

About the Complexity to Simulate Actions in Urban Areas

The types of engagement which our forces and headquarters are preparing for up to now are directly derived from the Cold War and their main characteristic is a combat in an open ground where the **urban areas** were avoided or at least under-evaluated. Effectively taking into account this environment inseparable from the modern conflicts requires that at short notice we accept several stakes among which the development of adapted training means.

Simulation is one efficient component to satisfy this need subject to taking into account the complexities linked to the urban environment. The vastness of the topic commands that we limit its discussion to the constructive simulation for CP training¹ and particularly for the level 4 CPs and beyond²; this requires some challenges to be taken up regarding modelling and the nature of combat. Determining the degree of realism of the combats so that the players give credit to the results of the simulation is part of it.

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Taking into account the duality “open terrain-urban environment”

The role of the larger units changes depending on the terrain of engagement. In a simplified manner, it decreases one level in urban areas. So, in the framework of the continuum “open terrain-city”, the combined arms battalion task force (French “GTIA”) constitutes the action pawn of our Land forces; the conduct echelon is most of the time located at the “GTIA” CP level, the brigade staff having a coordinating and synthesis role. On the contrary, in a city, the company team (FR “SGTIA”) is frequently the action pawn, in violence control as well as in coercion; the conduct echelon is located at the “SGTIA” level, the “GTIA” CP performs the coordination and synthesis role and the brigade CP carries out the planning and the management of the operational environment. Consequently the role of the players will differ depending on whether they try to enter a city (possibly after a siege) or they are staying in it. Let us remember that **the simulation tool needs to be able to permit an adaptation of the role of the players during the exercise.**

Similarly **the employment characteristics of the models and particularly those of the weapons and information systems, will have to evolve**

depending on their location in the continuum open terrain-urban environment⁴.

Defining the urban environment modelling degree

Characterized by a strong density of civilians sometimes belonging to various ethnic groups, the urban environment is structured around communication knots and networks; it is the location of numerous institutions necessary to the public life. It most often provides limited maneuver spaces, hinged around “canyons” and labyrinths, “concentrated open grounds”, surrounded with volumes offering as many masks, by turns inconveniences and assets.

The difficult modelling of the actions in urban areas is resulting from the complexity of the urban environment increased by the asymmetric engagement.

The physical environment or which degree in the reproduction accuracy?

The proper balance between the microscopic and macroscopic

Representing the physical environment requires an increased topographic accuracy in comparison with the open terrain. Indeed fighting in urban areas involves a large number of actors of various natures in numerous micro

battlefields. The “friend-foe” overlapping in a continuous maelstrom of intermingled forces and the splitting up of units inherent in the terrain partitioning constitute other particularities.

Besides, the realistic representation of the typology of the urban sectors and the consideration of the third dimension (basement, floor, upstairs) are indispensable; however the description of the volumes⁵ may be determined by the nature of the tactical pawn and the potential military value of the points of the terrain⁶. So the modelling of an old town center such as a kasbah - in which the commitment of armor is difficult - will be very detailed because the commitment of a combat section in one room of a building may have important consequences on the progress of the “SGTIA” operation or even on the “GTIA” one.

The evolution of the physical environment (system of water-pipes, movement hindrances) presents no modelling difficulty.

Which representativeness sample for the population?

The population can be considered in a macroscopic way as shield, hostage, victim, accomplice or neutral. It constitutes a stake for the force and the adversary. Nevertheless a more accurate

representation is usually necessary; so a broader variety of socio-cultural profiles increases the realism degree thanks to an enriched array of behaviors. The difficulty is to define the number of behavioral models of the actors in their environment.

The opponents or the problematics of modelling asymmetric actions and of the clashes arbitration.

Modern conflicts involve adversaries with sometimes limited means. The asymmetric combat is a combat from the weak to the strong escaping the logics of the traditional engagement. How to represent in a credible and realistic way militiamen trained for guerrilla and terrorist actions, immersed into the population, refusing pitched battles, trying to give a media coverage to non conventional actions essentially implemented by surprise? To which extent must modelling be detailed so that everybody may rebuild the causes tree and thus accept the result of the simulation?

Besides it appears difficult to determine the basis of the clashes arbitration. Indeed in open terrain it is agreed, and that gives it credit, that the arbitration is based on the forces ratio. The more forces the attacker has in the field, the more chances he has to win. In the case of an asymmetric adversary questioning this is relevant. Militias may achieve victories without having the numeric advantage. Which criteria should we rely on to get a credible arbitration?

A particular combat or the need to create new models and charts

Beyond the realization of the effects of the direct or indirect fires it is necessary to represent the effects of the fires through walls. The current trials aiming at assessing the terminal effect of ammunition on the infrastructure will provide a data base to conceive charts for the simulation tool⁷.

It is necessary to model numerous elements: rules of engagement, operational communication means and means of action in the psychological fields, CIMIC actions means, reduced lethality weapons, ground robots, so called abandoned sensors, tear gas, effects of a technological accident, effects of a humanitarian disaster, important characteristics of different buildings (apertures, wiring, heating, light, water...), etc.

Realism or effects, a modelling choice to be done

As regards realism it is necessary to reproduce:

- the fire accuracy, crucial in such a complex physical and human environment,
- the employment restriction of the weapon systems due to the population,
- the decrease of some capabilities of the weapon systems due to the physical environment.

As regards the effects it is necessary to insist on the collateral damages, casualties caused by friendly fires, but also to model the indirect approach (isolate, shape, destroy, etc.) thanks to armed, psychological or media means

while muting the internal processes of the last two.

The stress of the armored vehicle crews caused by the decrease of the geographical spaces and by the contraction of time must be modelled in terms of effects⁸. Same for tiredness, wear and tear and the urban movement difficulties.

Creating the conditions to reach the teaching goals

Beyond the modelling choices the effort must bear on the capability to create exercise performances that place the players in a position to reach a certain number of teaching goals.

Understanding the city and winning the intelligence battle

The simulation tool must enable the players to implement an analysis process of the physical and human characteristics of the urban area; a recreation of the urban complexity will guarantee a true work of understanding of the city. The playing staff must be able to win the intelligence battle by differentiating main action and safety action and then by conceiving and implementing a directed and dynamic disposition for information collection and finally by sharing the information. To that effect clues linked to the terrain, the population, the threat and the risks must be put at their disposal among "the noise of the city and the lights of the urban environment". The city being



considered as an “information engine” the goal is, by making effort on the human source, to know where is the enemy, where he is not, to determine safe routes to surround him, to render the enemy position untenable. The playing staff must be “fed” with events such as “incidents regarding logistics, terrain, population, intelligence, humanitarian, adversary, etc” to express the contraction of time. Each event responds to a previously identified teaching goal. Integrating an incident and event generator to the simulation tool permits to meet this requirement.

Mastering the combined or even joint dimension

The combined arms dimension of combat in urban areas is essential. It must be recreated at all the echelons (cooperation or even integration). It is necessary in particular to simulate the coordination actions between the entities and above all their combined effects. The difficulty to support a committed combined arms force must be highlighted.

Developing situation understanding

The simulation tool must enable to decentralize responsibilities and initiative taking. But it is not an end in itself: initiative and autonomy in subordinates’ action must be optimized by the efficiency of the leader’s decision making. The latter relies on the situation understanding. The stake is therefore this decision making resulting from the capability to analyse and to coordinate. The leaders must be able to seize opportunity objectives, to know the key points of the terrain and the reality of the adversary. To develop this situation understanding it is therefore necessary to feed the training phase with events permitting the analysis of the evolution criteria of a situation, the anticipation of the risk factors, etc.

Taking into account the mission as a whole

Conceiving the simulation tool must take into account the integration of the military factors with the diplomatic, economical and cultural parameters. Indeed broader considerations underlie urban operations. So the operation of the public administration, the humanitarian assistance or

the assistance to the economical development imply the coexistence of the armed forces and of so called inter-agencies entities. Particularly beyond level 4 the simulation tool must permit to combine military, humanitarian and public service actions, to implement a coherence of the aforementioned actions with the objectives at all the echelons. The players must be able to switch almost instantly from a coercion posture to a security or humanitarian one or simultaneously to conduct actions of different footings.

Adapting oneself to the terrain and to the adversary

Flexibility is a very important capability in urban areas. Therefore the simulation tool must not be frozen in its use. Depending on the generated situation it must be possible to make the forces doctrine and the associated processes evolve.

Defining the human outfitting suitable to the expected effects

Combat in urban areas demands a combined arms coordination at the lowest echelons. It necessitates to engage oneself with a very important forces ratio and thus with a large number of units. It is characterized by **sudden changes in the combat intensity**. The same unit may in a very short time switch from a quiet situation to an extremely violent and determining situation. Consequently in the simulation system for actions in urban areas, the “human layer” (1st and 2nd level lower animation, OPFOR...) is naturally higher than for simulating actions in open areas.

Besides it contributes to the realistic effect of the simulation because the lower echelons accurate co-ordinations are mainly performed at its level.

Taking the future into account

The **battlespace digitization** is under way. When the adaptation of the communication medium to the urban physical environment is effective it will provide a considerable contribution to conduct actions particularly for the benefit of situation understanding. **The “SIC-SIMU” link** (CIS-simulation system) may raise questions about the necessity to realize complete particular training assets since the CISs work stations may provide for the complement. Finally as long as the **Air Land Operational Battlespace** is not completed it does not seem necessary to invest in 3D constructive simulation for staff training.

1 Will not be studied: simulators for doctrine studies, for planning, for missions rehearsal.

2 Level 4, combined arms battalion task force; 3, combined arms brigade; 2, division; 1, army corps.

3 Bureau de préparation opérationnelle.

4 A tank is designed to operate in open terrain; some of its capabilities are decreased in urban areas.

5 Modelling in a realistic way but not necessarily accurate some interiors of urban structures (buildings, sewers, subway, underground parking lots, etc) particularly the accesses, floors, roofs, or even the corridors and rooms.

6 The mission “to seize” may have another goal than a key point of the terrain such as the population, a municipal official or a political leader. Besides the adversary may often move in a built-up area still occupied by non-combatants.

7 The knowledge of the terminal effect of ammunition on the infrastructure is vital because it has an influence on the employment of weapons, the safety and security.

8 The permanent fear caused by the immediate proximity of the enemy increased by the intrinsic isolation of the physical environment can be modelled in terms of effects (on the fire accuracy results, etc.).

Preparing for the engagements in urban areas is a must. If the recent creation of a training center for the actions in urban areas mainly for the benefit of the “SGTIA” is in keeping with that logics it is necessary in parallel **to educate and train the leaders and their staffs to plan, conceive and conduct operations in urban environment.**

The complexity lies in what is to be modelled. The reality of the combat in urban areas must be analysed in all its dimensions to feed the simulation tool with parameters and data but to distinguish the useful from the incidental while avoiding to introduce expedients. Concerned by training efficiency, **we need to materialize the effects and consequences of the combat actions** more than the reality of combat. Since combat in urban areas is a still poorly mastered domain it is tricky to accurately describe (and modelling demands accuracy) what must be modelled depending on the level to be trained. All the more reason, in a logic of the just need, **to limit ourselves, in a first step, to adapting the existing tools** i.e. JANUS and SCIPIO.