PROJECT WATER BEAR: ADAPTATION MODEL FOR DECISION-MAKERS IN EXTREME SITUATIONS

Natalia WOJTOWICZ,
Civil-Military Cooperation Centre of Excellence

Abstract :The following article will address the characteristics of challenges to decision-makers in extreme conditions and ways to provide solutions improving adaptation to disasters. A model based on the Water Bear's adaptation to extreme conditions will be proposed to recognize ways to improve performance and outcomes of response. Within a modular design, simulation will be run to recognize the human dimension in crisis and disaster response. The purpose of this research is to provide military Commander or civilian equivalent with both experience and information that will be useful in real-life situation.

Water Bear[1] is scientifically proven to be the most resilient creature on Earth. Scientists have run the most apocalyptic scenarios: killer asteroids, supernovae and gamma ray-busts to see if there is an

---

[1] Read further about modelling in reference to animal traits in: Matthew Crosston, "Bridging Non-Western Cultures and Conditions into Comparative Intelligence Perspectives: India, Russia and China." International Journal of Intelligence and Counterintelligence, 29: 110-131, 2016.

organism that can survive all.[2] Despite the name, Water Bear, is not significant in size – it is a microscopic (under 1mm) - organism residing in water.

Picture 1. Water Bear.

Introduction

This project originates from the 2018 Crisis Management Disaster Response (CMDR) Interagency Cooperation Conference which took place in Sofia. In spirit of the conference, a Working Group has attempted to initiate a solution which could address several requirements from different functional areas with one modular design. To maximize

---

[2] Several articles were published based on the research of Harvard University astrophysicist, Avi Loeb (on survival of catastrophic event in universe), biologist of University of North Carolina, Thomas Boothby (on shields proteins) and Japanese researchers that have tested immunity to radiation and DNA properties

the benefit from two institutes working together, the complementary effects are assessed and synergies summarized. Project Water Bear is at its initial phase, therefore this articles outlines the model, scope, training audience, desired end-state and envisioned application of developed solutions. It is the intention of the author to share the modular set-up with all the community responsible for improving the performance of CIMIC and CMDR, and in broader sense response to disaster. It can also serve as a precedent of cooperative work methodology which saves personnel capacity and adds value.

Modular Design

The basis of the modular design is the building-block principle. This principles means that all steps of the project add another level of expertise. The Depth of Knowledge (DOK) ranges from 100 until 500, reflecting awareness at the lowest level and mastery at the end of the road. Starting with basic level (online module), advancing to training simulation (use in course) and exercises. Those main actions will be supplemented by requirements analysis and following conclusions to be carried

on[3]. If time and capacity permits, additional experimentation workshop can be executed. For the overview of actions, outcomes and timelines, see the table on page 10. The modular design extends along the Experimentation, Education, Training and Exercises (EETE) spectrum and aims at completing full cycle of personnel development and decision-making support.
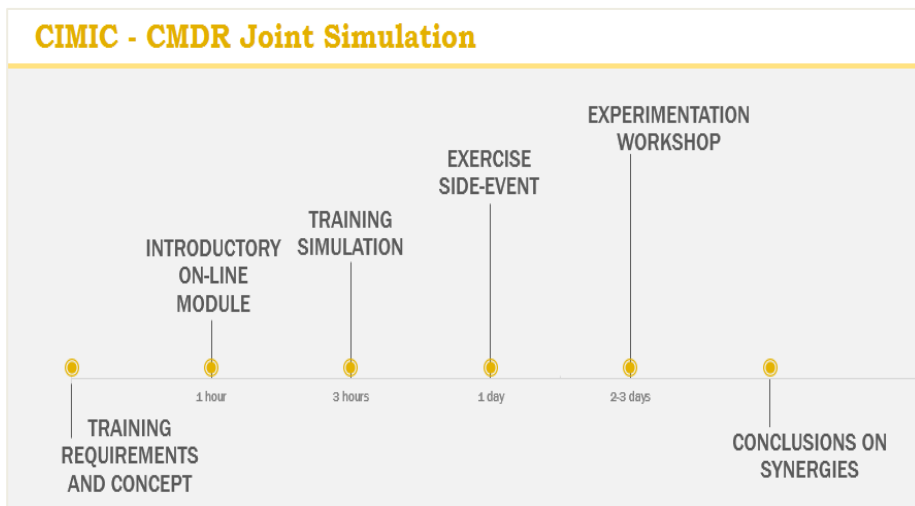
Pic 1. Proposed modular design – 4 main actions and supporting steps.

Scope

A joint simulation is planned to improve the knowledge, performance and practical cooperation, in support of the Experimentation, Education, Training and Exercises (EETE). It

---

[3] To allow observations to be translated to lessons identified and consequently learned, evaluation will be requested from Lessons Learned Branch.

is aimed at supplementing existing solutions with understanding of civil environment and response mechanisms. The main goals include:

➢ **Knowledge base of CIMIC-CMDR synergies;**

➢ **Training and Education – Joint Simulation available to courses, exercises and NATO events;**

➢ **Cooperation within COEs cluster build around practical solutions.**

As this is an initial stage of the project, those goals will be reviewed with prioritization when timelines will allow to associate the presentation of outcomes with specific events.

Training Audience

Within the scope of the joint simulation, the main effort will be dedicated to operational level Training Audience, providing military Commander or civilian equivalent with both experience and information that will be useful in real-life situation.[4] One of the main challenges in case of intersection of CIMIC and CMDR is joint planning and alignment of processes with all relevant

---

[4] Francis J.McHugh, "Fundamentals of War Gaming." The United States Naval War College, 3rd Edition, 1966, p.16.

parties[5]. Due to the practical focus of this project, priority will be given to the Training Audience of both centers and extended if required[6].

Desired End-State

The desired-end state is the increased level of expertise and performance in situation requiring adaptation. In the simplest of terms, the Working Group has considered not only what do we want to achieve but also <u>who</u> we want to achieve. Water Bear designated as the most resilient creature on earth can provide a lot of insights into handling crisis and disasters. What makes it the ultimate survival creature and how does he adapt to adverse conditions? How can we use characteristics of nature to improve decision-makers performance?

The Water Bear possess specific traits that allow him to become the master of response to stress:

---

[5] By relevant parties, the author means two aspects of human dimension: performance of people responsible for responding to certain event and the people that require this response to be successful.
[6] If you or your organization have interest in being involved/updated on this project please contact Ms. Natalia Wojtowicz (Wojtowicz.n@cimic-coe.org). As this is a cooperative project aimed at complementary effects and synergies, new contributions are welcomed.

1) Shields – protecting the organism from too high or too low temperatures and damage;

2) Immunity to radiation;

3) Extremophile – Water Bear can thrive in extremely different conditions, ranging from crushing pressures of the deepest oceans to frigid vacuum of space. The only deadly weakness is its environment – if all oceans are wiped out, it can't exist[7].

4) No dependency on sun - most organisms can stand bad weather, but die if deprived of sun in the long-term.

5) Crypto-biosis – ability to slow down metabolism and suspend into hibernation; If Water Bear meets adverse conditions in his environment, it retracts its limbs and accumulates remaining water.

---

[7] This also applies to most life on Earth.
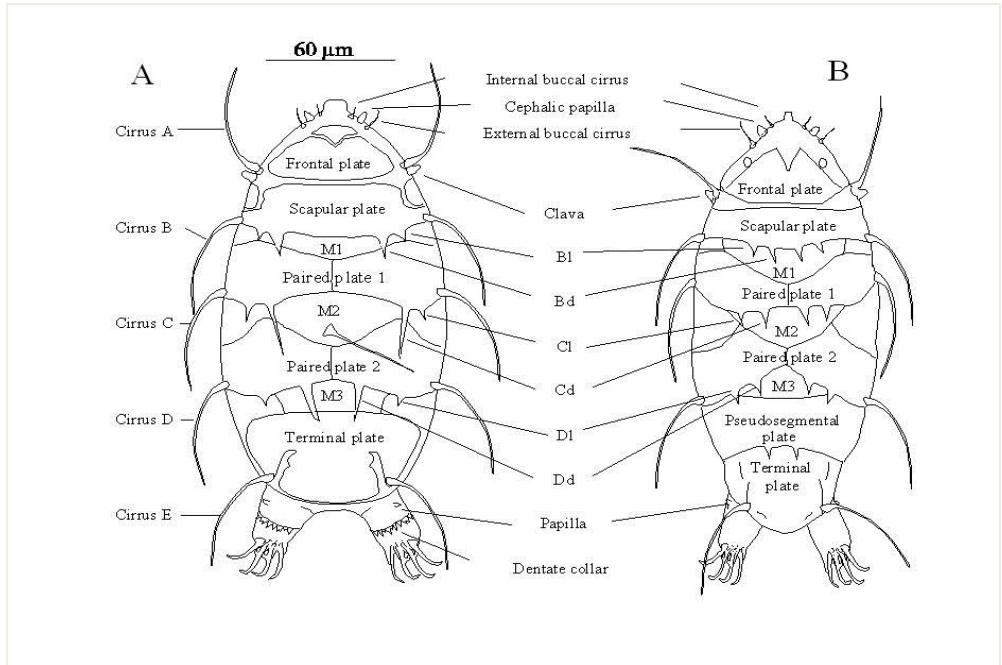
Picture 2. Water Bear anatomy and elements which determine his survivability.

Those traits allows the Water Bear to live through apocalyptic scenario. Can we use this to design a model of a resilient and adaptable decision-maker? What would he/she need in terms of information and experience?

The human who is responsible for responding to the adverse conditions in its extreme form requires a specific set of tools. Following the Maslow's Frontrunner methodology[8], this project

---

[8] Frontrunner methodology has been based on the premise that average of human population does not provide fundamental understanding of its needs. To

aims at identifying the factors that allow successful decision-making under extreme conditions complementing existing processes with human dimension.

Looking at practical use of this model (Graph 1), the following traits[9] of the decision-maker could be proposed:

- resilience to extremes - finding the right balance of action and analysis,

- adaptation to different environments – recognizing best ways to improve the particular situation,

- ability to defend course of action and motivate subordinates – taking calculated risk in case of changing conditions – resembling "building" shields against temperature,

- immunity to distractions – the decision-maker receives abundance of information and has to be able to filter actionable data,

---

investigate how to reach full potential, Maslow has recognized over 100 people who were most successful – professors, surgeons, directors etc. Mapping their inputs into a pyramid, he has identified what is essential in terms of needs (and therefore universal in all of the population), but also what is a higher level need which has not been otherwise visible. The same path will be followed within this research, in order to build on the existing baseline and add the human dimension into understanding of decision-making in extreme circumstances.

[9] Related to the human dimension;

- reversed hibernation[10] – within the area of disaster, the responders are usually not activated until it emerges. This requires ability to provide "sleeper cell" which can be hibernated when not needed. It has to be able to be restored in minimum time when the circumstances are worsening. This requires the decision-maker to have clear criteria for mobilization.

To achieve mastery in those traits, the focus will be drawn towards competences of the participants of the simulation (or other activities enumerated in the modular design). Initially, three competences are targeted:

➢ Planning;

➢ Assessment;

➢ Coordination;

➢ Translating policies into practice.

Due to the interest in cooperation between NATO and EU, interoperability will be considered alongside this project. If limitations are identified, they will be included in the observations. If synergies will arise, they will be captured in the

---

[10] Reversed hibernation reflects the crypto-biosis from Water Bear characteristics.

summary of the project. In support of the human dimension, the following factors will be mapped:

1) Initiative – decisiveness within high-pressure, high-tempo circumstances;

2) Adaptation – changing the way of approaching problem based on conditions;

3) Prediction – understanding of the human communities and their needs;

4) Resourcefulness – doing more with less;

5) End-state – clearly defined outcome of the activities.

The desired end-state is, in short, to provide the highest level of expertise in decision-making in extreme circumstances. To this ends, application of the developing simulation will enable improvement of performance of decision-makers and recognize the reception of the response measures by population affected by adverse events.

Application

M&S is the proposed solution to support decision-making in case of an event, scenario or training that requires expertise on both CIMIC and CMDR. That narrows down the circumstances

that will be presented to the decision-makers to historically-based, current or hypothetical disasters. The scenario will be further determined to be easily used[11] in existing Training and Education solutions.

Courses:

- CMDR – Strategic Decision Making for Crisis Response Operations Course;

- CCOE – NATO CIMIC Higher Command Course;

Exercises:

- Balkan Bridge 2019;

Further use of the developments can be added based on requirements review in 2018/2019[12]. The detailed overview of each step of the project can be seen in the table.

---

[11] The outcomes will be presented to the institutes and Course Directors to determine their usability.
[12] CIMIC and CMI discipline Training Requirements Analysis is planned for end of 2018. CMDR is updating their requirements with NATO Command Structure.

	ACTION	LEAD	OUTCOME	DOK*	TIMELINE
1	Training Requirements and Concept	Joint	Input for Requirement Authority – SHAPE J9 – regarding synergies between functional areas and their application. (Will be connected with Training Requirements Analysis process in CCOE and CMDR)	X	Q4 2018
2	**Introductory on-line module**	Joint	Knowledge base for participants. Provides preparation/ read-ahead material.	100-200	Q1 2019
3	**Training Simulation**	CCOE	Facilitated exercised aiming at improving performance of Training Audience.	300-400	Q2 2019
4	**Exercise side-event**	CMDR	Side-event during an exercise, which will showcase impact of CIMIC-CMDR on military operation. This can be combined with facilitated exercise, but will feature Computer Assisted Solutions.	400-500	Q3 2019 (indicated readiness - depends on exercise schedule)
5	**Experimentati on Workshop**	Only if needed	IF needed, these tools can be used to support an experimentation workshop of a chosen objective.	X	Based on needs
6	Conclusions on synergies	Joint	Report from the simulation which provides conclusions on CIMIC-CMDR synergies and their impact on military operations.	X	Q4 2019

Validation

Validation of the model will be based on: executing a simulation of the model during courses and exercises, interviews with practitioners and population. This will be paired with case studies that support the developing model[1].

Conclusions

Project Water Bear has been established at the CMDR Interagency Cooperation Conference in 2018. It is aimed at practical solutions addressing support to decision making from CIMIC and CMDR. To this end, a modular design of simulation and associated findings was proposed. Water Bear represents the resilience, adaptation, recovery, readiness and ever-lasting existence. It embodies the goals of joint CIMIC-CMDR simulation and the spirit of the decision-makers that will be responsible for responding to extreme cases of disasters and crisis. Water Bear is the way to improve performance by providing experience and information to the Military Commander and Civilian decision-makers.

---

[13] Read further about development in prototyping mode in: Paul K. Davis, "Illustrating a Model-Game-Model Paradigm for Using Human Wargames in Analysis", RAND, 2017.

The results of the Water Bear project will be presented during the next conference, allowing for validation of the proposed model and revision of applicability of the modular design of the joint CIMIC-CMDR simulation. Additional reports can be found on the CCOE (www.cimic-coe.org) and CMDR (www.cmdrcoe.org) websites.

Bibliography

Crosston, Matthew, "Bridging Non-Western Cultures and Conditions into Comparative Intelligence Perspectives: India, Russia and China." International Journal of Intelligence and Counterintelligence, 29: 110-131, 2016.

Davis Paul K., "Illustrating a Model-Game-Model Paradigm for Using Human Wargames in Analysis", RAND, 2017.

McHugh Francis J., "Fundamentals of War Gaming." The United States Naval War College, 3rd Edition, 1966,

US Army: The Army Human Dimension Strategy 2015.