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The Unit Commander on the Move Experiment: Information and Communication Requirements for Effective Command and Control in a Dispersed Battlespace

Topic 7
Methodological Development, Experimentation,
Analysis, Assessment and Metrics

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Abstract

The future operating concept of the Canadian Army is grounded in an understanding of the future security environment characterized by complex, multidimensional conflicts and a dispersed operational framework. Future operations will span the full spectrum of engagements requiring military forces to be dispersed in time, space and purpose. Dispersion in time and space will in turn increase the need for Unit Commanders to be mobile, moving away from the main static headquarters (HQ).

When physically separated from the main HQ, Unit Commanders require information and communication capabilities to effectively maintain command and control of their forces and assets and to maintain situational awareness. To identify and validate the key command and control and communication requirements that will enable Unit Commanders to effectively command while being mobile, the Canadian Army Land Warfare Centre, in collaboration with the Canadian Army Simulation Centre and Defence Research & Development Canada, conducted the Unit Commander on the Move Experiment.

This paper presents the methodology and the results of this experiment. The Unit Commander on the Move Experiment immersed participants within a simulated environment recreating situations where a Commander had to command while being away from the main HQ. Participants were Canadian Army officers with relevant experience and qualifications as Unit Commanders. A series of vignettes were created to provide the operational environment and a set of surrogate information technology tools was made available to the participants to plan and execute tactical tasks. The usefulness of each tool was then assessed through surveys and semi-structured interviews.

Acknowledgments

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1. Introduction

On behalf of the Commander Canadian Army, the Canadian Army Land Warfare Centre (CALWC) is responsible to generate future land operating concepts, and initiate capability development across the spectrum of army capabilities. As part of that mandate, CALWC sponsors targeted experimentation in capability areas which support its operating concepts. In order to provide a conceptual framework supporting capability development and experimentation, CALWC published Land Operations 2021 [1]. This document provides detailed information about the operating concept of the Army of Tomorrow (AoT). The concept is grounded in an understanding of the future security environment (FSE) [2] characterized by complex, multidimensional conflicts and a dispersed operational framework. Future operations will span the full spectrum of engagements requiring military forces to be dispersed in time, space and purpose [1].

Dispersed operations create the need for Unit Commanders to be on the move, away from the main static headquarters (HQ). In the Canadian military, Unit Commanders are usually commanding a Battle Group made of three infantry companies and one tank squadron. When physically separated from the main HQ, Unit Commanders still require information and communication capabilities to maintain battlefield situational awareness in order to effectively maintain command and control (C2) of their forces and assets.

Efforts to digitise Canadian Army (CA) command and control processes have focused largely on provisioning static headquarters with command support tools and have had significantly less success in extending a networked information domain into tactical vehicles. More recently, as the CA returned from a decade of combat operations in Afghanistan, attention has turned to solving the digital / analogue divide which exists between the main (and largely static) HQ and the mobile and forward elements.

The Unit Commander on the Move experiment described in this paper was sponsored by CALWC and conducted by the Canadian Army Simulation Centre (CASC) and by Defence Research and Development Canada (DRDC). This experiment was designed to validate the C2 and communication requirements of a Unit Commander on the move or commanding at the short halt in the future environment of the AoT. This experiment was based on a previous study where 75 subject matter experts (SME) were interviewed to elicit desirable features of a command on the move capability [3]. CALWC partnered with the Canadian Army Simulation Centre (CASC) to scrutinize the set of desirable features obtained in [3] and reduce them to a set of capabilities which would be feasible to replicate in existing simulations.

In order to gather the required information on the usefulness of C2 and communication functionalities, participating Unit Commanders were immersed in a synthetic environment replicating a mobile command situation which required the use of a suite of surrogate situational awareness and command tools. The information and communication functions to be validated were grouped in three main categories: situational awareness, communication and mission planning. Through the execution of series of tactical military vignettes, the usefulness of each C2 capability was assessed.

The remainder of this paper is organized as follows. The details of the methodology used during this experiment are provided in Section 2. Quantitative and qualitative results are presented in Section 3. Concluding remarks are made in Section 4.

2. Methodology

This section presents the methodological details underpinning the Unit Commander on the Move experiment. The details provided are related to the participants, the experimental setup, the tactical vignettes, the C2 and communication functionalities being validated, and the data collection plan.

2.1 Participants

The participants of this experiment were CA SMEs identified by their current and/or past position, deployed tactical operational experience and reputation as an expert in C2. These SMEs were current or recent Unit Commanders, Deputy Commanders, or possessed the experience and qualifications to act as a Unit Commander. In total, 15 SMEs participated in the experiment. All participants were of the rank of Lieutenant-Colonel or Major.

While this sample may appear small, it is of importance to note that there are only 12 Unit Commanders in post in the CA at any one time and due to their busy schedules, not all of them were able to participate in the experiment. By including Commanders who had previously held a command post or participants who were qualified to be Unit Commanders, it was possible to achieve a sample size large enough to be valid and the data to be generalizable.

Furthermore, the CA Unit Commanders belong to three Canadian Mechanized Brigade Groups (CMBG) spread across Canada: the 1st CMBG in Alberta, the 2nd CMBG in Ontario and New-Brunswick and the 5th CMBG in Quebec. Each CMBG potentially having a distinct culture, it was felt it was imperative to have representation from all three CMBGs. This was achieved by hosting much of the experiment at the Canadian Army Simulation Centre (CASC) in Kingston, Ontario and having participants from the 1st and 2nd CMBG travel to the CASC. For the phase of the data collection conducted with 5th CMBG, the experiment was taken on the road to Québec City where the 5th CMBG is located.

2.2 Experimental Setup

When participants first arrived at the experimental location, they were greeted by an experimenter, and taken to a room separate from the simulated environment where the aim of the research was explained by a representative from CALWC. At this point, participants were asked to sign a consent form if they agreed to continue with the experiment.

Following this introduction, the Unit Commanders were taken to a separate room were the immersive simulation environment was located. Participants were asked to behave in a manner that would be analogous to commanding from within a Light Armour Vehicle (LAV). In the room, there was an interactor playing the role of driver, and a second interactor playing the role

of battle adjutant. Two experimenters were also sitting at the back of the room to collect data during the simulated tactical vignettes.

Figure 1 shows a picture of the simulated environment with the Unit Commander sitting to the right and the battle adjutant sitting to the left. The driver was sitting to the left of the battle adjutant and the two observers were sitting behind the driver and the battle adjutant. The Unit Commander had two computer monitors in front of him, one providing planning functions and the other one providing a Common Operating Picture (COP) for improved situational awareness. The battle adjutant staffed a computer with chat, email, and file sharing capabilities and assisted the Unit Commander with the planning functions. A large monitor mounted overhead showed a 3D simulation recreating the battle environment. Another monitor to the right provided a more convenient view of the chat or the COP. A large paper map of the area of operation was made available on a board located to the right of the room.

The experiment controllers and additional role players were located in a separate room acting as the main experiment control room. Figure 2 shows a picture of this control room. For increased realism, expert roles players provided live interactions with higher HQ and subordinate units.

Figure 1: Command on the move Tactical Command Post. The Unit Commander sits to the right having the planning and COP monitors in front of him. The battle adjutant staffs the computer with chat, email, and file sharing capabilities and assists the Unit Commander with the planning functions.

Figure 2: Simulation control room: expert role players provided realistic interactions with the Unit Commander. Higher command and troops under the Unit Commander's responsibility were represented.

2.3 Vignettes

Three simulated vignettes were used for the experiment. Each vignette was based on an "Advance to Contact" task during which the Unit Commander had to order his troops forward until contact with the enemy was made. Once contact with the enemy had happened, the Unit Commander needed to create a plan of attack to push the enemy back. Each vignette lasted approximately one hour and a half and was relatively low pace to allow the Unit Commander to use each information technology tool to its fullest potential. The three vignettes used were designed to present a tactical scenario of increasing complexity. The details of the attack plans created by the participating Unit Commanders were not recorded as they were not part of the aim of the experiment.

2.4 Functionalities

For all three vignettes, a common set of surrogate information technology tools designed to support C2 while on the move was made available to the participants to plan, prepare, execute and monitor each tactical task. These C2 and communication tools are referred to as "surrogate" as they were designed in the context of a simulated environment and were in no way representative of the form these tools would take if they were deployed in combat vehicles, under real operational conditions.

The functionalities provided during the experiment were varied and included:

1. A geographic information system (GIS) function: Provided as a Google Earth®-like experience, a touch-enabled monitor presented four maps of the area of operation of varying resolutions (1:500,000, 1:250,000, 1:50,000 and high resolution satellite imagery). The touch

function and the computer mouse enabled the Unit Commanders to scroll the map and to zoom-in or out of the various map resolutions.

2. Line of Sight (LoS) function: to supplement the GIS information, a LoS tool was provided to identify the field of view from a specific point on the map. This tool presented a circle having a five-kilometer radius around the selected point of observation. The visible areas were identified in green, while the obstructed views were identified in red. This information was made available through the elevation data provided in the GIS function. A 3D shading capability was also made available to quickly identify potential restrictions to the field of view.

3. Common Operating Picture (COP) function: a COP function was provided to ensure that the Unit Commander could maintain his situational awareness during the execution of each vignette. The positions of all the sub-units (belonging to the "blue force") were represented by standard military icons. Each friendly icon could be aggregated at different levels, i.e. at the company level or at the platoon level. Arrows linked to each icon indicated the direction and speed of travel of each sub-unit. The fighting status of each friendly sub-unit was also provided as a gauged meter overlaid on each sub-unit icon. This "blue force tracker" was a combat effectiveness indicator representing an aggregate of manpower, ammunition and fuel levels. Finally, when known, the positions of the opposing forces (the "red force") were overlaid on the GIS map.

4. Map sketching capability: to create graphics explaining the details of an attack plan, a drawing capability was provided to create shapes, icons and text elements directly on the map. This functionality was available through the use of the computer mouse or through a free-hand capability.

5. Collaborative sketching capability: a capability to collaboratively draw on a common map was provided through a shared desktop software. This software allowed the Unit Commanders and the sub-units to share a common map, draw attack plan graphics collaboratively, or use a common mouse cursor to identify specific elements or positions on the map.

6. SIMPLEX communication: referred to as the Combat Net Radio (CNR), this radio network is all-informed (everybody on the network hears everything being discussed) and only one interlocutor can speak at a time. Standard military radio communication procedures have to be used to exchange information on this network.

7. DUPLEX communication: analogous to a phone conference call, this capability allowed for a restricted number of interactors to have a private free-flowing discussion without having to follow the CNR communication protocols.

8. Chat communication: two standard chat rooms were provided for text communications, one reserved to the Unit components and one reserved for the communication with the higher HQ.

9. Email communication: a standard email capability was provided through Microsoft Outlook.

10. Video-teleconferencing (VTC) communication: to supplement the DUPLEX communication capability, a video of each interlocutor could be provided.

11. File sharing: a file sharing capability was provided through a SharePoint interface. Documents prepared by the main headquarters were made available to the Unit Commander on this SharePoint site.

12. Terrain video: unmanned aerial vehicle (UAV) video feeds were provided and georeferenced on the GIS map. The UAV terrain videos were clips extracted from pre-recorded videos. A live video feed capability was not provided.

13. Microsoft Office: the standard Microsoft Office Suite was provided for consulting and creating documents.

2.5 Data Collection

During each simulation vignette, two researchers noted observations as to how the tools were being used by the Unit Commanders and also documented any comments participants made during the execution of the mission. At the end of each mission, one investigator conducted an interview while the second researcher recorded the responses.

At the end of each vignette, participants were asked to answer the following questions:

1. Which surrogate tools best enhanced your ability to:
    a. Understand the operational environment?
    b. Monitor the operational environment?
    c. Collaborate with your advisors and staff?

2. What tools did you rely on or use the most? Why?

3. What tools didn’t you rely on or use? Why?

Based on the answers to these questions, follow-up questions/probes were asked to gain a deeper understanding of the usefulness of each tool. At the end of the experiment, participants were given a survey to quantify the usefulness of each C2 and communication capabilities provided. This survey is provided in Annex A.

3. Results

This section provides a description of the results of the Unit Commander on the Move experiment. First, quantitative results from the post-experiment survey are presented with a ranking of the C2 and communication functionalities based on their usefulness. Then, a summary of the observations an insights collected during the experiment is provided.

3.1 Tool Ranking

After having completed all three vignettes, the participants rated the usefulness of each C2 and communication capability according to the scale shown in the survey in Annex A. This scale was translated to a numerical scale of 1 to 9 to obtain some quantitative results [4]. A value of 1 was assigned to the “useless” lower bound, while a value of 9 was assigned to the maximum “useful” bound.

The distribution of results is shown in Figure 5, with the functionalities being ordered from left to right, from most useful to least useful, based on their mean usefulness values. The data distribution is summarized by a box plot for each functionality. The red line represents the median, while the red cross represents the mean. The blue box delimits the first and third quartiles of each distribution, while the black whiskers represent the 9th and 91st percentiles. The ranking of the tools based on the mean usefulness values is summarized in Table 1.

Figure 5 shows that a ceiling effect exists for the top ranked functionalities, the map sketching capability and the collaborative mapping capability. Most of the participants agreed that these functionalities deserved the maximum usefulness value of 9. On the other end of the spectrum, the least useful functionalities, including VTC, chat and email, are characterized by a much greater variation.

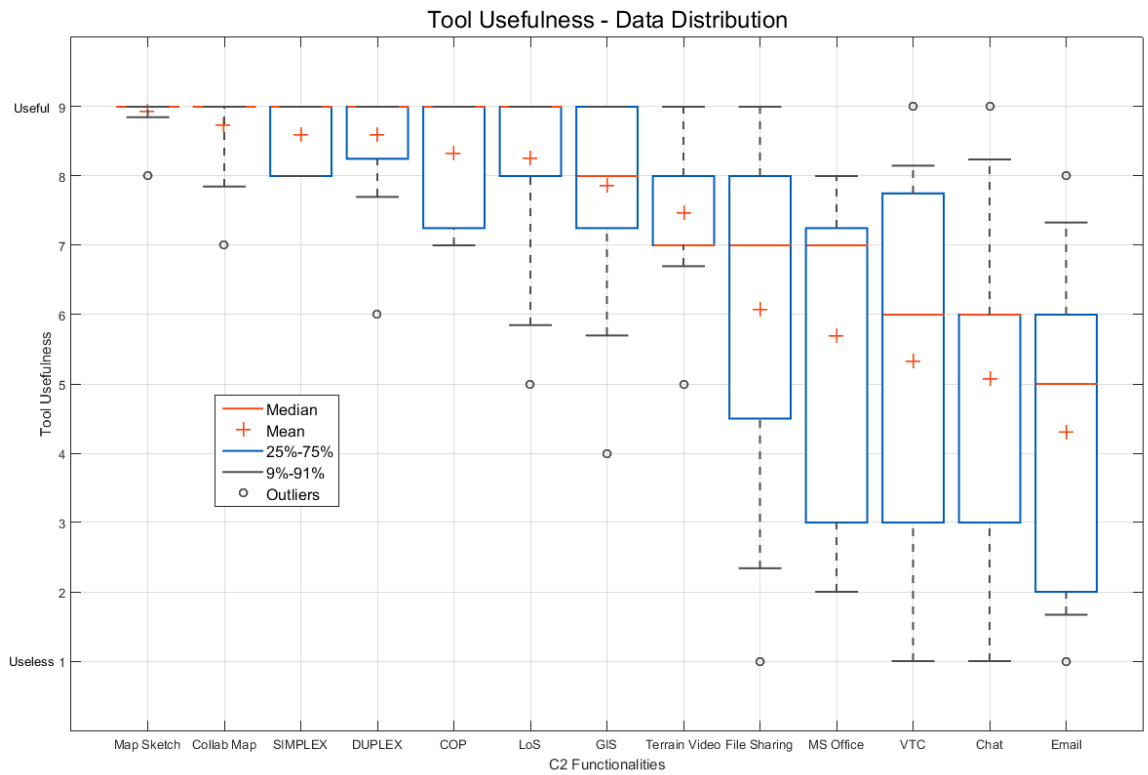

Figure 3: Distribution of the tool usefulness data collected through the survey presented in Annex A.

Command on the Move Functionalities	Mean	Standard Deviation
Map sketching	8.9	0.3
Collaborative sketching	8.7	0.6
SIMPLEX communications	8.6	0.5
DUPLEX communications	8.6	0.8
Common Operating Picture viewing	8.3	0.9
Line of Sight function	8.3	1.3
GIS function	7.9	1.4
Terrain Video	7.5	1.1
File sharing	6.1	2.5
Microsoft Office	5.7	2.4
VTC	5.3	2.7
Chat	5.1	2.6
Email	4.3	2.3

Table 1: Ranking of the Command on the Move functionalities based on the mean usefulness values.

3.2 Summary of Observations and Insights

3.2.1 Map Sketching, Collaborative Mapping, DUPLEX

For all 15 participants, the ability of the Unit Commander to create graphics on the planning map to detail the attack plan and the ability to discuss this plan with the sub-units through a shared map and DUPLEX voice communication were deemed the most useful functionalities. These functionalities were described as virtually recreating a typical mission planning session where all sub-units get together at the back of the vehicle of the Unit Commander and plan over a paper map. Two main advantages of building a cooperative attack plan through a shared map were identified:

1. Collaborative map sketching allows giving orders faster as there is no need to pass grid coordinates through SIMPLEX radio as is the case for the current process. This ability to transmit orders in less time than with current protocols allows troops to move faster to their attack positions and therefore allows the Unit to engage the enemy earlier. It was mentioned that this ability to move faster would be key to winning engagements. Another time saving is realised through the ability to work collaboratively without having to physically move on the battlefield to come together and plan face-to-face.

2. Using a shared map to give the details of the plan reduces the risk of errors by significantly increasing the clarity of the plan. Not having to transcribe grid coordinates given over radio removes the risk of error. Furthermore, through the use of the shared mouse pointer, the Unit Commander and each sub-unit can clarify elements of the plan and ask questions when aspects of the plan are not clear. It was mentioned repeatedly that “a picture is worth a thousand words”. It was also mentioned that collaborative map sketching would “defeat confusion”.

The need for the battle adjutant to man the planning function and create the graphics on the map with directions from the Unit Commander was deemed essential by most participants. It was mentioned that the Unit Commander should remain focused on the battle and not spend time creating graphics and handling the computers.

3.2.2 SIMPLEX Communications

The SIMPLEX communication function, recreating the standard all-informed Combat Net Radio capability, was also deemed to be an essential functionality for commanding on the move. It was mentioned that CNR was to remain the backbone of the communication functionalities has it is proven to be reliable and would have to be used as a back-up in case the DUPLEX and collaborative mapping communication links were lost. CNR was described as a no fail capability for commanding on the move. Furthermore, some participating Unit Commanders liked the all-informed nature of this means of communication as it allows all sub-units to be privy to the same information. Finally, it was also mentioned that once the planning is over and the battle begins, direct, quick, clear, and organised communications are needed and only SIMPLEX radio provides the required structure.

3.2.3 COP, Line of Sight and GIS Functions

The COP function, augmented by the Line of Sight tool and the GIS overlays ranked relatively high in terms of usefulness for most Unit Commanders. The satellite map layer of the GIS was described as the most relevant layer as it provided the best level of knowledge of the operating area and enabled the best analysis of the terrain. The COP function was seen as a great complement to the planning function as it allowed the Unit Commanders to maintain situational awareness at all time by knowing where the friendly forces were located, if the friendly sub-units were moving or not, and where the enemy forces were located. It was mentioned that the COP answered the three critical situational awareness questions of the Unit Commander: "Where am I? Where are my allies? Where is the enemy?"

The Line of Sight tool was used by most Unit Commanders to try to identify the best attack positions on the map and to identify the field of view of the enemy. The Line of Sight tool was often used in conjunction with the satellite map layer on the GIS map to increase the Unit Commander's understanding of the enemy position. The 3D shading capability to identify map features was rarely used, a number of participants commenting that the Line of Sight tool and the elevation contour lines on the map were enough to provide the required level of details.

3.2.4 Terrain Video and UAV Feed

The video feeds provided by the UAVs ranked eighth in the list of the most useful C2 functionalities while being on the move. The majority of participants mentioned that UAV feeds provided useful information on the terrain and on the enemy disposition. The ability to play a UAV feed over the shared desktop so that all sub-units could see what the Unit Commander saw was also described as useful.

The video feeds shown to the Unit Commander were clips of pre-recorded videos, as would be done if a sub-unit was to provide a video feed to the main HQ, and this video was then processed to extract only the significant components to be given to the Unit Commander who is away from the main HQ. Most mentioned they would prefer a live video feed to have the latest and most accurate information. However, some also cautioned against the potential of a live UAV feed becoming a distraction for the Unit Commander.

3.2.5 Other functions: File sharing, Microsoft Office, VTC, Chat and Email

File sharing, Microsoft Office, VTC, chat and emails were ranked as the least useful C2 and communication functionalities while commanding on the move. These functionalities were described as administrative tools rather than command tools. It was repeatedly mentioned that these functionalities would not be used for an attack being planned on the move and their usefulness would be limited to after the battle for providing situation reports to the main HQ or to the higher HQ. It was reported multiple times by the participants that a Unit Commander in the midst of a battle would never be typing on a computer and would rely on his battle adjutant to do so.

Of note, no participant used the email or the Microsoft Office functionalities during the experiment. Most Unit Commanders also commented that they did not pay attention to the chat

monitor and left it to the battle adjutant to handle. Finally, the video capability offered through VTC to complement the DUPLEX communication was rarely used and was perceived as not being very relevant and as having the potential to clutter the communication bandwidth.

3.2.6 Cognitive Load

Throughout the Unit Commander on the Move experiment, participants were asked about the impact of the various C2 and communication functionalities on their cognitive load. Overall, it was mentioned that the tools were not creating an excessive cognitive load and that the difficulties related to using some tools would subside if they were used more often. Once more, emphasis was put on the need to have a battle adjutant manning the tools to help the Unit Commander maintain focus on the battle. Many participants also made the assumption that the younger generation, assumed to be more tech savvy, would adopt these new C2 functionalities more easily.

3.2.7 Implementation

After each vignette, the Unit Commanders were also asked to provide insights on the implementation of the functionalities being validated into combat vehicles operating under real fighting conditions. The main observation conveyed by the majority of participants was that the tools needed to be simple and fast to use. Simplicity was described as essential when operating under the stress and confusion of combat. Furthermore, the systems needed to be as fast as or faster than traditional systems (namely a paper map and the SIMPLEX radio), as if it was not the case, they would not be used during a real operation. They mentioned that at the level of Unit Commander, time is very critical and the compromise of having increased functionality is not acceptable if it slows the process down compared to using a paper map and SIMPLEX radio.

Emphasis was also put on the need for robust and shock-resistant systems as combat vehicles bounce around and any fragile equipment would quickly break, as well as on the importance of avoiding interfaces that require very detailed movement or fine motor skills (e.g., small buttons) considering the movement of the vehicle, the use of gloves and environmental conditions (e.g., operations in very hot or cold environments). Furthermore, to allow for greater mobility and to meet the specific needs of dismounted infantry, some participants suggested that a tablet computer would be the best form to use in the turret as it could be taken away from the vehicle when needed.

Many Unit Commanders reminded the experimenters that techniques and procedures defining how to properly use the C2 functionalities had to be created concurrently with the development of these new tools enabling command on the move. In particular, procedures needed to be defined to ensure that all the required information would be included in a collaborative plan so that the sub-units would clearly know what is expected of them. Procedures are also critical to ensure that these new functionalities are used to their full potential and have maximum impact on the battlefield.

Some additional caveats were provided throughout the experiment. Of note, many participants mentioned that the advanced situational awareness made possible through the increased amount of information provided to the Unit Commander could create a risk of micro-management. With

tools like the Line of Sight tool and the blue force tracker, a Unit Commander might be tempted to micro-manage his/her companies, and take over the roles and responsibilities of the company commanders. Furthermore, it was mentioned that the access to a greater amount of information to support mission planning and situational awareness might have a detrimental effect on the reaction speed of Unit Commanders if they required too much information prior to making decisions. This phenomenon was described as “paralysis by analysis”.

Finally, it was noted by all the Unit Commanders that once the execution phase of the attack plan begun, upon completion of the mission planning process and once the orders had been transmitted to the sub-units, that only the COP function and the SIMPLEX radio would be used in a real tactical scenario to follow the battle and make minute-by-minute corrections. The other C2 and communication tools are not needed to fight the battle.

4. Conclusions

This paper presented the methodology and results of the Unit Commander on the Move experiment sponsored by CALWC and conducted by CASC and DRDC. This experiment was designed to validate C2 and communication functionalities designed to support Unit Commanders when there are operating away from the main HQ. The participants to this experiment were current or previous Unit Commanders or had the necessary qualifications and experience to be a Unit Commander. These participants were put in a simulated environment where a set of surrogate information technology tools was made available to plan and execute tactical tasks. The usefulness of each tool was then assessed through surveys and semi-structured interviews.

For all participants, the ability to create graphics detailing an attack plan on a digital map and the ability to discuss this plan with the sub-units through a shared map and a free-flowing DUPLEX discussion were deemed the most useful functionalities. It was felt that the ability to share a plan visually without having to give map coordinates through standard Combat Net Radio saved time and reduced the risk of miscommunication and errors. While the usefulness of these functionalities might be more limited under a time constrained hasty attack, their full potential could be realised for a less time sensitive deliberate attack.

The least useful C2 functionalities were deemed to be the administrative tools such as file management (SharePoint and Microsoft Office), VTC, chat and email. These tools were described as better suited for after an attack for providing situation reports to the main HQ or to the higher HQ.

While the C2 and communication capabilities tested during the Unit Commander on the Move experiment seem to have the potential to significantly improve the way mission planning is done while in a tactical command post, some caveats were identified. In particular, participants mentioned the need to implement simple and robust C2 systems, as well as the need to develop techniques and procedures defining how to optimally use these systems. Furthermore, the usefulness of the functionalities tested in this experiment will always be conditional on the

availability of a permissive and stable communication network having sufficient bandwidth for fast and secure data transmission.

A follow-up Command on the Move experimentation is currently being considered by CALWC, CASC and DRDC as part of the upcoming Concept Development Experiment (CDX) sponsored by CALWC and planned for the end of 2017. This new experimentation will focus on a refined subset of C2 tools, focusing on collaborative planning, and will be extended to the Brigade level participants operating away from static infrastructure.

References

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Annex A: Surrogate Tool Survey

Participant ID _____

Put an "X" on the line that best represents your position as to how useful you found each of the surrogate tools/functions.

Useless ___ ___ ___ ___ _X_ ___ ___ ___ ___ Useful

GIS function (Google Earth-like COP viewing)	Useless ___ ___ ___ ___ ___ ___ ___ ___ ___ Useful
SA function (COP viewing)	Useless ___ ___ ___ ___ ___ ___ ___ ___ ___ Useful
LoS function (COP viewing)	Useless ___ ___ ___ ___ ___ ___ ___ ___ ___ Useful
One-way / SIMPLEX Voice	Useless ___ ___ ___ ___ ___ ___ ___ ___ ___ Useful
Two-way / DUPLEX Voice	Useless ___ ___ ___ ___ ___ ___ ___ ___ ___ Useful
Chat	Useless ___ ___ ___ ___ ___ ___ ___ ___ ___ Useful
Email	Useless ___ ___ ___ ___ ___ ___ ___ ___ ___ Useful
VTC	Useless ___ ___ ___ ___ ___ ___ ___ ___ ___ Useful
Map sketching (ability to draw on touch-enabled screen)	Useless ___ ___ ___ ___ ___ ___ ___ ___ ___ Useful
Collaborative sketching (ability to interact with another's desktop)	Useless ___ ___ ___ ___ ___ ___ ___ ___ ___ Useful
File sharing	Useless ___ ___ ___ ___ ___ ___ ___ ___ ___ Useful
Terrain Video	Useless ___ ___ ___ ___ ___ ___ ___ ___ ___ Useful
Microsoft Office	Useless ___ ___ ___ ___ ___ ___ ___ ___ ___ Useful