MSG-104 Workshop: Simulation in Support of Current NATO-led Operations Technical Evaluator's Report

Johnny Garcia, Ph.D.
SimIS Inc.

Summary of Proceedings

1) Purpose: The purpose of this workshop was to share current best practice across the Nations and NATO organizations on the use of simulation to support operations. In doing so, it is anticipated that NATO and the Nations will be able to identify potential follow-on collaborative opportunities and understand how simulation might better be exploited.

Key Topics included:

- C-IED Training
- C2 and Decision Support
- Mission Rehearsal
- Course of action analysis
- Theatre missile defense
- Air/Land Integration Training
- HQ and/or Operational Level Training
- Human factors
- Capability development

Any other relevant uses of simulation technology in preparation for or use in operations.

Scope

The workshop convened for three hours during the afternoon of 30 November 2011. The workshop format allowed each nation/organization to provide a 15 minute brief followed by a 5 minute question session.

2) As with past workshops, this workshop facilitated the sharing of national experiences, exploration of simulations, understanding of best practices, and identification of barriers and solutions to further exploitation.

3) Workshop Agenda

Wednesday November 30, 2011

1330 – Introduction by Wayne Buck and Stuart Armstrong

1345 – Updates from GBR, Stuart Armstrong, COTSUE QinetiQ

1415 – Best Practices of Developing Efficient Ground Vehicle and C-IED Robotics Training, Sebastien Loze, CM Labs

1445 – Simulations for Standardizing Maintenance Training, Keith Pollock, NGRAIN

1515 – I2 Collective Training Capability, LCDR Fred Baxter, UK MoD

1530 - Modeling Simulation and Analysis at S&T Homeland Security, Dr. Nabil Adam, Department of Homeland Security USA

1545 – SAFIR (distributed simulation Support to Angle/French Interoperability and Readiness (SAFIR), Bharat Patel, UK MoD

1615 – Wrap up by Wayne Buck and Stuart Armstrong

4) Participants

ABBOTT Darrin (Mr)	United Kingdom	Member
BAEKKEN Kjell Inge (Colonel) Army officer	Norway	Member
ARMSTRONG Stuart (Mr)	United Kingdom	Chair
BERTHEL Glen (Mr)	Australia	Member
BIAGINI MARCO (MAJOR (OF3)	Italy	Member
BORGVALL Jonathan (Mr) Senior Scientist	Swedish Defence Research Agency (FOI)	Member
BRATHEN Karsten (Mr) Chief Scientist	FFI-Norwegian Defence Research Establishment	Member
BRUZZONE Agostino (Prof)	Italy	Member
BUCK Wayne (Mr)	Canada	Chair
CANTOT Pascal (Lt. Col.) Chef Division Projets Informatiques	France	Member
CHITTY Jon (Mr) Consultant	United Kingdom	Member
CHRISTENSEN Ole (Mr) Project manager	Norway	Member
FAYE Jean-Pierre (Dr) Engineer	France	Member
GANZ Illeana (Ms.) MSG Panel Assistant	France	Member
GARCIA Johnny (Dr)	United States	Member
GOODALL Cerys (Ms) Public Relations Manager	Canada	Member
HALVORSEN Sven Harald (LtCol) Commander Land Forces Training Centre	Norway	Member
JACKSON Peter Michael (Mr)	United Kingdom	Member
JANSSENS John (Major) Staff Officer M&S	Netherlands	Member
JONS Tom (Mr) Modeling and Simulation	United States	Member
KRARUP-HANSEN Niels (Mr) Senior Advisor, M.Sc	Denmark	Member
LEWIS Mark (Mr) Lecturer	United Kingdom	Member

LOUPOS Marios (Dipl.Ing) ELECTRICAL ENGINEER	Greece	Member
LOZE Sebastien (Mr) Director, Marketing and Partner Sales	Canada	Member
LYNCH Adelle (Ms) Training Quality Manager	United Kingdom	Member
MCMILLAN Richard (Captain) Naval Officer	Australia	Member
MURRAY Norman (Mr.) Management	United States	Member
MURSIA Agatino (Ing.) Head of Modeling and Simulation	Italy	Member
ROLAND Ronald (Dr) President	United States	Member
RYAN P Peter J. (Dr)	Australia	Member
SPINA Roberto (Mr.) Engineer	Italy	Member
TARD Laurent (LtCol) Militaire	France	Member
VOICULET Adrian (Mr)	Romania	Member
YU Leigh (Mr.) Associate Director	United States	

1) Executive Summary of Presentations:

November 30, 2011

5.1   Opening remarks by Mr. Stuart Armstrong and Mr. Wayne Buck

Mr. Buck provided an update to the audience on ACT happenings and ACT's role as NATO's leading agent for change - driving, facilitating, and advocating continuous improvement of Alliance capabilities to maintain and enhance the military relevance and effectiveness of the Alliance.

Mr. Buck further discussed areas that are benefiting from immersive technologies such as:

- Meeting & Collaboration
- Rapid Prototyping
- Training & Education
- Skill building
- Data Visualization & Analysis
- Outreach

Mr. Buck further discussed the need to leverage MSG-104 as a forum to continue collaboration in 2012.

5.2   Stu Armstrong QinetiQ UK MOD

Mr. Armstrong gave a presentation and video demonstration on QinetiQ's Pre-Deployment Training Situational Awareness Tool (PDT-SAT) which provides a simple and immersive tool that allows its users to gain situational awareness of geo-specific locations and incidents. This helps users to identify enemy tactics

by viewing and interrogating IED and other incident data that have taken place around them. The PDT SAT system integrates VBS2 with custom QinetiQ software to provide the user with a simple and intuitive interface through which to view historical incident data within a geo-located three-dimensional simulation. PDT SAT contains all the controls for filtering events, loading missions and switching between locations by walking driving and or flying. Mr. Armstrong showed another video on the balance between live, virtual and constructive where simulation provides more value to live training.

Mr. Armstrong left the floor so that Jon Chitty could give a quick brief on

Mountain Dragon and the Distributed Synthetic Air Land Training (DSALT) demonstration facility at RAF Waddington which enable soldiers to experience the complexities of controlling aircraft, artillery and other assets in a fast moving engagement within a safe, simulated environment.

5.3   Sebastien Loze CM LABS VORTEX sebastien@cmlabs.com

Mr. Loze from CM Labs CM Labs Simulation (www.vxsim.com), the global innovator of dynamics software and simulation-based training solutions, Vortex 5.1 allows developers to integrate real-time mechanical behavior into interactive 3D simulations, creating realistic dynamics for vehicles, heavy equipment, robotics and more. Vortex is used in hundreds of training, engineering and scientific projects to simulate complex machines and equipment, train operators, rehearse operations, and design and test vehicles. Mr. Loze gave a brief on best practices and lessons learned of Developing Efficient Ground Vehicle and C-IED Robotics Training. Mr. Loze provided three uses cases that have been investigated.

- Armored Personnel Carrier Simulator

- Environment interactions and communication through physics

- Explosive Ordnance Device Robot

Mr. Loze further described Vortex software and the role it plays for training. Vortex is not just a physics engine, it brings virtual world to life – based on fundamental physics and object properties. Vortex makes a virtual vehicle feel real to the operator and enables virtual test of a robot a reliable input for design. Vortex provides better skilled, more efficient operators. Vortex also reduces costs of time and wear-and-tear of actual equipment, reduce accident costs and wear-and-tear caused by novice operators on equipment, and reduce overall training time.

Mr. Loze provided 5 best practices found from tests conducted by the team:

1) Do not reinvent the wheel

2) Follow a clear path

3) Drive standards adoption

4) Stay on track for tomorrow's needs

5) Don't choose between Empirical & Analytical

Mr. Loze concluded that based on these three typical use cases as well as other customer success and market trends, CM Labs developed best practices, and advice and guidance to share them with the users of Vortex when they require expertise to start building ground vehicle or C-IED training simulation application.

5.4   Keith Pollock NGRAIN.

Mr. Pollock gave a brief introduction of Maintenance Training Transformation, noting

"Simulation enables us to learn much more rapidly and effectively than we might through conventional means of training."

He discussed the advances in simulation-based training and the need for NATO organizations to adopt solutions that can be universally adopted across common platforms. Furthermore, he provided a detailed look at two of today's training challenges which are universal across our Forces:

5.4.1 Era of Austerity

- The global economic crisis has impacted how our Forces choose to acquire new technologies.

- An ROI must be achievable and measurable and provide, at minimum, an immediate 10% ROI (DoD Maintenance Symposium).

- Existing training assets must be examined, and new training investments must be considered within the context of the type of equipment, its cost, the number in use, and the mission requirements.

- Manpower is being reduced and experienced professionals are retiring. As a result, maintainers often have basic skillsets but do not have platform-specific knowledge.

- Field Service Reps are a growing cost because the right training support is not available in the field for maintainers who often only have basic knowledge and skillsets. It's a cost that NATO countries need to be aware of, and manage.

5.4.2 Era of Persistent Conflict

- As a result of the drawdown, thousands of pieces of equipment are going to be re-set and redistributed to places like Libya, the Congo and others.

- The ability to maintain our operational tempo relies on our ability to quickly and cost-effectively sustain the equipment, lengthening its lifecycle and ensuring that troops have the right equipment in the field.

- Naval Surface Warfare Center has specific training requirements for its highly specialized tactical vehicles deployed in Afghanistan.

Mr. Pollock noted that traditional training does not support the new military environment in which the nations find themselves. It isn't cost-effective – we need to keep equipment in-service, not pull it out for training purposes. It doesn't address skill-fade – with modernized equipment, it can be months between scheduled maintenance. It doesn't provide just-in-time training in an efficient way – hauling manuals into the field is an ineffective way for maintainers to get the information they need, at the time that they need it.

Technology is advancing but similar to the evolution of simulation-based pilot training, companies developed specific formats to standardize the development process and improve the resulting deployment. Well known formats continue to advance and give users the confidence that their investment will work in expected environments. (ex. CDB, OpenFlight, etc.)

Advanced technologies are being examined by the military to determine how they can help support training requirements. These include mobile devices, cloud computing, virtual worlds, and learning management systems. By leveraging established standards that are proven to work with these technologies or in these environments, customers can be confident about the predicted outcome.

Mr. Pollock discussed that adopting a standard approach between NATO forces results in the ability for improved cross-collaboration, standardized training and performance support, and sharing of resources. Distributed training and troubleshooting is a key advantage (which will be discussed further) that can only be enabled by adopting common training formats. Mr. Pollack then presented a couple of challenges.

Challenge 1: the U.S. Army National Guard is supporting the development of local law enforcement in Afghanistan. Many of the people signing up are local farmers – rarely do they speak English and most are not literate. Objective was to leverage interactive 3D weapons simulations to provide weapons familiarization and procedure practice to Guardsmen anywhere, anytime.

Solution: NGRAIN provided a set of 3D-enabled small arms Virtual Task Trainers, which provide Guardsmen with weapon familiarization and procedure training.

Payoff: Guardsmen are able to receive weapon training regardless of language skills. As a result, Guardsmen safety is increased in the field, by ensuring all Guardsmen have the opportunity to attain the required level of weapon familiarity prior to deployment.

Challenge 2: The Canadian Forces are challenged to train soldiers in the field on the internal and external characteristics of landmines, as well as procedures for safe handling and disposal. Dependency on "dummy" landmines for this training causes significant acquisition, transportation, storage, update, and handling challenges. Objective of this challenge was to leverage interactive 3D weapons simulations to provide weapons familiarization and procedure practice to Guardsmen anywhere, anytime.

Solution: NGRAIN provided a set of 3D-enabled small arms Virtual Task Trainers, which provide Guardsmen with weapon familiarization and procedure training.

Payoff: Guardsmen are able to receive weapon training regardless of language skills. As a result, Guardsmen safety is increased in the field, by ensuring all Guardsmen have the opportunity to attain the required level of weapon familiarity prior to deployment.

Mr. Pollock provides some great examples of standardizing training and performance support; there is an opportunity for military forces around the world to work together at a training/maintenance level no matter where they are located. Key point that Mr. Pollack passed was that Interactive 3D technologies are accepted technologies. Organizations like NATO can encourage the adoption of these standards making them universal and therefore easier to be shared between countries.

5.5   LCDR Baxter MOD JTES

C-IED Training Initivies

LCDR presented a short briefing on Project CREOLE as it related to work the MOD has done in the area of C-IED. During the initial work in this area, the focus was on Defensive C-IED, specifically a) defeating the device and b) protecting the force. More recently this focus has changed to Offensive C-IED in support of COIN operations and Attacking the Network. Through this work, the MOD has found that simulation gives provides fidelity of information and then know what to do with it. The result is the ability to more rapidly developing cost-effective complex training capabilities. This has been accomplished through the implementation and understanding of hundreds of sensors.

The objective of Attack the Network has promoted an understanding of the TTPs that support C-IED operations and allow the enemy system to be understood and attacked. This is a key objective. Successful implementation of this objective requires a deep understanding of how to maximise employment of applications and feeds. Mr. Baxter noted the C-IED Information Management (IM)/Information Exploitation (IX) programme, which is aimed at having an AtN capability enabled to Coy level for H15.
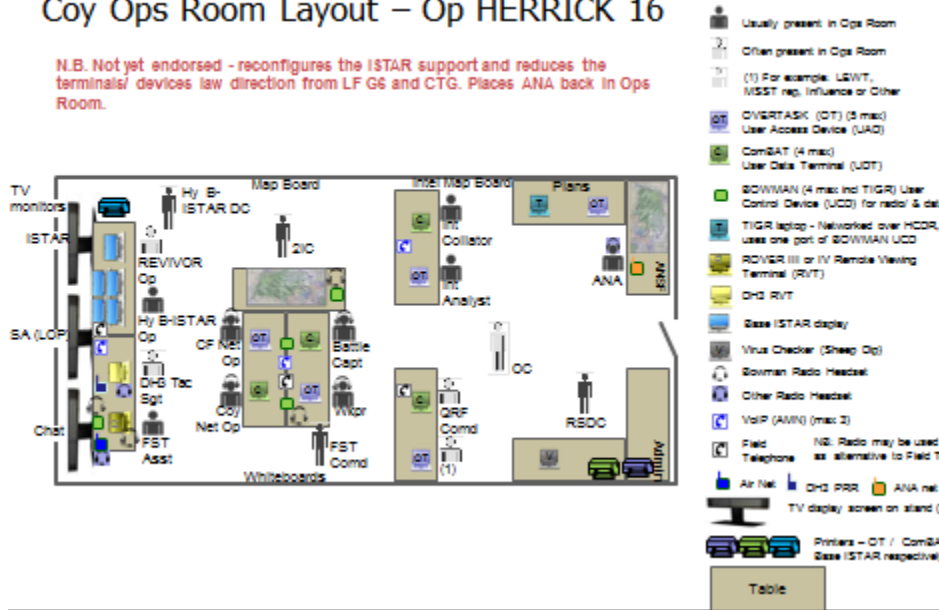
Figure 1: Coy Ops Room Layout – Op HERRICK 16

Mr. Baxter discussed the Coy Ops Room Layout as shown in Figure 1. This is an application that allows the MOD to better manage the environment. He also provided a discussion of the Project CREOLE ISTAR Laydown as shown in Figure 2.
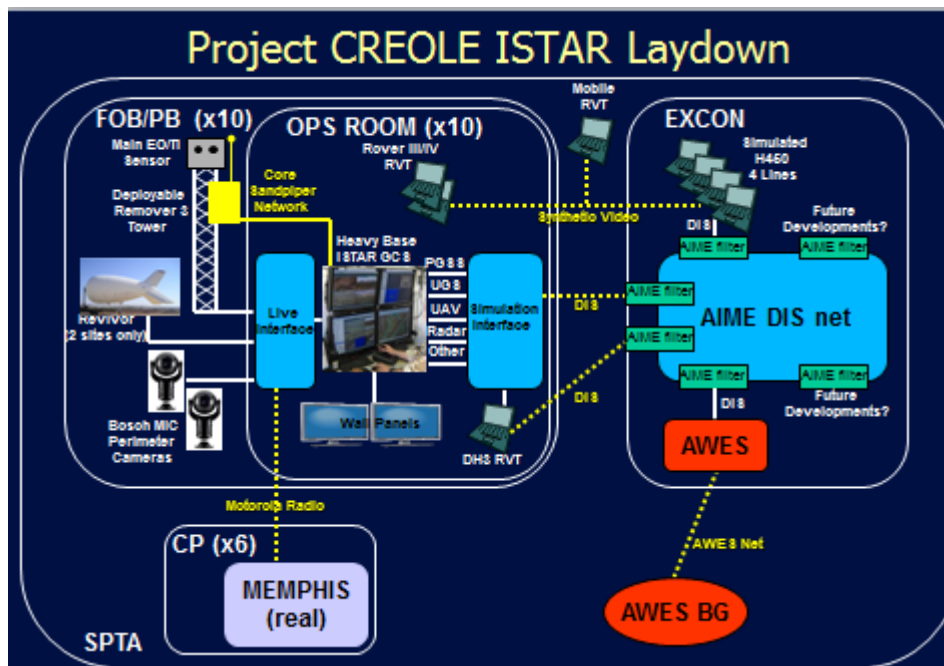

Figure 2: Project CREOLE ISTAR Laydown

Mr. Baxter provided useful information about this laydown, noting the greatest limitations are due to visualization. By means of example, achieving the desired fidelity as required by or for the warfighter (e.g., digging – shooting). Additionally, by servicing live interfaces using VBS2 and cameras the MOD can save millions of pounds in deploying UAVs to conduct this live testing.

Finally, Mr. Baxter discussed some recent successes in attaining the AtN MST Training Capability. An initial capability, which demonstrated within both virtual and live environments, has been expanded to all 5 BGs and networking as many as 6 FOBs. This provides a more permanent live capability expected in February 2012.

5.6   Dr. Nabil Adam DHS – nabil.adam@dhs.gov

Dr. Adam provided the group a presentation on some recent work by the U.S. Department of Homeland Security in the area of M&S for Analysis and S&T. Because he was a visiting guest to this MSG, he provided an overview of the DHS S&T organization and its Enterprise (both U.S. and international). He also discussed the environment they work within as well as some gaps and challenges. The primary focus of his presentation was to present the Complex Event Modeling Simulation and Analysis program and how it incorporates real-time information from the field agents.

The environment DHS works with is referred to as HITRAC (Homeland Infrastructure Threat and Risk Analysis Center). It services the highest level of government by enabling consequence analysis by analyzing data with respect to infrastructure missions. This can range from physical outages to economic impacts of natural and man-made threats. Within this environment, Dr. Adam specified five particular gaps with associated needed capabilities:

Gaps	Needed Capabilities
Manual/Human-intensive	Semi-automate manual process
Inability to recall previous studies	Build knowledge base
Poor transparency/traceability	Provide traceable models
Unable to access best models	Provide access to industry and academic models and tools
Limited visibility of NISAC M&S	Expose NISAC models to other agencies

His presentation explored and discussed current approaches to solving these needed capabilities. This led to the discussion of CEMSA.

> *CEMSA provides DHS analysts with MSA capabilities that enable dynamic semantic composition of simulation models and tools to analyze consequences of multiple, interacting, complex disruptions to the nation's CIKR*

The DODAF Operation View was given and showed the relationships among NISAC models, HSIP Gold (as well as other DHS databases), CEMSA, and the Knowledge Base. All of these are backboned by the DHS Enterprise Network and made available to in-house analysts as well via the internet to service other governmental agencies, universities, and industry. An expanded OV1 provided a glimpse at how the international community is also connected. The primary result of this is the support of real-time decision making in a crisis. By better enabling the collection and management of real-time field information, one may guide a more optimal execution of information collection.

Dr. Adam went on to describe information flow in a crisis situation including who shares the information and how they share it. This group includes everyday citizens and their connections to first responders…serving as a type of sensor to the larger effort. A future view of CEMSA was discussed which included Real Time Information as discussed in earlier slides.

With regards to a Way Ahead, Dr. Adam noted a BAA was published in August 2009 and a primer contractor was selected in 2010. They are employing spiral development in three-month cycles. The overall schedule covers a five-year horizon with full capabilities transitioned in 2015.

5.7   Bharett Patel UK MOD S&T

Dr. Patel provided a presentation on Support to Anglo-French Interoperability and Readiness (SAFIR) at Exercise Events. The primary aims of SAFIR include:

- to experiment and define requirements for perm distributed C2 simulation capability
- to enhance the trng by integrating
- to evaluate new concepts
- to underpin training cape for the future Combined Joint Expeditionary Forces (CJEF)

It was noted the concept of SAFIR to support future exercises was essentially to connect front line support to backside coordinating elements. Dr. Patel then presented a use case of SAFIR during Flandres 2011, a UK-FRA exercise of land forces in Mailly-le-Camp. Its purpose is to take stock of interoperability between armies. It was the first major event for build-up of CJEF. In essence it was a Command Post Training Centre event – a live event run in parallel with simulation.

One issue discussed was the importance of providing a UAV feed into the exercise:

- To show capability to train together at home stations
- Reduce the number of exercise support staff by linking C2 systems to Simulation systems
- Show more comprehensive and realistic training (simulate hard to deploy systems, use government and industry at remote sites, integrating design aids to support mission planning and fire support)

A video was shown of Exercise Flandres and use of SAFIR. The video reinforced the discussion points and provided additional information on the architecture of the UK and FRA C2 systems as well as the use of the JSAF M&S system to aid in decision support and enumeration of COAs. Also presented were the use of live and simulated systems in conjunction with one another to explore operational concepts about future approaches in engagement and fire support. Of note, the SAFIR network showed successful use of the internet and government secure networks could provide all the connectivity while maintaining requisite security. After the video, Dr. Patel stressed the importance of the architecture and the success of using the internet in the Flandres event. Success because it was both responsive and secure…achieving both to the necessary levels.

The next target exercise to exploit SAFIR will be the Exercise Rochambeau 2014 (UK-US-FRA) exercise. This is the next opportunity where both UK and FRA are working together again. Could represent a next step to learn…in addition to other lessons which may be gleaned from venues like MSG-085.

6.   CONCLUSION

- Mr. Buck provided an opportunity for around-the-room discussion. Key points included:
- nGrain said thanks for the opportunity to participate in this MSG-104
- France noted that with relation to SAFIR, the results were a tremendous improvement in time saving and performance…well done
- Neills noted MSG does have agreements with SISO wrt with standards
- In this age of austerity there is an opportunity to promoting the use of M&S. While this isn't a statement for replacing all live training, we can make live training we do conduct better by enhancing with M&S

Other participants thanked Mr. Buck for the opportunity to participate in the MSG.

Participants and workshop organizers assessed this session of MSG-104 as a success. The workshop met its objectives to:

- Provide demonstrations and presentations supportive of NATO exploitation of simulation for operations,

- provide updates on the nations' current application of simulation technologies, and

- provide capability briefings.

As highlighted in the various presentations and demonstrations, NATO partner nations currently use simulations in operations. The workshop participants concluded that a need exists to continue pursuing simulation solutions. This may require a review of existing acquisition and procurement guidelines. Finally, NATO and ACT enjoy an organizational infrastructure and innovative partners to facilitate these types of workshops in the future. They should continue to do so.