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Two Weeks with a Network-Centric Infantry Company in an Urban Warfare Trial

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Abstract

During 2005, the Israel Defense Force carried out a two-week battalion-level urban warfare trial. The purpose of this trial was to evaluate proposed new equipment and organization. Among other things, the battalion had a computerized command & control system, and many of its soldiers had portable computers.

We have observed the trial at the lowest levels - company and below - and will discuss the following issues:

* How did the individual rifleman function, when he had a personal portable computer connected to the battalion C2 system.

* How did the junior commanders employ their enhanced network-centric capabilities.

* How could a battalion headquarters use its networking capability to better support the soldiers and junior commanders who are in direct contact with the enemy, and are not, therefore, free to devote much time and attention to their computer.

I. Introduction

Experience accumulated in the Israeli Defense Force during recent years, while undertaking urban operations in a low intensity context, has shown the following: when an infantry battalion is given a mission it will also be given much more support from higher echelons than is customary.

In order to test possible ways of helping a battalion undertaking such missions, an urban warfare trial was carried out, during 2005, at the urban warfare training "village" of the Israeli National Training Centre, shown below. In addition to more intelligence, engineering, fire support and air support assets, the battalion also received a prototype of a computerized command & control system, connecting the battalion headquarters to some of the soldiers, who were supplied with portable personal computers of various types.

The responsibility for the trial was given to the chief of the infantry branch, who received for this purpose an elite infantry battalion. The company commanders in this battalion were highly experienced career officers, who have served as company commanders elsewhere before receiving their present command. Platoon commanders and soldiers have been selected from the general population of men who enlist for their compulsory service of three years, and are highly motivated. Junior officers usually commit themselves to an extra year or two, but are not career officers. There are very few career NCOs in the battalion.

II. Planning and Preparation

This trial was not a controlled experiment and can not prove the validity of any hypothesis, but it did contribute to a discovery process. It was meticulously planned by experienced people, and the participants were well trained. In addition to their general level of training, most of the participants came to a week-long orientation, during which they became familiar with the urban warfare training village and with the special equipment to be included in the trial. Radio operators have also received more extensive training with the computerized C2 system.

III. Running the Trial

The battalion brought to the trial three companies, with two platoons each. The trial started with six exercises, during which each of the platoons had its own exercise with its own scenario. These were followed by three exercises, in which each of the company commanders led a company-size task force. The last part of the trial consisted of three battalion-level exercises. About half of the exercises were conducted during the day, half during the night.

The main battalion headquarters operated from a heavily instrumented large tent erected near the village, and did not move during the trial. But the battalion commander, together with a few of his personal aides, did have the option to go down into the village when they chose to. Battalion level assets were permanently deployed around the village. Their getting into position was not played out during the trial.

All vehicles of the battalion, and some of the soldiers, carried equipment that allowed the civilian experts in the training center operating rooms to collect

information about their locations and actions. This information was also displayed, in real time, in the trial control room. Every exercise was followed by a debriefing session, held in an instrumented mobile lecture "room", where data gathered by the training centre could be replayed out on large displays and compared with the impressions of the participants.

In addition to the "blue" forces, whose performance the trial was designed to evaluate, there were two other teams in the training village: a "red" team, representing armed terrorists, and a "white" team representing the innocent inhabitants. Movements and actions of the red and white teams were controlled by the trial managers.

Except for a short demonstration, all the trial was conducted without live fire. Nevertheless, there was a lot of concern about safety, because a large number of vehicles, including some armored fighting vehicles, and a large number of people, from the red, white and blue teams, were all active in the streets and narrow alleys of the village. Each platoon and company was therefore accompanied by a controller/observer, who acted as safety officer, in addition to his other duties. The controllers who observed the company commanders have previously commanded those same companies.

A large number of visitors, including many general officers, came to observe parts of the trial. They were not allowed into the village during the exercises, but were invited to watch it from the top of a nearby small hill, or from a large tent instrumented with computers, displays and speakers, that enabled visitors to see and hear what was going on.

In addition to the controller/observers, a large number of observers who were not controllers were involved in the trial. These observers were not allowed into the village during the exercises, but were free to watch the battalion headquarter and the operators of the intelligence collection devices, and to participate in the briefing and debriefing sessions, held before and after each exercise, in order to gather data and reach their conclusions about the subject they were tasked to observe.

When we were invited to act as observers we were not enthusiastic at first, but when given the freedom to choose which questions we want to deal with we relented, and chose to observe the lowest levels - company and below, because we were very interested in the command and control process at these lowest levels. Having made this choice, we succeeded in convincing the trial commander that this issue can not be observed from afar. The two of us were, therefore, the only observes who were not controller/observers but were allowed into the village during the exercises.

IV: Warriors of the Map and Warriors in Contact

Some soldiers - for example, the staff officers in the divisional headquarters or in the artillery brigade command post - devote most of their attention to the map, and can be said to fight their war on the map. The map represents for them the battlefield, and serves as their natural aid for organizing and displaying information. The map, or the ortho-photo that sometimes replaces it, also serves as the basis for a common language, used by all those "warriors of the map", who are involved with battlefield but view it from the outside, from above.

The battlefield looks very different to those soldiers who are in direct contact with the enemy. These soldiers have to devote most of their attention to the terrain immediately around them, because that is where the enemy may be, and because that is where they try to detect targets, to be fired on by their weapons.

Those soldiers who are in direct contact with the enemy may have used a map, for general orientation and for choosing their route, but when in contact with the enemy they will find it difficult to embed information about their immediate surroundings in the map. If they had time to prepare their position, their main graphic aid will be the range card, not the map. This range card, and not the map, will also serve as the basis of the common language these "warriors in contact" will use to communicate with each other about what is happening around them.

Soldiers in the divisional headquarters will usually talk the language of the map. Soldiers in the platoons and the squads will usually talk the language of contact. But some people, especially in the battalion and company command levels, will have to talk both languages, and to translate from one into the other.

It is relatively easy to use technology to help warriors of the map. It is easy enough to do on the computer display the work that was previously done on the map board, and once done on the computer, it is easy to communicate the results of such work to others and to process them further by computer. It is much more difficult to use information technology in order to help warriors in contact, since their hands will be busy with their weapons, and most of their attention will be devoted to their immediate surroundings.

Because using information technology to help warriors in contact is more of a challenge, we were especially interested in observing the lowest level during the trial, and in seeing what the soldiers will do with their "future land warrior" kits.

V. The Individual Rifleman

Some of the riflemen had hand-held computers of the PDA type. Others had a computer in their backpack, with a helmet mounted display. Both types of personal computers were connected to the battalion command & control system, call Battle Management System (BMS). The personal computers displayed information about the terrain, hostile forces and friendly forces, and also allowed the user to input information. In the present section we will summarize our observations about the interaction of the individual rifleman with the Battle Management System, via his personal computer.

A rifleman in a combat situation will obviously keep his PDA in one of the pockets of his harness for most of the time. He will take his PDA out and use it only when he is free to do so, and when he has an important need to do so - either because he needs information or because he has something important to report.

Many of those soldiers who had a computer with a helmet-mounted display tried to divide their attention: to watch the display with one eye and the immediate surroundings with the other. They found out what any human factors engineer or psychologist would have known before the trial - you can not, in general, use your two eyes for two separate and independent tasks that require processing two different pictures at one and the same time. When turning your attention to the C2 display it takes time until you understand what you are seeing, and when taking

you eye off the display in order to watch the terrain you might have to wait until it adjusts to a different lighting level.

Feeding information into his computer demand more concentrated attention than a rifleman can usually devote to a task which does not contribute directly to his immediate combat needs. Using a mouse or another pointing device, using a keyboard, and especially pointing to a virtual on-screen keyboard, demand sustained attention to small details and fine manual control, which is not easy to achieve, even when the weather is nice, as it was during the trial, and there is no need for gloves.

Some of the riflemen were equipped with an integrated radio-computer, a GPS locator, and a laser rangefinder/compass. This combination makes it very easy to feed into the command & control system the coordinates of a point - it is enough to look at it and press one button. Since the computer carried by the rifleman knows were he is, and in which direction he is looking, and can measure the distance to the point looked at, it can easily calculate the coordinates of the point looked at.

While feeding the location of a point looked at into the computerized command & control system can be easily done by a soldier with a GPS locator and a laser range finder/compass, and by other technologies, feeding the description and significance of the point was much more difficult. Feeding the description was rarely undertaken by riflemen, while moving in the alleys and inside the buildings.

Riflemen fed descriptions of points looked at only when they had an interlude in the fighting, and only when they concentrated on surveying the battlefield and getting ready for the next phase of the battle. Most of the point descriptions that

were fed into the computerized system were not fed by regular infantry but soldiers dedicated to operating the Battle Management System or by specialist soldiers, like sharpshooters or like members of surveillance and target acquisition teams, who deployed in specially selected position, and often had high powered tripod-mounted optics.

If we look at the totality of enemy sightings fed into the computerized command & control system, we notice the following: sometimes different soldiers saw the same enemy and fed, separately and independently, multiple reports about him. The result may be several slightly different and supposedly independent sightings, which actually refer to one and the same enemy. On some occasions friendly soldiers were misidentified as enemy, and their location was fed into the command & control system. The result was that those misidentified soldiers suddenly saw a report about an enemy appearing right next to them.

If we consider the set of all reported enemy sighting we should take into consideration the following fact: different sightings were made at different times, and it is not clear what is a good way to display them. Should we display all available sightings, without regard to the time they were made, or should we display only recent sightings? How recent?

The previous three paragraphs give a variety of reasons for the following observation: the totality of reported sightings do not, by themselves, immediately lead to a Common Operating Picture of the enemy. We will return to this issue in the next section. But the ability to capture the location of an enemy easily and accurately, and to transmit this location quickly and reliably to others, via the

command & control system, was a very important tool for communicating between units, for example when requesting close air support.

We shall conclude this section with two comments about own troop location: First, if our ability to locate our own troops depend on their having GPS receivers, it may be impossible to receive up to date location information when they are under a roof or inside buildings. Displaying the most recent location information available is not always useful, and might be misleading. Second, if the radios available in the company and battalion can transmit data only slowly, then the information about the location of friendly units may be significantly delayed by the time it arrives. Such out of date information may be dangerous.

VI: The Junior Commanders

Because a junior commander can not watch his computer display continuously, he will see only isolated snapshots. He often finds it difficult to understand the way the situation is developing, because this requires a sustained attention. Someone sitting at a desk in the battalion headquarters could understand quite easily that a certain sequence of observations, made over time, represent one and the same enemy who is moving. As we saw repeatedly during the trial, this task, of turning individual isolated sightings into an identified "track" of an enemy on the move, was often too difficult for junior commanders or for warriors directly involved in combat inside the village. For they often could devote to their computer displays only a furtive glance, and tended therefore to concentrate on their immediate area and on the immediately visible enemy.

Can we characterize the occasions on which junior commanders will stop and devote more than a glance to their computer display? Based on our observations, we would suggest the following hypothesis: A junior commander will devote sustained attention to his displays only when there is a lull in the fighting, or a change in the mission, and when he would anyhow, with computers or without them, have to stop, observe, think, study the map or the photo, and read the new order or write one.

On one occasion we saw a company commander who stopped, took his computer out of his backpack, and after making a new plan for the next phase and drawing it used his computer as a map-board for briefing his soldiers.

Let us now return to the issue of feeding information into the command & control system. Certain kinds of data, like the self location of soldiers equipped with GPS, and the location of targets acquired with a laser range finder/compass, can be fed easily and automatically. And, of course, what is fed into the computerized system can be transmitted to others and displayed to them. But the data automatically fed should be considered as raw data, and it is not clear who will be able to digest it and turn it into an integrated Common Operating Picture (COP)? It is our tentative conclusion that when a platoon or a company commander is involved in close combat he will not have the leisure to identify units and draw their location, identify movements and draw the appropriate arrows. While the platoons and companies are busy with the immediate tasks of combat, only people at the battalion headquarters could create a Common Operating Picture.

That commanders of platoons and companies do not create an agreed COP should not be surprising. We usually do not talk about COP at these levels. The raw data

on which the COP should be based contains many corrupted or even wrong bits of data, which may conflict. There may also be gaps in the available data. The process of creating a COP depends on analysis - reconciling differences, filtering out what appears to be wrong - and synthesis - aggregating what seems to be related and abstracting the important features out of the mass of details. Since this is the nature of the COP, it is obvious that even with a lot more networking capabilities, it will be neither entirely accurate nor complete. Its status will remain that of a working assumption.

So why do we bother to create a COP? A COP created at the divisional headquarters can serve us well, because at its level of aggregation things can not change very quickly. But from the point of view of a company or platoon searching out a few terrorists, the enemy can change very quickly. Platoon and Company commanders will try to get all the information available about such an enemy, its infrastructure and its modes of actions. But their decisions will often still be based on an analysis of the terrain and enemy's possible courses of action, since positive, detailed, accurate and up to date information about the enemy will be lacking.

From the point of view of a company or a platoon commander, busily engages in urban combat, is seems fair to summarize by positing the following hypothesis: More networking capabilities will give us a better situational awareness, but it will be a "macro" situational awareness. The "awareness" supplied by our computerized command & control systems will encompass the general picture, but even with better systems it will most probably not include all the small details necessary in order to fight a few insurgents in the narrow alleys.

We have repeatedly stressed that a company or a platoon commander is too busy, while engaged in combat, to spend time with his computer. This is not a new observation. For many years he was too busy to spend time babying his radio, and was therefore given a radio-man as a helper. The radio-man not only carried the radio, which used to be very heavy, but also relieved the commander of the need to monitor the net. It is natural therefore to ask the following question: Should we turn the radio-man into a C2-man, and will the C2-man be able to effectively help the commander.

Many commanders have actually employed a C2-man during the trial. They typically relied on the C2-man to do the time consuming tasks, like feeding information into the command & control system, but some other things they wanted to do themselves. They especially wanted to watch the display from time to time and see the situation for themselves. On some of the vehicles, they could not watch the computer display and guide the vehicle at the same time. In such cases the C2-man would monitor the display continuously, and would alert the commander when an interesting new fact arrived. The commander could then come down and look at the display, or else receive from the C2-man a spoken description of the new fact. One commander we saw carried a paper map, and when receiving a spoken report of a new fact he would mark it on his personal paper map. If we want platoon or company commanders to be able to devote more attention to their computer display while mounted and moving, we should give someone else the responsibility for guiding the vehicle, or even for commanding the vehicle.

We shall conclude this section with one last comment about junior commanders. Having become used to the greater availability of video, they often asked for video signals of important points in the terrain. But when they received either live video or individual captured frames, they often did not know how to make use of them. This is because interpreting video demands previous training and continuous attention. But the junior commanders have often not been trained in video interpretation. Neither have they the time to monitor it for any length of time, until they can interpret it. It may be better to distribute only interpreted photos or frames, not raw video.

VII. The Battalion Headquarters and the Help it can Offer

As we have said several times, a rifleman in a direct contact with the enemy can not devote much time and attention to the display of his computer, even if he has one. But soldiers at the battalion headquarters can devote much attention to their computer, and actually work with it almost continuously, at what can be described as their 'desk', set up in a command vehicle of in a field office. So can we rely on people in the battalion headquarters to help those in the lowest levels - company and below - and digest their information for them?

As a way of thinking out aloud, let us consider the following alternative ways in which the battalion headquarters could help. None of these ways was tested during the trial, and they are given here as suggestions for the future.

We could assign to each company commander an S3 aide, who will sit in the battalion headquarters and who will continuously monitor the area of operations of the company and its immediate surrounding. The S3 aide will help the company

commander keep track of where his people are, and will tell him of interesting developments that happen outside his area but which can impact him. The S3 aide can also receive verbal instructions from the company commander and turn them into written orders and into graphics on the map.

We could also assign to each company commander an S2 aide who will tell the commander what the enemy around his company is doing, and will alert him when an ominous development might be taking place. The S2 aide will also hear from the people of the company which enemy forces they are seeing or engaging, and will feed this information into the command & control system, so that other people, in the same company or in neighboring companies, will receive it.

We could also combine the functions of the S3 aide and of the S2 aide, and assign all of them to one and the same person. This one person will act as a controller for the company commander. The controller will supply the company commander with a peripheral situational awareness, but will of course leave decision about combat in the immediate area of the company to the company commander. The controller will have to be skilled enough in order to help the company commander with relevant and important information without overloading him.

Will the company commander feel comfortable with such aides or with such a controller, if he is assigned from the battalion headquarters? Will the company commander prefer to send one of his own people to the battalion headquarters, to serve as his aide or controller? Developing the organizational culture necessary to make this work will take some time and effort. But one could hazard the following hypothesis: If we want the battalion headquarters to help the companies face the

flood of information expected in a computerized command & control system, then we will have to increase the number of people in the battalion headquarters.

VIII. Conclusion

Alberts and Hayes, whose *Code of Best Practice for Experimentation* has obviously influenced the writing of this paper, if not the conduct of the trial, warn us against relying on "happiness tests" when assessing the results of an experiment.

At the end of very intense two weeks, when the urban warfare trial we have been talking about had ended, everybody was very happy. Everybody felt a lot has been done and learnt. The trial did not prove anything - it was not controlled enough for that - but it generated ideas and hypothesis that we will have to discuss and evaluate further, including some specific suggestions on what we should not do and on what we might try to do. We hope we can start the discussion now.