11TH ICCRTS

Coalition Command And Control In The Networked Era

Command Post Anywhere II (CPA II) - Investigating Into A Motion Capable System for Adaptive Command Environment (MACEN) Concept for Armour Brigade and Battalion Operations

Topics:

C2 Concept and Organizations
C2 Experimentation

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ABSTRACT

A large Command Post on the battlefield is likely to be hit by enemy Targeting capability. To remain competitive on the battlefield, the command post would need to be dispersed and agile. The Command Post Anywhere (CPA) concept of physically dispersing fixed command elements over a wide area of operations was experimented successfully together with the 8th Singapore Armoured Brigade in 2004. The experiment was to prove that a Command Team was able to work distributed over a wide area, with no loss of situation awareness and sensemaking capability.

We expect that these fixed elements of the Command Team would also need to be mobile so as to keep pace with the forces on the battlefield. The concept of the Motion-Capable Adaptive Command Environment (MACEN), developed by the Singapore Armed Forces Centre for Military Experimentation (SCME), is the next logical evolution of the CPA concept for an adaptive command environment. The MACEN concept is a joint design and research by the teams from SCME and the Defence Science Technology Organization (DSTO), Australia with the objective of achieving seamless command environment that spans across the command echelons and the physical environments.

In this field experiment SCME and DSTO collaborated with the 4th Singapore Armoured Brigade to conduct the MACEN experiment out in Shoalwater Bay Training Area, Queensland, Australia from 14-18 Nov 2005. In this experiment, the Principal Staff Officers (PSO) were physically separated in their respective Armour command vehicles that were linked through a Command and Control system called the ForceMate that is a collaborative system leveraging on the extended range 802.11 WIFI communication infrastructure. This experiment gave first insights into the Human-Computer Interface (HCI) issues, and the command team processes for collaborative planning and co-ordination of Armour operations in both static and mobile vehicular environments.

INTRODUCTION

The future battlefield will be harsher, especially for the C2 environment. Generally, UAV, helicopters and fighter aircraft have become quite prominent in search of C2 entities such as the Command Post (CP) and communications set-up. Military forces have therefore started to embark on semi-fixed CP structures, enabled with on-the-move capability. This would especially be useful for Armour operations having the characteristics of quick tempo operation over the conventional Infantry forces and their CP. Therefore, the operating of Command and Control (C2) systems in Armour vehicles on the move in the battlefield terrain is not a new problem. It has existed for many years. However, in our humble opinion there had been only limited success and sporadic insights from the roughly 10 to 20 years of field trials and experiments.

How Would MACEN Enhance Future C2 Warfare?

The MACEN concept is about how a future C2 structure should operate in the land battlefield. In order to derive the logic of a good C2 structure and operating environment, we will make references to current or traditional model of C2 operations, focussing essentially at the Brigade CP operations. The planning and co-ordination for the Brigade lies with the Brigade Main, which is usually a fixed or semi-fixed CP environment. However, given the wide area of operations especially for an Armour Brigade CP over tens of km necessitates the Brigade's command team to be separated into the Main and Tactical CPs. This presents a dilemma i.e. should the Brigade Commander and his Principle Staff Officers (PSO) be at the Tactical CP or the Main CP or distributed across both CPs? For the Brigade Commander, he could be right up at the front at the Tactical CP near to his manoeuvre forces to feel the battle and provide command presence to make timely decisions, or he could be with the fixed Main CP at the rear where he might have more information about the other perspective of the Brigade battle situation.

But such a separation of the CP to Main and Tactical CP is still very distinguishable by sensors from the air. Looking at an alternative perspective, we should develop a C2 concept that enables the brigade commander and his principle staff officers to carry out their command functions regardless of their location (near the front or from the rear). SCME explored a concept called the Command Post Anywhere (CPA) for an Armour Brigade operations (Cheah et el, 2005) and this was experimented in Australia in 2004 codename Experiment Future Might 04. CPA is about the distribution of individual CP Cells to as wide as 10 km, connected via a broadband and collaborative C2 environment that would allow the Brigade Command Team to work as equally well as they would if they would centralise. The intent of the CPA was not only to remain highly survivable in the theatre, but also to allow the specific Cells of the Brigade CP to be at the best possible position so as to influence the operations. For example, the Brigade Commander could be with the forward Battalion, while the Brigade S2 can be at the Intelligence Collection Cell location, the Brigade S3 with the reserve forces ready to launch upon call, and the Brigade Fire Officer co-located with the Artillery gun units. Although SCME has experimented with the CPA concept to a success in 2004, looking ahead further, it might be a matter of time, perhaps in a couple of hours, that a smart adversary would ensure his airborne sensors would comb the area of operations persistently looking or detecting for the distributed cells and call for laser guided munitions to destroy or disrupt the individual CP structures.

Thus, a logical step would be to enable the CPA concept with the Command-on-the-move (COTM) capability. COTM, however, has largely been tackled with incremental solutions that in our opinion focus too much on being able to work and command while inside an Armour vehicle on-the-move. It is highly expensive to ruggedise C3 systems within the confines of the Armour vehicle. For most military forces, it is hardly affordable, although sexy like an aircraft cockpit. Also, more often than not, officers would stop the vehicle, open their hatches and dismount to appreciate the situation better, or sometimes move around to conference with other members of his command team

tactically. Enabling COTM is therefore not the end-all for effective command to take place..

The MACEN concept is our take on the next bound in the overall CPA concept as well as providing the Commander and his principal staff officers with the ability to adapt to the changing environment or conditions i.e. static working conditions to motion capable operations as well as working with other team members who may be in motion or in static environments, and over various adaptive communication environments. This is a new paradigm for future military C2 warfare, and not found in current military doctrine, as far as the authors' are concerned.

The twin pillars of the MACEN concept are that of mobility and adaptability for the Command Team to work in several battlefield environments. Extrapolating developments on the communications front, communications coverage should become ever more pervasive, although this should not be generalized that very good communications would always be available, especially under heavy foliage and urban conditions. Nevertheless, the command environment leverages on the pervasive and available broadband communications so as to be as mobile as possible. The increased lethality of weapon systems also implies that dispersed operations will soon to be the norm, more out of necessity than by choice.

Figure 1. Forcemate User Interface

With MACEN, the future Brigade C2 would adopt a different paradigm. The CPA concept can now be realized with full potential with the on-the-move environment. Beyond this, the Commander and his principle staff officers would be able to dismount and discuss plans and contingencies beyond their Armour vehicle with a Tactical Digital Assistant (TDA). There would not be any Brigade Main CP, but perhaps several Tactical CP, highly mobile and working closely with the tactical fighting forces, both in front and the rear, that does not emit physical signatures to airborne sensors trying to detect and target it. The outcome is the ability by these smaller Tactical CPs to dictate or influence

the tempo of the battle by moving forward with the battle while still able to do collaborative planning and co-ordinations among themselves through the TDA, enabled by broadband communications.

The TDA is embedded with a Collaborative C2 system called ForceMate. ForceMate is a specialisation of MissionMate, a C2 Knowledge System (Cheah, Chew & Tan, 2004). Forcemate is designed to work under unstable network environment. For example, if the network is not available, it would alert the user that there is no network connections and would try to re-connect in the next 7 seconds. Thus, with a specialized software built in-house at SCME called the Battlespace Communication Environment System or BACES (Low et el, 2005), a communications profile about available bandwidth and throughput can be mapped out. With such prediction going into MACEN, the Brigade C2 structure can adopt to one that is adaptable. For example, the Brigade Commander, when knowing he would no longer be having available communications coverage for a period of say 10 min because of high foliage, he would pre-arrange and handover command to either one of his Battalion Commanders or Brigade S3 or S2 temporarily, and they become his proxy for a while before handing back the Command. This is the softer side of the adaptability of the CP structure environment, quite often neglected in training. The adaptability aspects will reduce the predictability of operations from the enemy's point of view and takes away the big bulls-eye target of the fixed CP.

The key focus in ForceMate is the ability for the dispersed or distributed smaller Brigade Command Teams to do continuous collaborative planning and co-ordination of the operations. To do so, a Team Operational Picture (TOP), which is a GIS-based collaborative tool, allows each member of the command team to edit his own layers or common layers that are visible. The main benefit of TOP is the ability for each member to monitor the current battle situation and real-time planning products of his counterparts in the Command Team.

THE MACEN EXPERIMENT DESCRIPTION

Objective and Area of Focus

- The overall objective of the MACEN concept is to:

- Explore what is required for sense-making in various operating environments in terms of:
  - Human Computer Interface (HCI)
  - Team Processes

This translate to the following specific experiment areas of focus and lines of enquiry:

- Will the MACEN concept enable the forces to dictate the operations tempo?
  - Will it lead to improvement in terms of continuous situation awareness?
  - Will it lead to improvement in terms of seamless continuous planning?

- Will the MACEN concept enable situation awareness through the C2 and interactions with the C2 to be maintained in all environments?
  - All physical environments i.e. at fixed command post, in stationary and moving vehicle.
  - All communication environments i.e. varying coverage and bandwidth.

Buildup Plan

The efforts to investigate the MACEN concept consists of the 3 inter-locking activities of system trials, controlled field experiments and operations field experiments. Due to the difficulty in simulating the in-vehicle characteristic to a satisfactory level, a virtual experiment was not conducted prior to the 2005 field experiment.

The approach was to first carry out a series of system trials to iron out the hardware, software, and the Human Computer Interface (HCI) issues. The insights gained were integrated into the design of the 2 experiments that focused on the in-vehicle Human Computer Interface (HCI) and the Command Team processes, respectively. The data collected from the HCI experiment represents the controlled data set for comparison with the results from the operations experiment. The Team Process experiment was essentially an exploratory experiment to evolve the preliminary team processes that was used in the operations experiment.

System Trial

The objective of the system trial was to assess the feasibility and effectiveness of the elements to be included for the actual experiment setup.

The system trials were done in Singapore at an armour vehicle training area and it employed a Bronco and a Bionix armour vehicle with the Forcemate C2 installed on board.

Figure 3. Bronco (Left) & Bionix (Right) Armour Vehicle

The Forcemate system including its communication hardware was tested on both the Bionix and the Bronco armour vehicles. The different seating positions of the Forcemate operator and his assistant (who was also the camera man with the digital camera) was tested. The feasibility of doing video recording with a digital camera and the best location

for the camera man was tested. This information was used in the design of the recording setup and seating arrangements for the participants and assistance.

We developed a set of pre-defined user interface tasks to be used to assess the level of interaction possible within the moving vehicle. Thus the set of pre-defined set of user interface tasks was developed and used in the Human Computer Interface (HCI) part of the field experiment.

Tablet Vs HMD

Both the pen-tablet based (MobileForce CA-27) and the lightweight Head Mounted Display (HMD) version of the Forcemate system were tested. The C2 display presented through the light weight HMD (MicroOptical SV-6) version was surprisingly stable in the moving armour vehicle, however it was deemed that further refinements to the input controls and a larger Field of View and a re-design of the User Interface (UI) would be needed before deploying it for the field experiment.

HUMAN COMPUTER INTERFACE EXPERIMENT

The purpose of the HCI calibration experiment is to establish in controlled runs the baseline measurements of physical stability of the in-vehicle environment and the corresponding level of human computer interactivity that is possible.

The HCI calibration experiments conducted prior to the operations experiment was able to establish the baseline measurements for the physical stability of the in-vehicle environment and the corresponding level of human computer interactivity that is possible. The Bronco armour vehicle with two subjects equipped with Forcemate C2 system was used in this calibration experiment. The predefined HCI tasks used and the sample results are found in Annex A.

Vehicle Motion Measurement & Analysis

The MACEN concept makes use of portable computers inside moving vehicles. In order to characterise the vehicle motion, a three-axis accelerometer was fixed to the vehicle structure and data was collected during the various exercise activities.

A Crossbow CXL10LP3 10g three-axis accelerometer and Valitec Ready DAQ Data Logger were used to collect the motion data. The data from the accelerometer was sampled at 10 Hz. The data was analysed in the Excel spreadsheet program from Microsoft and MATLAB from MathWorks.

During the HCI mini experiments three vehicle conditions were used; static – with the vehicle stationary, off-road – with the vehicle moving cross-country, and on-axis – with the vehicle travelling along a graded, dirt road. It was expected to show three different patterns of vehicle motion. **Error!**

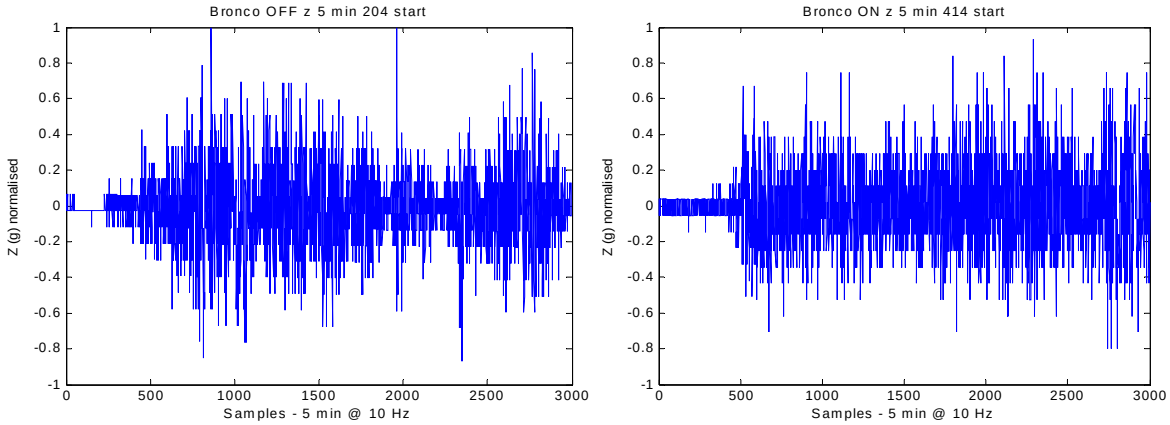

Figure 4. Vertical accelerometer output for OFF and ON road 5 minute periods

The normalised vertical amplitude pattern is shown in figure 6. Even though subjects reported that they felt more motion-sickness and difficulty in using the computer in the off-road compared to the on-road condition, no difference was seen in amplitude. The level of vibration was calculated using the basic evaluation method in standard AS2670.1 (section 6.1). The values for the illustrated 5 minute periods were 2.08 m/sec2 for the off-road section and 2.11 m/sec2 for the on-road section. These are both considered "extremely uncomfortable" according to the standard (section C.2.3).

Motion sickness was reported as a significant effect, even after only 20 minutes of off-road activity. Vibration in the frequency range below 0.5 Hz is reported (Boff and Lincoln, volume 3, section 10.4, 1988) as a main cause of motion sickness. Figure 6 shows the spectrograms for the same 5 minute periods shown above. It can be seen that both periods have visible power components around 0.5 Hz. Further analysis is needed to do a statistical comparison between the two 20 minute data records available for the off and on-road conditions for this frequency band.

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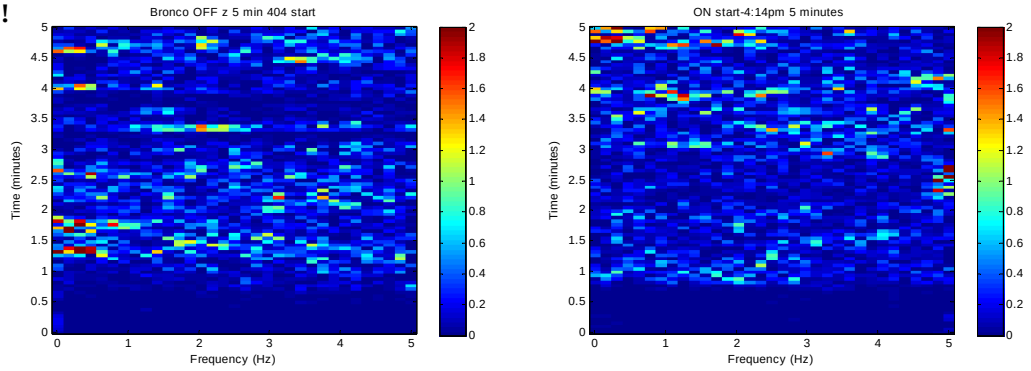

Figure 5. Spectrograms for vertical accelerometer output for off and on road 5 minute periods.

Subjects were able to complete their performance tasks in the "mini-experiment" under all three motion conditions. They considered the off-road condition the most difficult.

Further studies under more controlled motion conditions are needed to identify vehicle motion levels for practical and user acceptable human-computer interaction.

HCI Results

The subjects may have found it easier to compensate ON-road rather than during OFF-road where the shocks were more random and harder to anticipate and thus compensate for. The graphics overlay of the predefined task along with the sample results are as shown below.

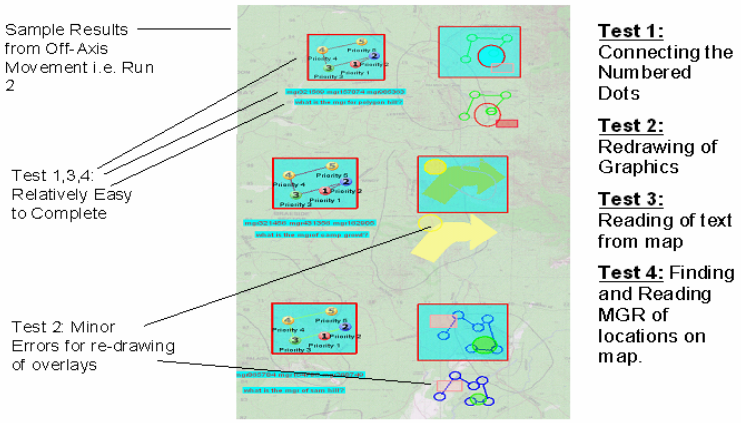

Figure 6. Sample result for pre-defined HCI Task

The summarised timings in minutes and seconds i.e. MM:SS.SS to complete the predefined tasks are as follows:

Time to complete predefined tasks for On-Axis Run (MM:SS.SS) :

	Min	Max	Mean	Number of Samples
Join Dots	00:6.51	00:08.17	00:07.47	4
Read Coord	00:9.63	00:09.79	00:09.70	2
Describe location	00:15.70	00:44.34	00:30.02	2
Copy Graphic	02:07.45	02:21.80	02:14.60	2

Time to complete predefined tasks for Off-Axis Run (MM:SS.SS) :

	Min	Max	Mean	Number of Samples
Join Dots	00:16.00	0:40.50	00:31.80	3
Read Coord	00:15.30	01:05.60	00:37.60	3
Describe location	00:12.70	01:34.90	00:49.50	3
Copy Graphic	01:14.50	03:00.90	02:16.60	3

OPS TEAM PROCESS EXPERIMENT

Scenario Design

The operations scenario elements consist of the following subjects:

- Brigade Commander (Bde Cmdr)
- Intelligence Officer (S2)
- Operations Officer (S3)
- Fire Support Officer (FSCC)
- Logistic/Combat Support Officer (CSS)
- Commanding Officer (CO) of 1st Armour Battle Group (ABG1)
- Commanding Officer (CO) of 2nd Armour Battle Group (ABG2)

The common baseline for all the scenarios is as follows:

- Both ABG COs on the move in the vicinity of Start Point (SP).
- TAC1 group on the move from Start Point (SP) to End Point (EP).
- TAC2 group remain stationary at End Point (EP).

A test scenario run was executed to serve as a reference baseline for the subsequent operations scenarios and also as an experiment process check. For this test scenario, the 2 CO ABGs move out from site Start Point (SP) to End Point (EP) and continue to manoeuvre in the vicinity of EP. TAC1 group of vehicles (including Bde Cmdr) moves out from SP to EP. The first experiment inject (Enemy Course of Action (ECA) overlay) is activated while TAC1 is in the communication coverage of site 1. The second experiment inject was activated when TAC1 goes temporarily into the communications blind zone.

Ops scenario 1 focuses on investigating the team processes between TAC2, which initiates changes to the plan, and the ABGs and TAC1 who reacts to the changes to the plan. For ops scenario 1, while the Armour Brigade Groups are executing the plan, TAC2 make adjustment to Bde Ops plan due to enemy action, TAC2 inform the ABGs and TAC1 of changes in the plan. Co-ordination of changes in ops, fires, intelligence, engineering and CSS will be trailed.

Ops scenario 2 focuses on investigating the ability for concurrent and seamless transition of planning functions. For ops scenario 2, the scenario play is such that Higher HQ gives a change of plan to TAC1 and TAC2. Assuming TAC2 is in the midst of a battle, it delegates to TAC1 to plan. Tact1 draft and sends the plan to TAC2, which adjust and finalises the plan.

Ops scenario 3 focuses on investigating how the Bde Cmdr sense-make and prioritises when the respective plans from CO ABG1 and ABG2 comes in simultaneously and whether the ABG COs are self synchronise. For ops scenario 3 the Battalion updates the situation on the ground and proposes the course of action to the ABGs, TAC1 and TAC2. The 2 ABGs COs send their respective plans to TAC2, which response if changes if required.

Measurements and Metrics

The list of metrics and measurements undertaken for this experiment is as follows:

- Subject workload
  - NASA TLX survey to gauge the work load of the participants.
- Subject Activity
  - Audio visual recordings
    - First Person Point-Of-View (POV): Video recording using Cap-Cam (mini-camera mounted on a cap worn by the in-vehicle subjects).
    - Third Person Point of View (POV): Video recording of subjects by ops observers using handheld video cameras.
- Physical environment stability measurement
  – In vehicle 3-Axis acceleration recordings (10 data samples per second)
- System Usage measurement
  – Server side video screen captures
  – Client side video screen captures

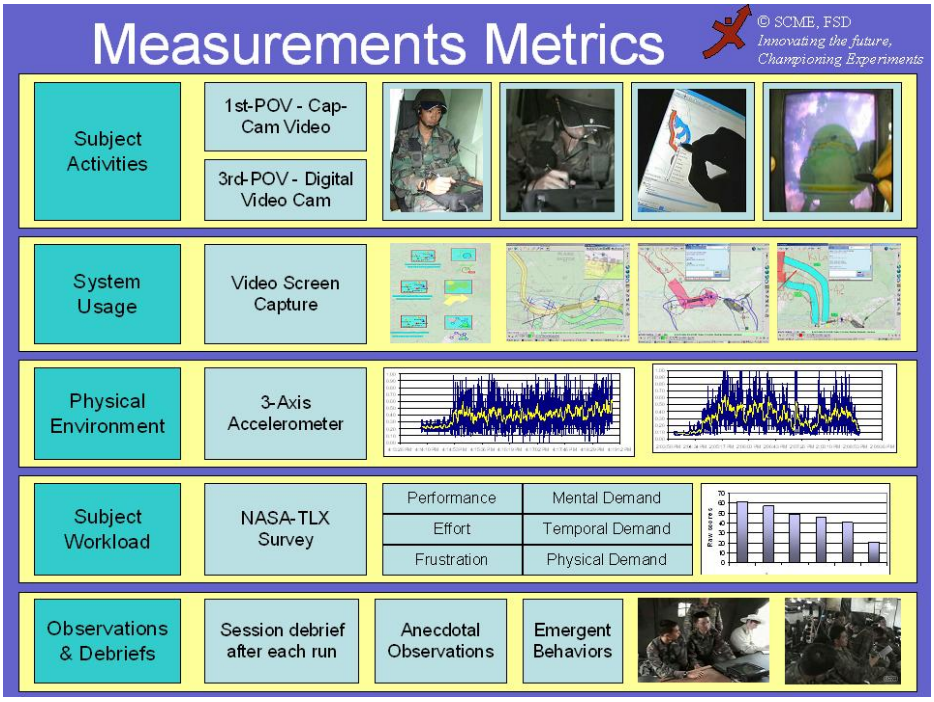

Figure 7. Table of Measurement Metrics.

Experiment Results

Preliminary analysis of the screen video captures from the clients and server side indicates that the activity level was relatively well spread out across the time of the scenario runs, with clusters of high activity levels around the time of key experiment

injects. We are in the process of performing more detailed analysis on this data to correlate it to the Command Team's Teamsight processes.

The overall result from the workload surveys indicates that the subjects were very focused on the performance factor, corresponding with a relatively high effort level. The physical demand was least important. The fact that the frustration level was significant was illustrated from video analysis that revealed some instances where the subjects needed to repeat certain tasks a few time to get it right. The feedback during the After Action Review also contained useful improvements to the Forcemate software and the system as a whole that should reduce the frustration level. The electronic version of the NASA-TLX survey was administered to the key participants after every scenario run. The summarised survey results are shown in figure 8.

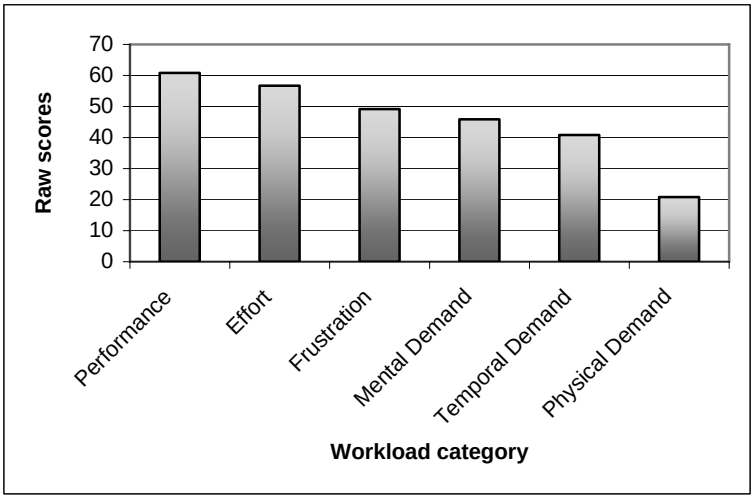

Figure 8. NASA-TLX Workload Survey Results

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Team Process

The Command Team was able to evolve their team processes in terms of how they used the collaborative tools on Forcemate to achieve their operational objectives. The experiment runs yielded useful insights in the following areas.

- Drawing Tools Usage.

- Adaptation to communications blind zones.
- Adaptation to physical environment.

Subjects moving in-vehicle with substantial time pressures tended to use the freehand drawing tools as oppose to the vector graphics tool. There were also instances where the free hand drawing served as a placeholder and was later updated at a more convenient time with a more precise vector graphic drawing.

As the runs proceeded, a usage pattern emerged in terms of the usage dynamics. The digital highlighter (graphics grey out and disappears after a definable time e.g. 12 seconds) was used for quick scribbling to focus another team member's attention, basically for information that is only useful for a short period of time. The free-hand drawing tool was used when the information needs to be permanent but there is significant time pressure to convey the information a timely manner. The vector graphics tool was used when there is less time pressure and when the vehicle platform is relatively stable i.e. moving slowly or stationary. This set of usage patterns will serve as the inputs to guide the evolution of the Forcemate User Interface.

A screen shot of the Observer software with the associated video captures is shown in figure 9.

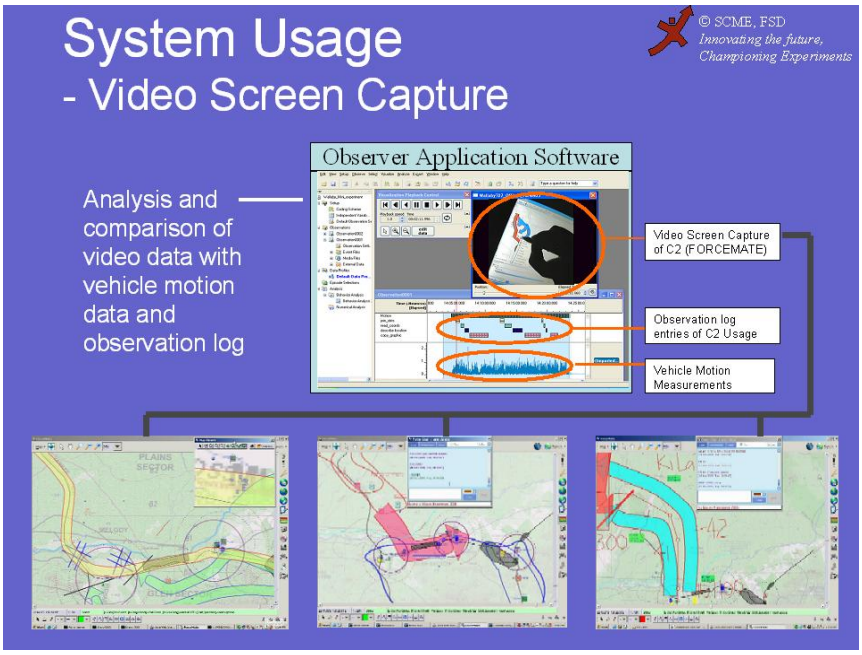

Figure 9. Analysis of audio-visual recordings with accelerometer measurements using the Observer Software.

Through the 4 scenario runs, the Command Team was able to evolve their team processes in terms of how they used the collaborative tools and adapt to attain continuous

situational awareness for their missions. The experiment runs yielded useful insights in the areas of user interface interactions (especially the use of planning and drawing tools), adaptation to the communication blind zones, and adaptation to the physical environment.

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Adaptation Behaviour

Based on the known communication coverage overlay obtained from the communications trials, the Brigade Commander was able to adapt and delegate planning functions to other members of the Command Team when he was heading towards a communication blind zone. Adaptation to the physical environment was also evident in the team processes. For example, when the Brigade Commander was in a fast moving vehicle over rough terrain, he would tend to delegate the creation of the plans by conveying his command intent and general plan through a combination of tactical voice communications, digital highlighter, and free-hand drawings, to one or more of his Principle Staff Officers who are in a more conducive environment to plan on his behalf. More work will be needed to crystallise these usage patterns into a set of operations procedures that complements the MACEN concept.

In some instances, the team members were still able to have intermittent connection to the communications infrastructure even while in the communication blind zone. Thus, they were able to have infrequent but useful snapshot glimpses of the current plans and overall situation awareness during unstable network connections. This was part of the overall experiment design to observe adaptation behaviours. When they move decisively into the communication coverage, they were able to resume the planning processes swiftly. Future experiments could experiment with different schemes to reduce the "friction" induced by the changing physical environment (especially unstable platform) and the transition between the disconnection and connection to the communication links.

Emergent Behaviour

The experiment runs were designed to have room for the evolution and team process adaptation, and the runs yielded some interesting emergent behaviours. The Forcemate system or TDA was designed to be used in-vehicle but that did not stop the Command Team from using it in some other relevant and novel context.

During the operations scenario runs, there were many instances where the TDA (a commercial ruggedized tablet PC) were brought up to the hatch openings to be used while the subjects were top-side of the armour vehicle. In addition to using the TDA during the operations scenario runs 1 to 4, some subjects found it useful to carry their individual TDA tablets with them during the pre-operations brief and also during the post-operations brief. They were able to exchange information and do their mission pre-planning on their individual TDA tablets by bringing the tablets with the customised information into the armour vehicles to hook up to the in-vehicle power and communications modules. In our view the concept of seamless information access and situational awareness across the different command environments as applied in this context has been clever and in line with the concept of MACEN.

DISCUSSION

The concept of MACEN was to realize the full potential of CPA and provide the land battle commands with a very robust C2 structure that is survivable, adaptable and possibly scalable for distributed operations, both in today's context of the land battle and the future. MACEN is a move away from the structured COTM, where we would fix C3 system in vehicles. MACEN adopts the use of the TDA, enabled with the ForceMate and broadband communication systems, as the key to transform the C2 concept for the Brigade Command Team because its characteristics is mobile in nature that helps to improve the adaptability of the command to influence the tempo of the operations. With MACEN, the potential benefits would be to revolutionalize the military C2 structure from a physical presence of a Brigade CP to one that has its elements dispersed all over the battlefield, and yet connected as though they would be physically together. It also affords an equally robust C2 decision making process through the collaborative C2 system, without having to physically meet each other.

The MACEN experiment was experimented in Nov 2005, as part of the larger Singapore Armed Forces Experiment Future Might 05 agenda in Australia. It was further developed from the CPA experiment in 2004. It is also a first step to gain insights into the MACEN concept and how it translates into the operational capabilities of mobility and adaptability for the next generation of Armed Forces. The preliminary findings indicate the feasibility of the MACEN concept as fielded in the context of a Brigade level Command Team. Such a concept is applicable military wide, and is not customized just for the Singapore Armed Forces (SAF). Looking at the experiment results as a whole i.e. from the HCI to the team process, the MACEN experiment has been validated well and has given us a broader insight about adaptability and mobility of command and control operations.

The next step for MACEN is in the area of adaptability for command and control structures. During the

experiment, inevitable gaps in the communication coverage that resulted from the communication nodes separations and the air-ground line of sight issues were purposely incorporated as part of the overall experiment design as an opportunity to investigate the overall adaptation of the C2 structures. While we could identify at a certain juncture that the Commander would be about to be in the blind zone, would he actually want to move in there when it is evident the critical battle is about to commence? Perhaps he would wait for a while to make the critical decision before delegating the responsibility. And while he has delegated the responsibility, there must also be a changed in the culture of the entire Brigade team to know who is in command for the temporary period and that all orders will still need to adhere to, for the better good and in order to keep up with the tempo of operations.

The other important focus is the MMI. Current TDA is only in 1 screen and no keypad. This means that all the massive information has to be displayed on one screen, which is probably not realistic. Other forms of augmented cognition should be studied into to assist the Commanders to make better decisions and not just use the TDA.

Thus, the focus of MACEN will now be to investigate the processes, organisational, and system adaptations across the echelons of command and the different unit types, with their associated Command Team processes. If MACEN expands beyond the Brigade level of Command to the Battalions and even to the higher CP such as the Divisions, it would even influence new operational strategies for distributed operations. In the context of this experiment, only one type of unit i.e. armour units, were experimented on, and it was mainly at the Brigade level of command. The author describes this as an exploratory but very successful experiment about the new C2 structures which would revolutionalize current operational paradigm to one that adopts mobility, dispersion and address the issues of adaptivity in command which could be fulfilled by a principle staff officer of the Command Team.

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