

The simulation, training synergy

within the French Armored Branch in 2003 : Implementing an actual training engineering

Simulation belongs to the contemporary environment, just like cellular phone, the Internet, and new medical technologies. For a long time, the military institution was a precursor in this field, which is from now on accessible to all. However the use of simulation has a cost, and it requires major changes in our operating modes. The justification for often massive and disruptive investments becomes an issue in itself : what is the simulation's return on investment.

The rather recent experimentation of simulation within the French Armor branch, at least at that level of integration, reveals very convincing and even stimulating synergies. It comes from a particular conjunction where the institution accepted to rely on the rank and file's strong creativity. It led to an in-depth pedagogical transmutation, to such a point that one can now evoke an actual training engineering.

BY COLONEL MICHEL YAKOVLEFF, ARMORED BRANCH SCHOOL TRAINING DIRECTOR

SIMULATION IN THE ARMORED BRANCH PERSONNEL'S TRAINING AT THE BEGINNING OF THE 21ST CENTURY

Today's Armor is undoubtedly, within the Army, the branch that depends most heavily on simulation, at all training levels, from the soldier up to the commander. Without getting into an exhaustive description of the many systems implemented, some examples are supporting this thesis.

Basic soldier training : the Leclerc specific "program"

The Leclerc main battle tank is fully integrated within a comprehensive program of simulators designed at the same time as the tank itself. This early consideration was, at the time, a very innovative idea that the branch had some difficulties to impose, and which has now become obvious to all (as for the Tigre helicopter program). As a matter of fact, simulation, at that

level, was regarded as luxury in the eyes of not well-informed observers.

Several simulators, of variable complexity, enable the Leclerc crew to learn and practice all conceivable actions, in a protected environment and at variable paces : from the initial step by step training to the compressed timing of the final tests.

The driver has at his disposal a "driving training simulator", and the turret crew a "turret simulator",

thanks to which each crew member can learn and practice the handling operations corresponding to his work station. Because of their simplicity, these two systems, are nowadays called by purists "trainers" rather than simulators. Relative simplicity, moreover, because all interactions between the controls and the environment are represented : the landscape moves, the engaged targets are destroyed or speed up, etc. Let us note how the use

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makes it a tool very well adapted to training within battalions.

At higher level : platoon or company task force, ROMULUS (today in its fifth version) allows to train the leaders to think tactically, and confronts them with the result of their decisions : movements, maneuvers, and also engagements outcome. Romulus is also an excellent compromise between complexity and realism - and it is also a product of the Saumur school. Its current development reproduces operational logistics in a credible way, which many tactical simulations currently on the shelf tend to neglect.

In addition, the Army acquired two American tactical systems : JANUS (focused on the combined arms battalion size task force level, even if it can adapt to the two adjacent levels : company task force, and brigade), and BBS (brigade to corps level). Their complexity limits their diffusion and employment (Janus is fielded in the branch schools and BBS is set up in the HQ training center at Mailly-the-camp). In addition the joint staff (EMA) has installed the JTLS simulator (American too and one only system, set up at the Ecole Militaire, Paris), allowing to represent CJTF operations. French systems are currently at their final stage of development : SCIPIO for the Army, Alliance at joint level.

Today, within regiments, schools, or specialized centers, the French commanders have at their disposal the world most powerful means, providing

of the terms itself was affected by an interesting evolution... because hardly ten years ago, their complexity and their level of realism would have made them less disregarded !

The crew, as a whole, has a “*Crew training simulator*” (SEE) at its disposal which makes possible to integrate all of those individual operations learned in a static way notably for firing while on the move. This simulator federates the turret and driver’s simulators, reproducing the tank and turret movements in a very convincing way. To illustrate the interest of this coupling : the pilot can for instance, position the tank onto the engagement direction of an enemy (it joins the tank on the gun). The purpose of this crew reflex is to orient the MBT front shield (better armored and profiled) toward the enemy, and to better stabilize artillery mechanism. Simulation thus enables the crew to practice collective reflexes, that would be impossible to inculcate and mechanize otherwise than by taking

the tank out to the field. Integration can be carried out at one level higher. Four coupled crew simulators (SEE) form a “*platoon training simulator*” (SEP) thanks to which the entire platoon can learn how to work together, to maneuver and to fire. Even more, by placing the company commander in one of the SEE simulators and his three platoon leaders in the three others, it is then possible to train the company chain of command to maneuver and fire together. The system main computer makes it possible to simulate the platoon leaders’ subordinates and to handle them in accordance with the employment doctrine.

Besides being extremely realistic, these simulators are highly reliable. They permit to study and play all technical know-how inherent to the weapon system. Their versatility, as well as the initial concept richness, makes it possible to tackle the first level of the tactics, i.e. the tank maneuver, the platoon maneuver and the control of fires.

Training the commander : the array of tactical simulators

More than twenty years ago, the Army initiated tactical simulation programs. The beginnings were rather chaotic, but today we have a coherent series there too. The Armored branch, again, acted as a pioneer, in particular when designing some specific products that had later a wider diffusion. The very first level of tactical simulation, SOSIE - is a product developed primarily in Saumur, thanks to the fertile imagination of a very limited group of cadre. It allows the training of the crew in giving and receiving tactical orders (to be differentiated from the technical orders related to the weapon system). A simple model, with a moving landscape as well as an evolving tactical situation in accordance with the issued orders, deliberately disconnected from any specific weapon system, SOSIE can adapt to any type of crew or platoon. It is a low cost product, using off the shelf computer systems. It is very easy to use, which

very realistic situation settings for all command levels. Different from the technical simulators, which aim at mastering manual know-how, these simulators belong in fact to the “*decision trainers*” type. The real world presentation is not real but symbolized (charts and icons replace landscape and silhouettes). Their interest comes from the reliability with which they handle very many objects, with very variable capabilities (the units), on a digitized terrain, by confronting the missions with the results based on algorithms.

Unfortunately the exercises complexity makes their scheduling rather uneasy, and rather uncertain in the current context, where employment of forces precedes their training. In this context, the simplest designs survive more easily to scheduling uncertainties.

There again, the Armored branch choices, deliberately oriented towards the implementation simplicity, show their relevance.

Criticized or disregarded in the beginning, often because of their apparent lack of ambition, these choices based on realism, and even on an healthy skepticism, can be regarded from now on as references.

Simulations using actual means

To the layman’s mind, a simulator is first of all a digitized toy. As a result, it is often forgotten that it exists a “*non-electronic*” type of simulation. Although spectacular shelters can reproduce the inner reality of tanks, there are simulations which reproduce the target or the enemy, in the real world, in the field.

The Armored Branch has once again been a precursor. The combat practice range at Lagnes is nothing but a tactical situation simulator, where the platoon, with its own equipment, is placed in a realistic tactical situation. In that case, simulation combines in synergy the field, the enemy configuration (materialized by series of targets at real distances), the mission (itself adaptable since a few years), and lets the platoon play with its own equipment. Within the Army, only the Armored Branch developed the concept, that early, and that far. To such a degree that Lagnes has become a world reference that few armed forces can match.

At a more elementary level, an Armored Branch officer invented a firing simulator, the STIVAD, permitting a tank “*to shoot*” at real range, the aiming elements being reproduced thanks to a plotting table. Rather easy to implement, inexpensive, widely fielded, this system enables the crews to maintain their expertise acquired in the field.

THE SIMULATION CONCEPT COHERENCE WITHIN THE ARMORED BRANCH : THE TRAINING ENGINEERING a new teaching format is required

The good old pedagogy is now obsolete. Fifteen years ago, it was still possible to inculcate each working station rudiments to a crew, to proceed to about fifty series of short range firings, to shoot about twenty shells, and to teach the crew’s elementary operations (to move, to post, to observe by day and night, to use its weapons), on board of the tank in the field.

The instructor was either embarked, or closely posted in sight with a radio set. The pedagogical critic was done live, on the radio, or the crew stopped the tank and disembarked for a quick “*hot wash up*”. Then it repeated the failed operation again and again, plowing the practice field again and again. At the same time, the fighter pilots revived their engagements by handling plane models with lots of gestures...

The complexity of the Leclerc weapon system, as well as the tank’s ergonomics, that excludes any additional embarked person, makes useless a pedagogy that would only use the tool itself. The safety considerations are also part of the problem, in the same way as it would not come to anybody’s mind to let a fighter pilot taking off with the aircraft for learning how to fly it...

The definition of the Leclerc tank : from concept to design

The Leclerc tank design followed a logic different from its predecessors and competitors’ one. Indeed, since the glorious First World War FT17, staffs and manufacturers did their best to improve performances of the major functions : mobility, protection, fire power - and later on, communication. That led us to the current Leopard II, Abrams, Challenger generation that represent the best that could be achieved while reflecting the compromises accepted by the staffs. In



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return, the brought in improvements contributed to made evolving the concepts of employment - without however any change of nature since the end of the Second world war, with the exception of the “*fire on the move*” capability.

Behind the Leclerc development, there is an opposite logic : starting from the concept of employment, regarded as the best possible, to arrive to the tank design itself. The “*in-tank*” governing idea is the “*hunter-killer*” concept that governs the distribution of tasks between the tank commander, who finds and designates the targets, and the gunner, who kills them autonomously, while his leader is already searching for the next target. That “*in-tank governing idea*” was accompanied externally by a “*total system*” concept, according to which the tank, taken individually, becomes a “*node*” of the total system, i.e. the company and the battalion. The tank communicates in an autonomous way, it knows

its location, it reports its logistic status, it announces firing sequences... Whereas, within allied armed forces, such a degree of dialogue, is only a function that has been added to an existing tank, for the MBT Leclerc, it is a *concept* inherent to its design. The SIR (regimental Information system) is just in the process of being fielded : in fact, it is the federating architecture which is late behind the basic element.

Roughly speaking, one could say that the current tanks’ new functions, in particular those linked to communication and “*artificial intelligence*”, are only grafts or muscular or intellectual growths. Conversely, they are part of the Leclerc’s DNA.

The training engineering

Simultaneously to the Leclerc weapon system’s definition popped up the crew training issue. Indeed, it would have been paradoxical to imagine a tank equipped with so extreme potentialities without obtaining the

adequate means to learn and practice those potentialities.

The basic idea is that the whole of the know-how, individual as well as collective, must be mastered step by step, thanks to adapted tools, before the designated crew is considered to be ready to operate on its tank.

The theory is reduced to bare essential for the comprehension of the tank’s internal logic (like the above mentioned hunter-killer concept). The trainee learns the gestures corresponding to his function, with increasing degrees of complexity, speed, and precision. Then he learns how to work within his crew, to master technical operations and elementary actions (collective tactical actions). It is only after having fully mastered an entire sequence that the crew is allowed to practice its know-how on the tank itself.

Without entering into too many details about all these simulators functioning, we noted that they were numerous and multiform. But the technical

dimension, whose most achieved form is constituted by the Leclerc simulation series, is part of a larger group that integrates tactical training with the equipment (the Lagnes firing range complex), and the tank commander’s training to maneuver (using tactical simulators).

What makes unique the Armored Branch simulation concept is its coherence which from now on has been completed with the introduction of the Leclerc generation. From the very first elementary gesture, up to the army corps maneuver, today’s Armored soldier can be trained to carry out all the elementary actions, or to make all the decisions, which are the very heart of his job. We may also note that the Armored Branch did not want that these actions take place in cocooned centers, but that constantly and with application, and from the very start, it develops the means for finalizing training in the field with the actual equipment.

One should not wonder about the fact that the Armored Branch has been in the lead for thirty years. The tank is, almost by nature, the most complex of the land weapon systems, at the same level as the helicopter. This complexity increases the needs in two seemingly contradictory directions : downwards by the automation of gestures, always more numerous, more delicate, and in faster sequences, and upwards by their integration in the weapon system. It is often forgotten that beyond that single complexity, tanks are performing a type of combat that is faster, more changing and evolving than that of any other branch. For these reasons this type of combat becomes more demanding technically (calling upon the tankers’ manual know-how) and tactically (the armored leader’s decision-making state of mind). There is no other branch likely to require from any of its leaders such an adaptability to the change of posture. This is what undoubtedly explains why the branch’s officers and NCOs contributed so much to the invention of products that are now developed and distributed. The success of the current training concept within the Armored Branch primarily relies on the fact that the initial concept is complete and healthy, but also, and perhaps even more, on the fact that this product is the result of a meeting between the top of the hierarchy, obsessed by coherence, and ranks and files, obsessed with realism.

The synergy of simulation in all its forms, with the training of the executants and cadre, is the sine qua non condition to overcome the technological advance created by the Leclerc. Its success is a good omen for the next jump, which should be doctrinal rather than technological. New command and control technologies, the Leclerc being the first step of which, will lead to a major evolution for our Army operating modes. Today’s Armored Branch is well prepared to integrate new developments.