SERIOUS GAMES – FUTURE OF TRAINING AND EDUCATION WITHIN THE AIR FORCE

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Abstract: *The future of training and education allows the rise-up of a new concept regarding the possibility to make operational the skills needed for students as staff-officers. The new operational environment, the budgetary constraints, the need of interoperability lead to the use of a new method, serious games, which should become a cornerstone in military education together with the classical methods and synergetic with them. This paper tries to highlight some directions to follow in order to meet educational demands according to the national and Alliance's standards.*

Keywords: *serious games; simulation; Air Force training.*

Introduction

The reality foreseen starting with 2014, when "*NATO is expected to shift its emphasis from operational engagement to operational preparedness*"[1], and *The Connected Forces Initiative* impose us a new way of thinking for maximizing the opportunities of training and education in order to meet the national and Alliance's educational standards. At the same time, we should take into account the most efficient approach so that we will achieve the goal of ensuring effective education and training in order to make different branches think and act as one. Moreover, the education and training system is called to participate in the formation of fellows as military and citizens, with skills in the personal development of knowledge, prepared for operations and, why not, for social activities in the labour market.

Besides, we consider that education and training are key agents for co-operation and interoperability both within NATO and with other agencies involved in the area of military activities. Education deals with the theories, and helps understand concepts, doctrines and fundamentals. The purpose of training is to put into practice and apply knowledge, help assimilate the subject matter completely, and transfer the knowledge into practical skills needed for operations.

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The most important and complex phase of training is represented by exercises whose aim is to test the acquired knowledge during live or computer-assisted exercises with a scenario based on different realities. We consider that the exercises represent the most realistic criteria to verify the efficiency and the effectiveness of training in order to fulfil the mission requirements by command and forces structures. Exercises could cover the full spectrum of operations, should provide all levels of intensity, promote interoperability and compensate for the reduced operational experience of command and forces working together.

Serious games for the air force

One of the issues of execution and assessment through live exercises is the realistic environment, which should provide conditions and situation, determining the performers to transfer the knowledge into practical answers and to built-up solution to the various problems. Moreover, due to the budget constraints, the live exercises are more and more difficult to be performed, so it is mandatory to find alternative solutions, among which one of the best known being the *Computer Assisted Exercises*.

What does it means?

A *Computer Assisted Exercise* is a "*synthetic exercise where electronic means are used to simulate scenarios, processes and procedures of all kinds and levels of operations, in complex environments*"[2].

Put differently, a *Computer Assisted Exercise* is a "game" planned and executed for the purpose of training or assessment of the level of preparedness for the specific tasks that are going to be fulfilled by command and forces structures. It is a game, a part of a wide class of games, known as *serious games*.

With the advancement of technology and the wide-spread use of state-of-the-art computers, the way in which education and training are perceived within the Armed Forces has also changed. The emergence of E-learning and the larger use of serious games have marked a progress for military education as well. First used within the financial field as a means of learning and market simulation, serious games soon outpaced other forms of training because of their versatile nature.

Targeting certain fields of activity, serious games were first created to meet the specific needs of a specific category of personnel, being mainly used either for training or assessing; later, with the growing interest of defence, their use was widened to simulating real theatre conditions. The latter led to an increase in how

teachers delivered experiences that otherwise students would not have had access to, and to a progress in how standards were taught by enlarging the rigid and restricted area of the traditional classroom. However, despite their advantages, the use of serious games complicated the problems students had to solve within their training doubled by the fact that the game itself had to be learnt and mastered by both teachers and students thus involving not just time, but also logistics.

Being simulations of real events, serious games focus on a certain audience within the Armed Forces assisting a service and one category of personnel. Even if they are simulations of possible real events meant for training, they still retain the game – like features such as the possibility to win based on sound decision-making and the appearance of a genuine product designed for entertainment.

History of serious games dates back to the 80s when the proliferation of computers made them available to colleges so that they would be used by teachers and students as a drilling method. Being quite simple at the beginning, as time went by, games became increasingly developed with the help of cutting edge science, and at the beginning of the 21st century, games commissioned by the US Army made their way into the training of military personnel and simulation of real-time events in combat situation.

Apparently an oxymoron, the term serious games was defined as "games that do not have entertainment, enjoyment or fun as their primary purpose"[3] or as "any meaningful use of computerized game/game industry resources whose chief mission is not entertainment"[4]. However, serious games are not a recent concept, as in an early definition provided by Clark Abt in the 70's, he stated that "*Games may be played seriously or casually. We are concerned with serious games in the sense that these games have an explicit and carefully thought-out educational purpose and are not intended to be played primarily for amusement. This does not mean that serious games are not, or should not be, entertaining*."[5]

According to Sawyers' Taxonomy[6], serious games are widely-spread nowadays being used by several sectors ranging from education, training and research to government, corporate or defence. This diversity is also mirrored by the array of purposes displayed by serious games as means of education, training, and information:

1. Rehabilitation & Wellness
2. Recruitment & Propaganda
3. Soldier/Support Training

4. School House Education
5. Wargames / planning
6. War planning & weapons research
7. Command & Control

		GENRE						
		Games for health	**Advergames**	**Games for training**	**Games for education**	**Games for science & research**	**Production**	**Games as work**
SECTOR	**Government & NGO**	Public health education & mass casualty response	Political games	Employee training	Inform public	Data collection / planning	Strategic & policy planning	Public diplomacy opinion research
	Defence	Rehab & wellness	Recruitment & propaganda	Soldier support training	School house education	War games & planning	War planning & weapons research	Command & control
	Healthcare	Cybertherapy / exergames	Public health policy & social awareness campaigns	Training games for health professionals	Games for patient	Visualisation / epidemiology	Biotech manufacturing & design	Public health response planning & logistics
	Marketing & Communications	Advertising treatment	Advertising, marketing with games, product placement	Product use	Product information	Opinion research	Machinima	Opinion research
	Education	Inform about disease / risks	Social issue games	Train teachers / train workforce skills	Learning	Corporate science & recruitment	Documentary	Teaching distance learning
	Corporate	Employee health information & wellness	Customer education & awareness'	Employee training	Continuing education & certification	Advertising visualisation	Strategic planning	Command & control
	Industry	Occupational safety	Sales & recruitment	Employee training	Workforce education	Process optimization, simulation	Nano / bio-tech design	Command & control

Figure 1. Serious games taxonomy (Sawyer, B., Smith, P)

"Carol I" National Defence University has recognized the potential of serious games for defence both regarding education and training taking into account users' needs. A step forward was made in 2010 when NDU became involved in

an endeavour meant to create a common framework regarding Serious Games. Its participation in GALA NoE project (Games and Learning Alliance – Network of Excellence) since 2010 has aimed at building a consortium called European Virtual Research Centre which has to deal with the fragmentation in the field by collecting knowledge, integrating, harmonizing, and coordinating research regarding SG (Serious Games) while disseminating the best practices and tools as a benchmark at international level.

From the Air Forces' perspective, a serious game must be supported by some components, of which we mention:

- National and Alliance doctrines;
- Standing operation procedures regarding planning process, decision making process, command and control, and execution of the air operations;
- Knowledge and skills of personnel (based on previous training and education);
- Computer based system which should integrate factual elements of them, together with the same elements regarding the adversary, having the capability to draw different solution in compliance with game theory or to acknowledge the solution given by the gamers.

In a synthetic description, correlated with the Air Forces' command structure, the Air Forces structure, the core function in operation, and the air operations, we think at the hardware and software necessary for:

- Air planning system;
- Combat intelligence system;
- Tactical units command and control system;
- Information processing system;
- Air Forces mission support system;
- Logistics;
- Simulation of adversary and friendly operations (war gaming or constructive in order to asses Air Component Command).

The game based on this system must offer adaptive planning for operations in order to provide combat intelligence, show the status of the tactical combat and support units, and support the air planning process (development and distribution of ACO, ATO, SPINS) for all types of air operations. Also it must simulate, based on a scenario, the adversary's operations and the support for the current operation against the enemy.

The system and the game should work based on models which approximate the real life, built upon case studies. The simulation must describe the behaviour of the systems involved in the game. The interface should be friendly and similar with the one working in air operation centres. The game must ensure the possibility to work based on different hypotheses, and also to test them and reach conclusion regarding the failures of command. These requirements have led us to the conclusion that the variables must change continuously with respect to the time. The modelling paradigm must be based on the system dynamics, game theory etc.

Finally, we would like to emphasize the advantages of using serious games during training of airmen[7]:

- Short preparation time;
- Variable costs according to the appointed budget; once the system is set-up, the costs include only administrative affairs;
- High capability of using evaluation methods;
- High realistic simulation;
- Update and upgrade of the game based on lessons learned after the game.

Conclusion

According to Michael and Chen (2006)[8] the importance of serious games increased on the global market as means of training by simulating real-life situations that otherwise would be too difficult to put into practice for reasons of cost, safely etc. The Air Force should benefit from this technology as it would shorten and improve the period of training resulting in numerous benefits for both institutions and personnel from which we highlight:

- Improving the skills of the personnel in the context of downsizing and restructuring of forces;
- Developing the skills necessary to the personnel in order to rotate in the headquarters;
- Improving the capability of simulation of wide types of operations;
- Counteracting the outcomes of ad-hoc making-up headquarters, staff etc.;
- Ensuring more flexibility and less constraints in execution;
- Reducing the delay in the training for different missions or tasks.

All these arguments support the requirement to ensure the optimal climate for transferring knowledge into skills in a complex environment.

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