Future of M&S in Czech Army

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ABSTRACT

The increasing importance of Modelling and Simulation (M&S) in Czech Army is well recognized. Advantages in low cost, high efficiency and effectiveness of their application are some of the key points that provide opportunities to use modelling and simulations in new and challenging ways.

Simulations give support by the creation of realistic synthetic environment that represents data of real world situations. Commanders, staffs, units and crew are properly trained to exploit the information superiority which command and control systems are being designed to provide in the future. Czech Army uses OneSAF system for both commanders and staffs training by computer assisted exercises (CAXs) and virtual simulator computer generated forces (CGF). Relative separately, for live simulation we use MILES system without instrumentation now.

DIS is elementary protocol for simulation connecting in the Czech Army. Centre of simulation and training technologies have linked simulators and decision making process supports system together to be staffs and commands training was realistic not only situation but support tools too. So, the Czech Army will use same data sampled from DIS like data from NEC elements which are simulation entities. This idea will be utilized for NEC conditions staff training creation in near future.

Education, training and exercises are important factors for achieving interoperability Czech Army commanders and staffs with all partners in NATO multinational environment. Our activities for future are oriented especially to provide joint and/or combined operation in asymmetric war (operations) by distribution simulation on international level. Achieving compatibility of command and staff procedures is possible through approaches using ICT and simulation techniques as well as the latest scientific developments in the M&S area. Modelling and Simulations is according to our opinion generally main way for increasing our interoperability.

The simulation systems and especially the systems for computer assisted exercises (CAX) were particularly topical during the reform execution in the Czech Army.

INTRODUCTION

The Army of the Czech Republic (hitherto ACR) put into operation its Centre of Simulation and Trainer Technologies (hitherto CSTT) in 2000. The CSTT has been used for the training of Czech military professionals as well as these for the military forces of Austria, Slovakia and also USA (Texas National Guard). The military professionals, military schools students and civilian universities students have practised the skills for classic warfare and for missions in operations other than war (OOTW). Since its establishment, CSTT has trained tens of thousands of military personnel with the tools of constructive, virtual and life simulation. CSTT is a state-of-the-art facility within ACR and wants to keep its leading position of an entity that utilises the latest information and communication technologies (ICT). For that purpose, it sees the key in updates and development of both CSTT software and hardware and its structure.

ACR Centre of Simulation and Training Technologies: Current situation

CSTT Headquarters is in Brno. Its structure includes two divisions:

> 1. Brno Simulation and Training Technologies Division,
>
> 2. Vyškov Simulation and Training Technologies Division.

CSTT has been built to comply with the "Simulation and Training Technology Implementation Concept" issued in 1998. The concept is executed via "ACR Simulation Centres Building Project" and specified through partial engineering, operation and software requirements in each of building stages. The "Midterm Investment Plan" involves the project in the form of an individual item monitored by the Czech Ministry of Finance. We have been working on "CSTT Upgrade and Development Plan" for the period from 2009 till 2013.

Brno Division

The division uses tactical simulator built by phases and based on commercial software available under the name of OTB[1]. The division is intended for carrying out training of commanders and staff officers at and below brigade level in both combat and non-combat operations. The tactical simulator allows also training of the lower-level commanders placing accent on CPX or group exercises.

The current version of OTB software shows slight differences during simulations in artillery/air force efficiency, effectiveness and engagement when compared with real weapon systems. The software excludes some logistic actions, such as equipment failures and defects detection and diagnosis or repairs, or replacement of blocks/segments in weapon and other systems. The software needs modifications to be done so that it could be used for rescue operations training or for peace or other non-combat missions.

The tactical simulator has been modified to support interlinks of OTB software and command and control system (abbreviated OTS VR PozS)[2]. It is also the principle tool to control the virtual simulators of type I (Full Mission Simulator) and type II (desk-top, reconfigurable simulators). The division uses type II virtual simulators (three pieces) as virtual command points at tactical level.

The tactical simulator and other CSTT's equipment meet the current requirements of combat operations command training, comply with the trends adopted by advanced militaries and need "only" minor modifications to observe the changes in ACR troops engagement during the above-mentioned period.

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[1] OTB – OneSAF Testbed Baseline

[2] OTS VR PozS – Czech Army decision making process support tool

The tactical simulator of today supports only limited requirements of urban area combat operations. Neither can it simulate a long-distance combined movement execution and support. Tactical and technical analyses for ACR development purposes are possible to carry out in limit extent.

The division is expected to be completed with the tools for management, execution and evaluation of the courses and lessons that would use the distance learning, training and e-learning tools.

Vyškov Division

The division is intended for carrying out training of leaders or company commanders while placing accent on the training of combat vehicle crews or selected artillery professions with installed virtual simulators.

The division is equipped with MILES tactical simulator to support head-to-head field exercises. The system misses control and evaluation tools, the ability of preparing and conducting after-action review and real-time date transmission to the exercise command point. MILES system partially fails the requirements of modern live simulation training and its life-cycle is at the end both technically and operationally as it disables instrumentation.

The division has crew simulators available to train tactics and firing. The simulators are: type I virtual simulator – OS-72M4 (Crew Full Mission Simulator of T-72 M4CZ Tank) and 10 virtual reconfigurable simulators of type II (desk-top). The latter may be reconfigured to simulate T-72 or T-72 M4CZ tanks, BMP-1 or 2 AIFV, Mi-24 helicopter, commander after squad dismounted or a field artillery observer.

The division computer network uses DIS[3] communication protocol (in perspective of the implementation of a higher HLA architecture) to interconnect the virtual simulators among themselves and to the constructive simulation systems of Vyškov and Brno divisions.

Vyškov division is furnished with multi-purpose equipment for T-72 M4CZ crew fording training and for diver aqualung training.

It may train some of artillery professions with ATSSCz[4] artillery simulator (fielded in 2004) that uses the theatre observation equipment and ASPRO[5] tools.

The above-mentioned facts lead to the following statements:

- Brno division owns and uses equipment that meet the requirements and comply with modern trends, but the tactical simulator system needs updating;
- Units are trained in tactics and firing with MILES system simulator without AAR system – not instrumented whose components are at or around the end of life cycle;
- A comprehensive equipment to train units (squad, platoon, company) in tactics or firing including vehicle training is still missing. Such an equipment (tactical firing simulator) should run on-line and enable programming and reviewing the trained situations;
- ACR has not yet finished distance learning/training system that would include modern information and communication technologies;
- The factors that affect the update of current STT and implementation of new systems include current training system, allocated funds and current acquisition process.

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[3] DIS – Distributed Interactive Simulation

[4] ATSSCz – Artillery Tactical Simulation System Cz

[5] ASPRO –Czech Army artillery battalion fire control system

ACR Centre of Simulation and Training Technologies - Upgrade and Development

The STT development priority is to introduce as much tools and equipment into the training process as necessary for turning it into an efficient and valuable service for a wide range of military professionals as required for both combat and non-combat operations. STT development must support implementation of arrangements that would lead to meeting the ACR units' final capabilities and further development.

When implementing the "Concept…" and CSTT Update and Development Plan for STT[6] to achieve the desired situation it is necessary to keep observing the principles of the "Simulation and Training Technology Implementation Concept" approved by the Czech MoD in 1998 whose principles have remained topical. Another fundamental aspect of today is economic factors and efficiency assessment (what types of current STT should be updated and what acquired new, at what amount and selection, way of implementation and fielding; for new STT an assessment of the need of other provisions such as personnel or materiel, where deemed necessary), development trends monitoring and analysing and definition of priorities so that they follow real needs of structure organisation, training objectives, trends and financial possibilities and soft- and hardware acquisition to comply with ACR's missions and military science recognition.

The following principles are supposed to be followed in STT update and development planning and implementation:

- Complying with training system;
- Supporting training with the usage of STT and assurance of efficiency, economy and the application of NATO standards requirements;
- Acquisitions of new equipment with complete service packages observing the provisions of Czech law in force that comply with the EU requirements for the branch, applicable to defence standardisation, codification and state controlled quality assurance of products and services intended for national defence;
- Generation of the conditions of psychomotor skills intensive repetition for the crews of weapon systems and other assets that would allow generation of non-standard situations that, if failed, result in the operated system damage or destruction, injury to health or lost of lives;
- Generation of the conditions of crew answer analysis, evaluation and fault remedies;
- STT updates and new technology fielding to continue in the reduction of financial expenses necessary for real equipment and defence systems training;
- Use STT effectively to continue in improvement of commanders and staff officers training, especially in decision-making process and battle leadership while having the possibility to check whether the decision was right, including the results and modelling of situations impossible to achieve by common methods.

Regarding the differences in CSTT divisions' missions, their update objectives and ways differ as well.

Brno STT Division Upgrade and Development

The unique facility to train commanders and staff officers at the levels of battalion and brigade gives fast answers to the requirements of exercises on task forces missions. We suppose a new version of constructive simulation software (OOS[7]) would be installed that would enable:

- Easy database management,
- To run distributed exercises,

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[6] STT – Simulation and Training Technologies

[7] OOS – One Semi-Automated Force Objective System

- Training in conducting "classic" warfare, urban area warfare, OOTW and rescue or anti-terrorism operations.

If the resource framework would suffer substantial cuts we suppose to do partial modifications and verification of the original software (OTB) concerning:

- Non-combat operations models;
- Urban area warfare models;
- Realness of ammunition effects used by enemy artillery, air force and other fire delivery assets against friendly combat assets and systems as well as ACR's firing systems acting on the potential enemy;
- Realness of actions and missions of land forces fire support provided by air force, weapon systems fielded in ACR and of general logistic support actions;
- Interface to the decision-making support systems that has been implemented in ACR by incremental measuring method;
- Interfaces to other training simulators fielded in ACR (ATSSCz, Full Mission Simulators and desk-top air force – fixed- and rotary-winged aircraft – simulators);
- Interconnection of tactical simulator assets and life simulation ones.

The just mentioned modifications would generate the essential prerequisites of brigade or lower task force commanding/staff officers training to complete missions in the new environment.

Other parts we expect to be added to the current software/hardware would be such to support the management training of crisis situations, rescue operations and other non-combat operations. The expectations issue from the assumptions the current software would be open to enhancement with additional modules (ACR owns a licence for source code modification) or the acquisition request of adequate software would be met for exercise availability in the above-mentioned operations.

When enhanced with hardware, software and communication equipment, CSTT will be able to run distributed CAX with mobile assets and the after action review systems that would be exercised outside CSTT. The Brno division would be upgraded in a manner its hardware and software are connectable to the current STT systems at Vyškov division as well as at other similar facilities deployed elsewhere within ACR or abroad.

Vyškov STT Division Upgrade and Development

Division's principle task to accomplish in the oncoming period is to use solely life simulation for individual/team training. We suppose to meet the objective through incremental purchase of systems that would be instrumentable or an instrumented system that would enhance and complement depending on resource framework scope to allow head-to-head exercises at the levels from platoon to battalion task force. The new tactical and firing simulation system must enable real-time field training control and after-action review.

In the first phase, a company tactical and firing simulator, including technology and manpower, will be delivered and implemented that would allow programmable tactical training and firing training to include evaluation. The simulator control unit must enable data transmission to battalion staff having exercise on the tactical simulator. The simulator composition (acquisition) would consider cost effectiveness and economy so that the already purchased and fielded life simulation system components could be used fully and completely.

The earliest period would require implementation of the interconnection of Vyškov division virtual simulators, life simulation system with the tactical simulator for commanding/staff officers training at Brno division. The two divisions have been interconnected earlier but we expect to finish the test operation of the connection and launch real usage for distributed exercises. The solution has been based on the current version of DIS interface protocol that would be soon replaced with HLA protocol. The connection to Brno division will be done strictly on purpose basis so that the investments make sense and the data relate to exercising battalion staff work and actions.

For full usage of the assets at both Vyškov and Brno divisions the terrain databases will be unified for ATSSCz and company tactical simulator and other or new versions of OneSAF software. The ATSSCz system will be adapted to connect to other simulators. ATSSCz upgrade expects the simulator would be completed with the configuration for reconnaissance systems of LOS or Sněžka type.

A relatively independent chapter of CSTT development is the usage of CBT rooms and ADL/ADT assets to train a wide range of individual military, but also civilian, users. In this field, CSTT has been collecting the necessary amount of information, knowledge and experience to be able to make expert suggestions concerning the modern technology implementation for ACR requirements. The basis would consist in creating a policy that would comply[8] and harmonise the interests of military schools and training facilities. The current capacities of CBT rooms would enhance with SW and HW so that the classes could be tailored for a wide range on military specialisations at basic, technical and special levels of training, making thus the rooms more effectively useable.

CONCLUSION

When accomplished, the measures taken would generate the basic preconditions the Brno division tactical simulator could support the full training of commanding/staff officers in brigade or lower level task force missions.

CSTT will complete its equipment with hardware, software and communication assets to run distributed CAX including mobile assets and AAR systems. A connection of company tactical and firing simulators will be done to transfer selected data between the two elements. Thus, conditions for management training in combat crisis situations and other non-combat operations will be generated.

Unified terrain databases will enhance the configuration capabilities of CBT rooms. The simulators and trainers amounts tailoring process to fit actual requirement will finish, including upgrades and new training assets implementation**.**

Higher phases of distance learning and training incorporation into ACR structure organisation and corrected disproportions of current situation and actual requirements will be used to improve ACR units teaching and training efficiency. STT will support units training with simulations at higher quality level. Field training at the essential tactical level, i.e. company, will have a complete tactical and firing simulator implemented working on the basis of laser generators enabling mission programming and reviewing. Selected data may be transferred to the staff officers exercising on the tactical simulator (Brno division).

An educated guess has determined the implementation of the measures by 2015 will have required the total amount of financial assets of approximately CZK 150 mil CZK. The same amount of finances is expected to be required for CSTT development in the years 2015 – 2020. Of course, the actually available assets depend on the target framework allocated to ACR from Czech national budget.

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[8] Based on "Czech National Education Development Programme" approved in 2001 and on the experience and knowledge of the Ministry of Education, National Distance Learning Centre and NATO Training Group