The discussion touched on data as the new gold and compared data also to the effects ammunition. LTC Przemyslaw stated that in the medical field is overwhelmed with research and data that requires correct analysis. David Ochmanek postulated that in the race between the U.S., Russia, China, Europe, and India requires cooperation between nations for peaceful use of space that balances security. For Patrick Troutman space is the future area of cooperation for NATO. COL Pillmeier emphasized the political and military character of the Alliance and discussed that warfare requires a comprehensive approach. This is being incorporated in NATO's Warfighting Capstone Concept (NWCC), considering not only fighting, but also shaping and contested environments. Reflecting on August Cole's question regarding the most significant technological prediction for NATO over the next ten years, COL Pillmeier prioritized an enabling "info-structure" allowing information sharing and the consolidated exploitation of all available data (both publicly available and military to NATO nations) would be most crucial. LTC Romelczyk stated that it is telehealth and remote contact with patients. Patrick Troutman prioritized the fusion of technologies like AI, robotics, and high energy density storage units, creating robotic systems that can behave at human level, beyond human scale and durations. David Ochmanek foresaw advanced battle management allowing to share information seamlessly across domains and missions, and exploiting robotics. Fusing these two ideas could reintroduce mass onto the battlefield in all domains by employing large numbers of inexpensive unmanned vehicles. August Cole considered the most significant technological prediction for NATO the fundamental ability to understand the environment not just in a current sense, but in a predictive way.

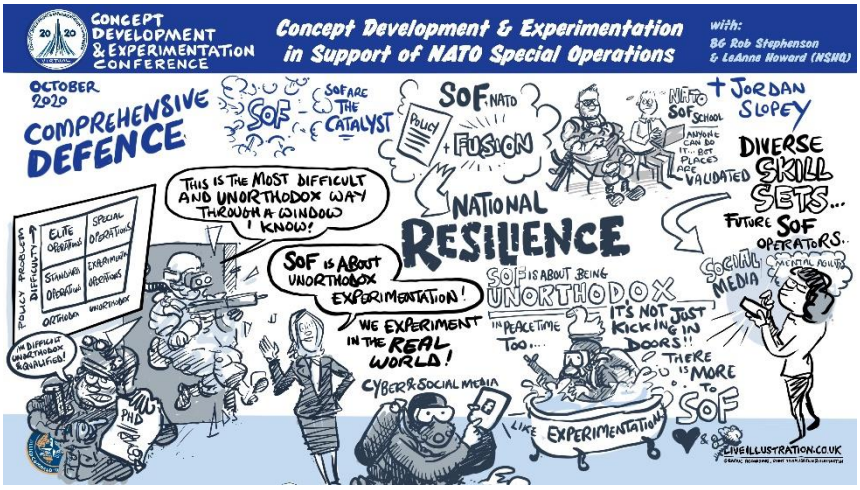


EXPERIMENTATION (DAY 2)

CONCEPT DEVELOPMENT & EXPERIMENTATION IN SUPPORT OF NATO SPECIAL OPERATIONS FORCES

LEANNE HOWARD, NATO SPECIAL OPERATIONS HEADQUARTERS, (NSHQ)

Touching on a Hollywood movie-clip portraying a Special Operations Forces (SOF) operation, Leanne Howard reflected that special operations include much more than just direct action. Special operations are routinely conducted in politically sensitive, uncertain or hostile environments. The resulting need for innovative tools and innovative TTPs makes SOF unique. Howard noted three key lessons: First, the role of experimentation; even with limited resources, the use of cutting-edge technology can level the playing field. Second, lateral thinking; lessons implemented combined with lessons learned. Third, a comprehensive, whole of society approach; not only the mission requires a focused effort and in-depth support, but also recruitment, training, education, equipment, and preparation of SOF operators. She further highlighted some key efforts focused on SOF experimentation that included comprehensive defence and a Joint Fire Observer course. She also noted a growing professional front for "how to build SOF". Critical for future SOF operators was focusing on individuals and exploiting diversity. The value of special operations is not just for direct action missions; SOF are a tool for more than one job, to include counter-hybrid, resistance, or in support inter-agency fusion, from peace-time through post-war time.



THE PROCESS OF DISCOVERY IN OPERATIONAL MILITARY DESIGN

WARREN "SKIP" PARISH , LONGREACH PROJECT

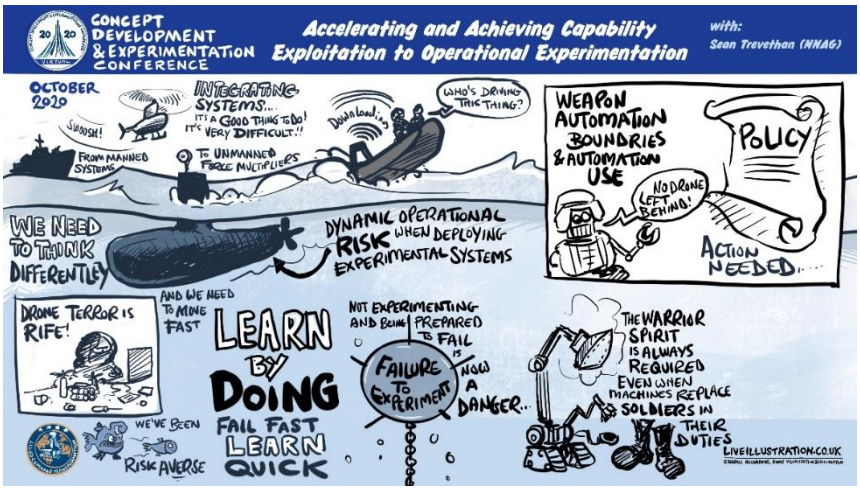
Warren Parish explored the process of discovery in military technology design. He addressed experience related elements of discovery: *What is discovery? What is the process of it? What is the most efficient way to discover? What are the elements of solutions?* Defining a problem set is essentially a calling out of the basic elements that we are after. He contrasted exploring whether the problem set is defining the mission, and/or whether the mission is defining the problem set. He also challenged to look at what nature does in similar circumstances. Nature is a guide; the way that nature does things, may provide a solution or at least better understanding. Warren Parish also focused on resilience, i.e. how war fighters come up with solutions

to their mission revolving around the process that they go about doing that. Resilience is also about confidence and history of successful missions. Eighty percent of current and near future weapons systems are commercial technology; new things are to be expected when stepping onto the battlefield. Conducting studies, interviews, etc. with war fighters and analysing existing "vacuums" or gaps to explore solutions that could help the war fighters succeed in their missions is key. Success is developing technologies that increase mission success or make achieving the mission more efficient.

ACCELERATING AND ACHIEVING CAPABILITY EXPLOITATION TO OPERATIONAL EXPERIMENTATION

SEAN TREVETHAN , NATO NAVAL ARMAMENT GROUP

Sean Trevethan identified the need to accelerate the employment of unmanned systems. Exploiting new technology quickly will be key to maintaining future operational advantage. There is a risk if we do not change the way we do business. This requires new thinking and new ways to move things forward. The future requires an integrated force mix with unmanned systems that can work together to complement existing manned platforms. The Maritime Unmanned Systems (MUS) initiative envisions "a maritime force teamed with interoperable unmanned systems to securely deliver force-multiplying capability by Allied and Partner nations". REPMUS 19 (Robotics Experimentation and Prototyping MUS), a flagship exercise geared at integrating multi-national conventional and unmanned forces to deliver real-world operational effects with seven participating nations, helped coin the phrase "Learn by Doing – fail fast, learn quickly". OP IRIS in March 21 will explore tactical development in all domains and then from interoperability to interchangeability. Dynamic Messenger 2022 will include experimentation in five areas: C2 ashore, Forward Deployed MCM/ASW, Integration of UxV Systems, Integration of Conventional Units, and Interoperability. NATO could leverage the work different nations explore in various pockets to accelerate development. The potential for unmanned systems is vast and offers great opportunities in support of the Alliance; these include integrated networks of unmanned ships, especially in regards to CSIR platforms, or potentially SAR missions.

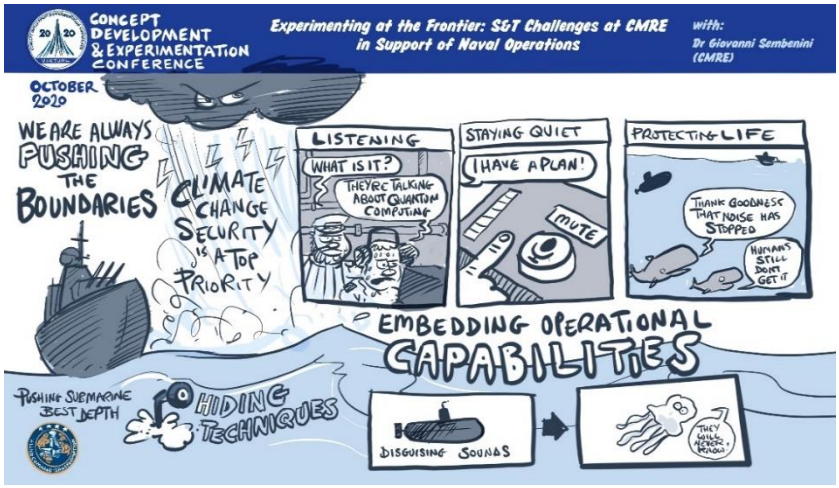


EXPERIMENTING AT THE FRONTIER: S&T CHALLENGES AT CMRE IN SUPPORT OF NAVAL OPERATIONS

DR. GIOVANNI SEMBENINI, NATO STO, CENTRE FOR MARITIME RESEARCH AND EXPERIMENTATION (CMRE)

Dr. Giovanni Sembenini, Deputy Director at the NATO Centre for Maritime Research and Exploration (CMRE) introduced CMRE's mission; CMRE organizes and conducts scientific research and technology developments for the delivery of innovative field-tested solutions to address the defence and security needs of NATO. An established scientific and engineering knowledge base enables CMRE to publish research for the benefit of NATO. CMRE enables nations to work effectively and efficiently together by prioritizing national leads to focus on research and technology challenges both in and out of the maritime environment. NATO ACT innovation branch has been funding CMRE to develop advanced concepts for robotics, anti-submarine warfare and decision support in the autonomy of ASW programs. This specifically includes work to demonstrate the power of oceanographic measurements and assimilative forecasting modelling techniques in order to enhance awareness and tactical

advantage of ASW forces. One recent program established a technology demonstrator to exhibit the "JANUS Blue Force Awareness Concept" during NATO's ASW exercise Dynamic Manta earlier in 2020. The concept consists of four key elements, including oceanographic and acoustic gliders, ocean and

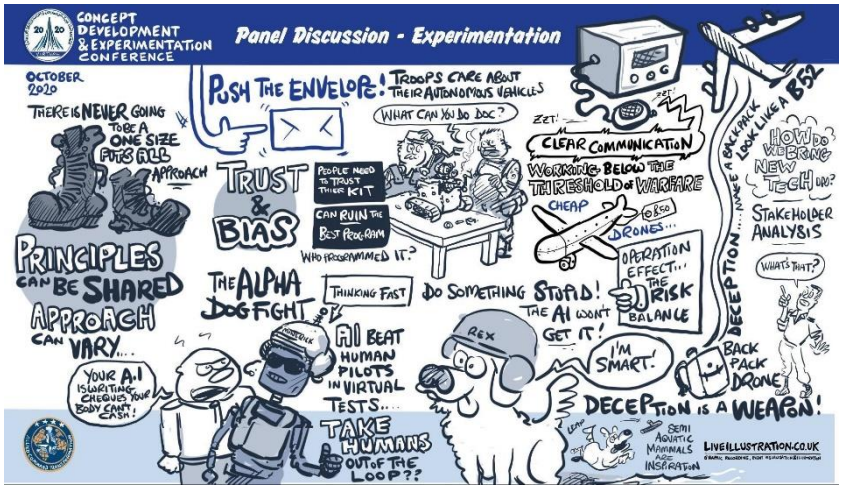


acoustic models with data assimilation, multi-static active sonar performance prediction services and JANUS to communicate the position of any unmanned vehicles to submarines. Concept tests during Dynamic Manta, offered great insights into the possibilities of new oceanographic and acoustic gliders. The exercise demonstrated the assimilative oceanographic forecast system capabilities and provided next generation enhanced services to provide MARCOM with daily meteorology and oceanographic briefings. Acting as Rapid Environment Assessment Support Cell at HQ MARCOM, CMRE provided underwater environmental forecast and tactical decision aid results in the exercise area.

PANEL DISCUSSION DAY 2: EXPERIMENTATION

MODERATED BY DR. LYDIA KOSTOPOULOS, US SPECIAL OPERATIONS COMMAND (SOCOM)

The Panel focused on Experimentation, moderated by Dr. Lydia Kostopoulos (Strategy and Innovation Center, USSOCOM) included: Ms. LeAnne Howard (Strategy and Policy Advisor, NATO Special Operations HQ), Dr. Giovanni Sembenini (Deputy Director, NATO CMRE), Mr. Sean Trevethan (NATO



Naval Armament Group) and Warren "Skip" Parish (Longreach project). The first highlight from the discussion focused on Alliance needs to think about comprehensive defence as NATO models experiments, including the widest ecosystem possible. Another highlight with the panellists was the topic of autonomy and recognition of algorithmic bias. Unexpected bias could exist in various areas and system; this is a definite need and opportunity for experimentation. This spilled into the conversation of trusting an autonomous system that may perhaps be biased. One of the last conversations covered the nature of experimentation and the need or acceptance to fail, it was even phrased as, "Fail Fast". This is the place to be able to fail because it's acceptable to fail - it helps us see how far we could go. This is a challenge, however, especially when in a military environment where failure is not a very popular result.

CONFERENCE WORKSHOPS (DAY 3)

WORKSHOP 1 - INFORMATION ENVIRONMENT ASSESSMENT (IEA); A STUDY IN EXPERIMENT CAMPAIGN

LED BY KATHLEEN HUGHES, HQ SACT OPERATIONAL EXPERIMENTATION BRANCH

Katie Hughes led the workshop titled "Information Environment Assessment (IEA); a study in Experiment Campaign." The workshop looked at an experiment case study for an "Information Environment Assessment" or IEA for short. An IEA is a repeatable information environment assessment method, that operates continuously, is collaborative and flexible at the user level, and enables federated working, supported by a data centric technology solution that is guided by the same principles. The goal for IEA is to shift the level of effort from acquiring and preparing data to one of analysing, presenting, and taking evidence-based decisions. The workshop lead explored the story of IEA from its beginnings in 2016 to present with discussion of the experiments conducted. Each event provided opportunities for learning to shape future activities. Some key considerations learned have been the importance of sponsorship, venue selection, data selection and analysis, and concept demonstrators and prototypes.

WORKSHOP 2 - "LEGAL, MORAL AND ETHICAL ISSUES WITHIN CD&E. A MODERATED, INTERACTIVE PANEL DISCUSSION ABOUT LEGAL, MORAL AND ETHICAL ISSUES WITH DEVELOPING CONCEPTS AND EXPERIMENTING."

LED BY ROBERT BRACKNELL, HQ SACT LEGAL BRANCH

The workshop on legal, moral and ethical issues within CD&E included guests Andrew Milburn, Geoffrey Corn and Charles Dunlap. In their discussion, the panellists reviewed the legal and ethical frameworks that military leaders will rely on now and in the future when making informed strategic, operational and tactical decisions. Geoffrey Corn discussed how advances in technology will impact ethics and law related to war. Andrew Milburn discussed the importance of mission command; while mission command is included in many military doctrines, it is not currently practiced in the way that it was initially designed. Milburn also stated that the current and future balance of the great power competition is and will be dependent on perceived legitimacy and influence of actors in that competition. Charles Dunlap reviewed the connection between law and ethics. He discussed that law is often a baseline determination of ethical standards. In warfare, however, law is often not specific by design because it cannot account for all possible scenarios, military leaders may have to face on the battlefield.

WORKSHOP 3 - "FICINT. HOW-TO WORKSHOP IN FICTION WRITING WITH INTELLIGENCE FOR IMPROVING VIGNETTES AND ILLUSTRATIVE SCENARIOS "

LED BY AUGUST COLE & PETER W. SINGER, WRITERS OF MILITARY 'USEFUL' FICTION

August Cole and Peter Singer led the workshop titled "FICINT. How-to workshop in fiction writing with intelligence for improving vignettes and illustrative scenarios." They discussed the goal of FICINT or fictional intelligence, which is to provide a narrative to figure out the future. The narrative is an effective method to pass along complex ideas. A narrative that hits emotions will drive actions and the more connection the reader has, the more likely they will be to share or distribute the narrative. FICINT is a hybrid of a narrative and research analysis, or a hybrid of entertainment and education. August Cole discussed seven steps how to write useful FICINT. The workshop culminated with each participant writing their own "Useful Fiction Story Elements'' and sharing it with the group. August Cole and Peter Singer provided feedback to participants on their vignettes.

WORKSHOP 4 - "FACILITATION WORKSHOP TO IMPROVE YOUR SKILLS IN FACILITATING (VIRTUAL) MEETINGS AND WORKSHOPS."

LED BY CLARA PETERS, HQ SACT CONCEPT DEVELOPMENT BRANCH

Clara Peters moderated the facilitation workshop and noted that, especially in today's world, conducting workshops virtually is very different compared to what we are all used to doing. The workshop's main focus was to identify what makes a good workshop through advantageous facilitation. The workshop-lead covered the aspects of setting up a workshop using the easy "5Ps": purpose, products, participants, probable issues, process. First, you need a purpose for the workshop – the WHY. Next is products - identifying what the products will be. Then identifying participants – thinking about who do you need, who is coming? Next is identifying probable issues and then thinking of solutions. Finally think about the process and ways to execute. A "bonus P" was also introduced: – a "Parking lot" where the workshop members can park any issues that are not relevant to the issue at hand. Preparation is key; anticipating issues or problems. This can be mitigated through communications checks, meetings, or extra interactions prior to the actual event. Other probable issues to consider are e.g. distracted, negative, or overpowering participants and the challenges of working with them. Overall, there seemed to be an art to facilitation - it's not just a science.

WORKSHOP 5 - "EDT BINGO, A FUN WAY TO EXPLORE THE IMPACT OF EMERGING AND DISRUPTIVE TECHNOLOGY ON THE WORLD OF TODAY AND TOMORROW."

LED BY DR LYDIA KOSTOPOULOS , US SPECIAL OPERATIONS COMMAND (SOCOM)

The workshop on Emerging Disruptive Technologies (EDT) reviewed a series of innovations in technologies that could shape the future security environment. Specifically, Dr. Kostspoulos discussed challenges and opportunities in Unmanned Aerial Vehicles (UAVs), electronic warfare, kamikaze drones, surveillance technology, changes to smart infrastructure and subterranean warfare. In a discussion on smart infrastructures and surveillance technology, she stressed that while technology may be regulated or controlled by laws fixed to geographic boundaries, the cyber domain was not regulated by similar legal barriers. Technological changes in the cyber domain will have implications globally regardless of where they are physically first created or designed. New technologies are being sold to customers that may use the technology to support terrorist related activities or illegal activities. The ability to buy new technology may now provide an advantage to adversaries that are limited in their ability to develop the technology independently but are willing to use it against stronger more capable forces. This may affect many asymmetric warfare scenarios where weaker adversaries are still able to use advanced technology against a superior force.

WORKSHOP 6 - "VIRTUAL WARGAMING. A VIRTUAL WARGAME WORKSHOP BASED ON THE INTERMEDIATE FORCE CAPABILITY WARGAME."

LED BY JOHN NELSON & COL WENDELL LEIMBACH NATO STO SAS-151

SAS-151 is working to enhance NATO's ability to deter and defeat adversaries, especially countering acts of aggression below the level that would trigger a conventional (i.e., lethal) response. Wargaming, including the ICD&E Conference game, are comparing actions and outcomes (tactical – strategic) when only Baseline capabilities are available versus Intermediate Force Capabilities (IFC) also being available. SAS-151 engaged ICD&E Conference participants in a Hybrid Threats wargame that promoted insights and outreach that will be used in 2021 NATO Intermediate Force Capabilities (IFC) Concept Development.

WORKSHOP 7 - "VISUAL STORYTELLING. AN INTERACTIVE, INTRODUCTORY WORKSHOP TO VISUAL STORYTELLING AND BRAINSTORMING TECHNIQUES."

LED BY CHRIS SHIPTON, LIVE ILLUSTRATION

In the visual storytelling workshop Chris Shipton led the participants in drawing exercises and challenges in order to help develop a visual language and learn about the role of drawing in communication. He talked about how imagery could be used to communicate and to articulate aspects that might be harder to articulate with words. Drawing methodology can be employed to communicate better. When drawing a house, people tend to draw a similar looking image because we have a visual language embedded within us and drawings might be similar because many of us share similar visual shorthands. He also introduced participants to the concept of graphic facilitation and graphic recording. Graphic facilitation is the use of large-scale imagery to lead groups and individuals towards a goal; graphic recording is the creation of large-scale imagery to capture groups and individuals progress towards a goal. Both methods are used in various processes such as meetings, seminars, workshops, and conferences.

WORKSHOP 8 - "EXERCISING MADNESS. A CONCEPT, DEVELOPMENT AND EXPERIMENTATION EXERCISE FOR COUNTERING CIVIL UNREST WITH EMERGING NON-MUNITIONS TECHNOLOGIES"

LED BY DR GITANJALI ADLAKHA-HUTCHEON, SLOBODAN JOVIC & BRAD WALLACE, DRDC CSS, CANADA

In the Countering Civil Unrest workshop, Dr. Brad Wallace and Dr. Gitanjali Adklakha-Hutcheon led a seminar wargame with (S&T) License. The goal was to provide participants with a teaser and a minimalistic feel of MAD. The two envisaged outcomes were to firstly, test the operational relevance of futuristic fictional system cards (FFS), pre-created in part 1 using a scientific game storming session. Secondly, to advance the identification of the stage of these systems in the concept maturity continuum, extending from explore, experimentation, validation, all the way up to exploitation. Participants split into 2 teams. Both a blue and a red team were briefed on a fictitious vignette and able to plan their own actions. Teams were encouraged to come up with just two moves towards their plan. In round 1 they focused on conventional capabilities and established a baseline. In round 2 teams were given new cards with additional capabilities and went back to plan new actions with new toys. This establishes a way to look at what could be disruptive in the presence of new capabilities. The wargame provided opportunities to consider opposing forces and their moves, how to mitigate those moves and develop countermeasures, including risks associated. Exploring after how many moves a team gets stuck and why, can support introducing more science and tech in an area.

WORKSHOP 9 - "M&S FOR CD&E. EXPLORE HOW MODELLING AND SIMULATION CAN HELP YOU AND LEARN HOW TO INTEGRATE THIS TOOL IN YOUR CD&E PROJECT."

LED BY LTC MARCO BIAGINI, PHD, M&S COE

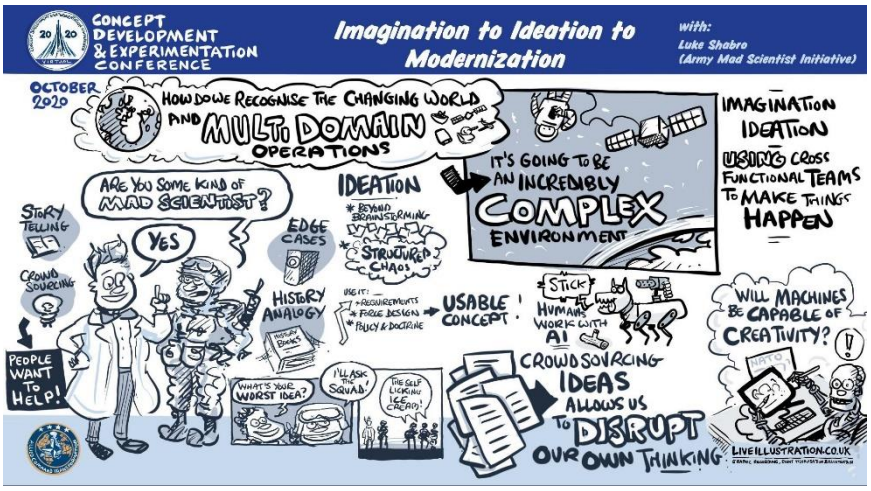
This event was an exciting and inspiring dive into the promising world of modelling and simulation (M&S), led by experts. Ltc Marco Biagini (M&S COE) and Thomas Mansfield (M&S at CMRE) exploited a unique opportunity to present to a wide eager ecosystem, the capabilities offered by M&S in their respective fields. The workshop presented the M&S COE interaction with NATO (i.e. NATO CD&E and M&S methodology, role of M&S in NATO ACT warfare development, M&S COE approach to capability development) as well as the M&S at CMRE in support to CD&E (transformational, solution, test and evaluation). A second part was dedicated to questions and requests for support, and provided the occasion of many debates related to concrete applications that could support concepts being developed, e.g. the multidomain C2 concept. Networking aspect of this workshop were key, and may lead to further cooperation.

FROM IDEATION TO CONCEPT (DAY 4)

IMAGINATION TO IDEATION TO MODERNIZATION

LUKE SHABRO , US ARMY TRADOC, DEPUTY DIRECTOR MAD SCIENTIST INITIATIVE

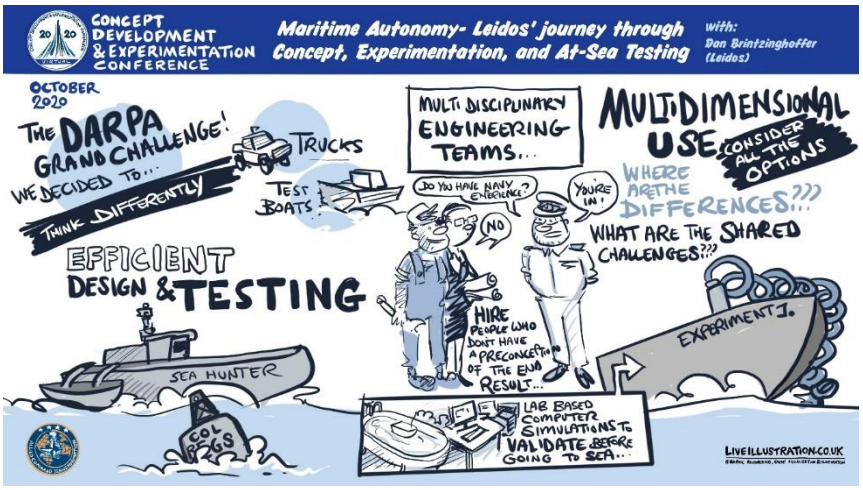
In his discussion about the 'Imagination to Ideation to Modernization' methodology, Luke Shabro revealed various options for generating imagination and ideation, and also how his methodology supported creation of the US Army's Multi Domain Task Force. The Army Mad Scientist Initiative is a program that works across academia, technology industries, government agencies and other military services to envision the future and develop concepts that will meet the ever-changing operating environment. He outlined that, by disrupting conventional thinking and challenging assumptions, the future can be analysed in different ways. Examples included using crowdsourcing, through social media platforms or writing competitions, to gather a broader viewpoint (especially in terms of cultural and age perspectives). Ideation goes beyond classic brainstorming; it is important to keep the ideation process structured and the team focused on the problem. Luke Shabro stressed linking modernisation to the user and the importance of accurate requirement statements. He concluded by reaffirming that the imagination to ideation to modernisation method applies to all concepts that look at future operational environments and supporting functions. He emphasized that the key to the process was to explore options without undermining the power of imagination.



MARITIME AUTONOMY- LEIDOS' JOURNEY THROUGH CONCEPT, EXPERIMENTATION, AND AT-SEA TESTING

DAN BRINTZINGHOFFER, LEIDOS, VP BUSINESS DEVELOPMENT, MARITIME SYSTEMS DIVISION

Dan Brintzinghoffer described Leidos' journey with the Sea Hunter unmanned maritime vessel (USV), from concept to construction to delivery as a case study. He explained that the project started with submitting ideas to a U.S. Defense Advanced Research Projects Agency (DARPA) 'Grand Challenge'. Leidos was awarded an Anti-Submarine Warfare (ASW) Continuous Trail Unmanned Vessel (ACTUV) contract to develop an USV. He explained requirements, such as long duration and collision regulations (COLREGs) that had to be taken into consideration. To enable the concept development of SEA HUNTER, Leidos invested in talent

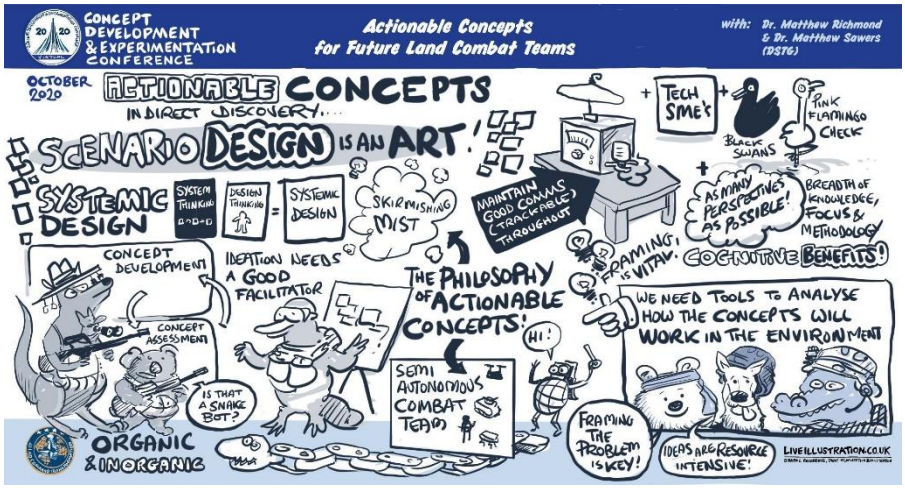


management and innovative partnerships, and drove a 'clean sheet' approach to the USV design in order to remove bias. Dan Brintzinghoffer commented on the complexity of CD&E when designing a system of systems, using the development of the collision avoidance system as an example. However, he explained how Leidos' software simulation facilities had enabled an efficient approach to experimentation prior to validation of the concepts during at-sea trials.

ACTIONABLE CONCEPTS FOR FUTURE LAND COMBAT TEAMS

DR MATTHEW RICHMOND & DR MATTHEW SAWERS, DEFENCE SCIENCE AND TECHNOLOGY GROUP (DSTG) AUSTRALIA

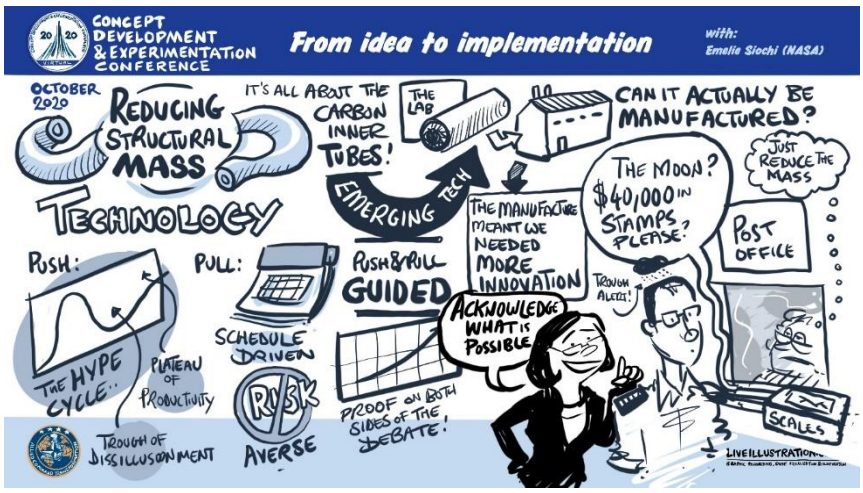
Dr Matthew Richmond and Dr Matthew Sawers discussed their philosophy of actionable concepts and introduced the idea of systemic design. Using two case studies about dismounted combat teams, they explained that their approach blended a systems approach and design thinking in order to develop concepts that would exploit emerging technologies. Through a five step approach that started with understanding the problem through 'inquiry' and 'framing', the concept developers could envision the future operational context through scenario and trend analysis. The DSTG duo also discussed important relationship between concepts and innovations, and that diversity was extremely important for the generation of concepts. They explained the active engagement that DSTG carries out with entities such as universities and Innovation Hubs, in order to generate a trusted cadre of diverse contributors. These contributions are important in every step of the process so that innovation continues to support the development of concepts.



FAST TRACKING TECHNOLOGY DEVELOPMENT, A CARBON NANOTUBE EXAMPLE

DR. EMILIE J. SIOCHI , NASA ADVANCED MATERIALS AND PROCESSING BRANCH

Ms Emilie 'Mia' Siochi provided a case study on Carbon Nanotube Technology (CNT) to highlight the fast tracking of technology development. Mia described the potential of carbon nanotubes to reduce the structural mass of spacecraft and the economic benefits of such action. She explained that maintaining or improving the strength of current material was a key constraint when developing the CNT concept, and used a fuel-tank case study to provide detail of how CNT could dramatically change the current limitation of

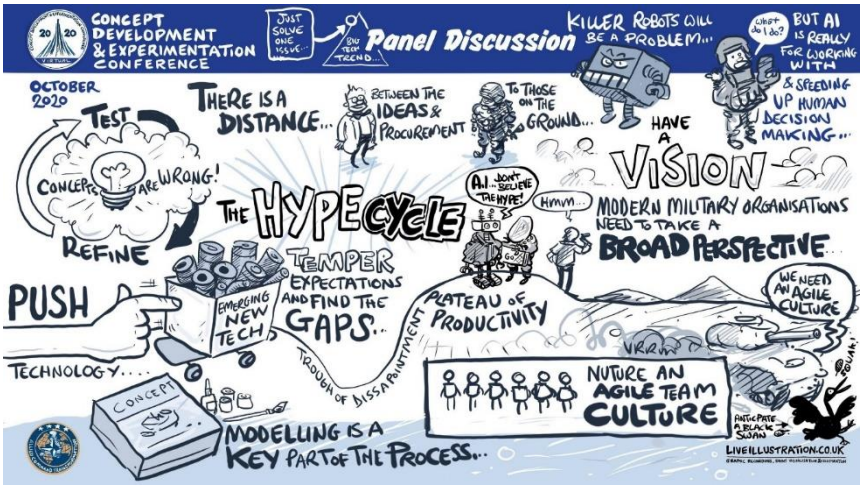


having to use low pressurised systems. She also raised the challenge of industrialising EDT lab samples to a quantity that could economically be applied to a developing concept. She went on to describe three technology development approaches: technology push, technology pull, and technology 'pull guided push'. She emphasised the success NASA had achieved through 'pull guided push' in order to facilitate "user driven technology maturation", and concluded that this approach could be a very effective method to accelerate the maturation of any emerging technology.

PANEL DISCUSSION DAY 4: FROM IDEATION TO CONCEPT

MODERATED BY PATRICK TUCKER, DEFENSEONE

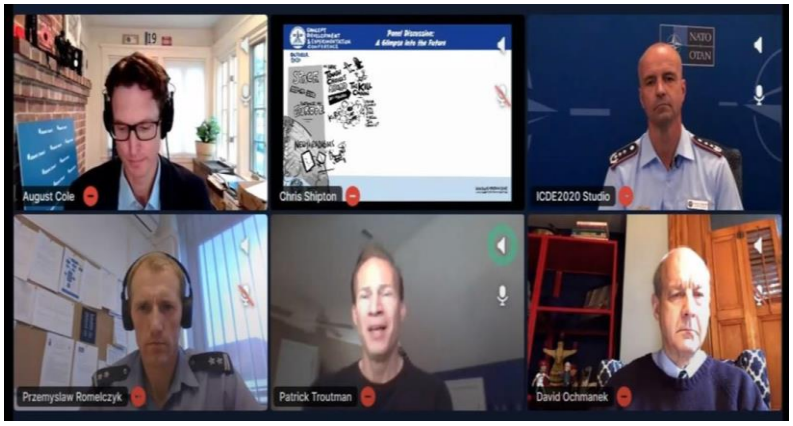
The panel discussion, moderated by Patrick Tucker included Dan Brintzinghoffer, Dr. Matthew Sawers, Dr. Matthew Richmond, Dr. Emilie Siochi, Luke Shabro and COL Stephan Pillmeier. The panel started with a discussion about the challenges of creating future goals in an environment where information technology is changing rapidly. While technology has changed the way a future goal may be accomplished, it does not prevent future goals from being created or accomplished. The panel also reviewed the importance of communication when building a model between team members with different backgrounds and disciplines. By assessing the strength of a model through a variety of perspectives, teams are able to update and alter simulations to reflect new information that is being exchanged. It is critical to have team members stay abreast of innovations that are being discovered, to ensure that new changes are quickly incorporated into any relevant aspect of a model or simulation. The panel also examined how military concepts and doctrine could or may need to be adjusted depending on changes in technology. It is important to consider the expertise of others who are able to provide up to date data and new perspectives which can be combined with military priorities in order to ensure that concepts are shaped and doctrine is modified to reflect the current and future state of technology. A change of culture within the military community was noted as a key portion of altering the way forces react and operate in a changing technology environment. Even though technology will always be evolving, it is important to assess how it can affect a military mission; those types of assessments will become extremely relevant to changing the way future militaries operate.



CONFERENCE SUMMARY AND CLOSING REMARKS

RADM JOHN TAMMEN & COL STEPHAN PILLMEIER, HQ SACT

Welcoming the audience to the final sequence of the 2020 Virtual ICD&E conference, COL Pillmeier explored how this endeavour in various digital spaces across time zones and four continents had truly been an experiment. Referring back to August Cole's message on the importance of the right narrative, COL Pillmeier reflected that sometimes "pictures can be worth more than a thousand words". Via a short video, the AV-team provided a quick impression summary of digital conference events as well as some "behind the scenes" insights into the workings of the ICD&E conference team located at VA Wesleyan University. Concise messages could also be provided via images, which is what Chris Shipton, the event's illustrator skilfully demonstrated over the course of the event. Quickly referencing some highlights from future oriented discussions on Day 1 (Theme: "A glimpse into the Future") COL Pillmeier reiterated the importance of exploiting modelling and fusing technology and sensors/data both militarily and publicly available. August Coles' perspective of "rethinking how we understand the world around us" and "looking optimistically into the abyss" are two elements crucial for CD&E successes. Reflecting on the journey through experimentation he recalled discussions on algorithmic bias, the concept of trust, and the robustness of algorithms. Probably the largest takeaway from Day 2 (Theme: "Experimentation") was creating room for failure, i.e. an appropriate environment to allow risk taking and failure with the opportunity to fail forward and learn/adapt. During the workshops on Day 3, participants were able to sharpen the "tools" in their CD&E "tool boxes". (Pro)activity and sharing is key for collaboration. To foster experimentation the creation of sandboxes that one can explore and fail in will be important. From the final discussions on Day 4 (Theme: "From Ideation to Concept"), COL Pillmeier highlighted the benefit of collaborative, interdisciplinary approaches, fast track development, and looking at system level benefits, particularly with a view to scaling successes.



RAdm John W. Tammen, Deputy Chief of Staff (DCOS) Strategic Plans and Policy joined for the closing "fire-side" chat. He had listened into various sessions and was particularly impressed with insights from the FICINT workshop conducted by August Cole and Peter Singer. Being able to tell the story, i.e. the right narrative, would be an important tool for NATO to prepare for the future and future challenges. Emerging Disruptive Technologies will provide opportunities in shaping the future Military Instrument of Power. The NATO Warfighting Capstone Concept, which he engaged on with MilReps earlier in the day, will ensue several concept development efforts that will shape NATO's CD&E effort over the next years. RAdm Tammen assessed that the risk and effort taken in shaping this virtual conference had paid off.

COL Pillmeier provided final closing comments, thanking guest speakers, moderators, workshop leads, as well as the conference support team, and most importantly the audience. He encouraged continued collaborative engagement despite restrictive circumstances and appealed to the CD&E Community of Interest to help inform and inspire concept development work and experiments for the benefit of NATO. In the spirit of continued learning, he encouraged conference attendees to respond to the survey to help improve future events.

2021 INTERNATIONAL CONCEPT DEVELOPMENT & EXPERIMENTATION CONFERENCE

2021 will be ICD&E's 21st year and 20th anniversary. HQ ACT is working with France for hosting the 2021 ICD&E Conference during the week of 25-29 October; we would look forward to seeing you there, if circumstances allow. Attendees of the 2020 ICD&E Conference can expect an email in spring of 2021 with information and registration details.

FOR MORE INFORMATION CONTACT

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