Javelin and NorBMS

This essay will make an account of Javelin and Battle Management System (BMS), and then contrast the pros and cons these technologies might have for the planning and leading of military operations on the company level. As for the BMS this essay will mostly be based on personal experience with the system and its development. I was serving with the Recce Platoon in Telemark Battalion from 2010-2012 and in 2011 we were testing and helping out with development of the Normans system. At that time I was already well familiar with the FACNAV and using it in combination with a Harris HF[1] radio. First the BMS will be explained as to what it is and then I will go through some brief history and challenges of the development. Then the pros and cons will be discussed. The same structure will then utilised for the Javelin weapon system. When it comes to the Javelin however, the focus will be more on the weapon system as it is not a planning tool, nor a leadership tool. The source of information on the Javelin is the lecture given by Holtane week 46.

Battle Management System

What is a BMS?

BMS is a collective noun for a type of technology. The primary function that is in focus, with most countries developing a BMS, is the so called Blue Force Tracking. Blue Force Tracking is the ability not only to know your own position on a map, but to see all your friends` positions as well. To a layman familiar with action games, especially first-person-shooters (FPS), this concept may seem very familiar.

Figure 1 - screenshot from multiplayer in Call of Duty[i]

[1] High Frequency

In the upper left corner one can see the "radar" in videogames with some of the basic functionality of a BMS:

- It shows a map of the battlespace
- It shows your own GPS[2]-plotted position (the yellow arrow in the figure)
- It shows the Blue Forces` positions. (The green arrows)
- It shows the enemy (red dots)

This functionality has previously only been available in games and science fiction, but thanks to the advances in technology it is possible to achieve the same in real life. Even though the aforementioned functionality is what a BMS is *expected* to deliver, there is a myriad of possibilities as to what it *could* achieve. It is a computer based system, so any task a computer could be asked to perform; the BMS should be able to do as well. Thus, imagination is the only true limitation to what a BMS can do, be it the imagination of the programmer or the Armed Forces that task him.

Norwegian Battle Management System (NorBMS)

Many countries have strived to get an up-and-running BMS and Norway is no exception. The following paragraph will be a brief anachronistic and flawed history of BMS in Norway based on my personal knowledge to the systems.

Kongsberg Defence and Aerospace (KDA) is, and have been for some time, a world leading company within defence related R&D[3]. KDA developed the NorTAC-system that was probably Norway`s first somewhat functioning BMS. It was "quickly" surpassed by the FACNAV[4] provided by Teleplan Globe. The Norwegian Armed Forces already used Teleplan`s multifunctional MARIA Geo Development Kit for several of its smart functions, communication reception analysis being one of them. So when the FACNAV was introduced as a DACAS[5]-system to the Norwegian Armed Forces, many of the underlying MARIA based functions were still available. The FACNAV evolved to become both DACAS and BMS and then the Norwegian Armed Forces had an all-in-one package. The FACNAV became Norway`s BMS of choice and was aptly renamed NorBMS.

Figure 2 - DM7 tablet Windows-machine with NorBMS software installed[ii]

[2] Global Positioning System
[3] Research and Development
[4] Forward Air Controller , Navigation
[5] Digitally Aided Close Air Support

The NorBMS currently holds all the functionality that the "radar" has in videogames. It is hooked up to a GPS and a radio and pushes out your information to the rest of the Blue Forces. In the right screenshot on Figure 2 you see all friendly forces as blue dots and all reported enemies as red dots. It has a bunch of additional functionality such as terrain analysis, Line-of-Sight (LOS) analysis, text messaging, offset waypoint calculation, input for live video feed capture from sensors and 3D terrain view just to mention a few. These computers are made to be vehicle mounted so NorBMS will not keep track of unmounted personell.

Norwegian Modular Arctic Network Soldier (NORMANS)

The Normans project has been in development since 2000, led by the Norwegian Defence Research Establishment (FFI – Forsvarets Forskningsinstitutt). The project is supposed to produce a modular combat gear for the soldier that includes everything he needs; helmet, vest, CBRN[6], C4IS[7] etc. The C4IS part of this project has been rapidly advancing in its development in recent years. Today this project`s BMS is almost just as functional as the NorBMS and the systems can communicate with each other. On the BMS exercise Bold Quest 2011 (BQ11) in Indiana USA, one of the primary goals for the Norwegian unit over there was to prove that it was possible to have Blue Force Tracking on every single soldier, using the Normans system, and for a fighter jet to receive the Blue Forces positions on his HUD[8] during a CAS[9] mission. An additional goal was also that all the participating nations BMSs should be able to communicate with each other. In week 2 of this 4-week long excersice, the Norwegian unit could for the first time see Italian Forces as Friendly Forces on their screens. One of the biggest challenges for Norway`s BMS during BQ11 was bandwidth on the radio.

Challenges in developing a BMS

The challenges that come up when developing a BMS are probably way too many for the scope of this essay, but here are a few worth mentioning all the same.

- Communication Systems
- Security
- Intercultural Communication

As for the communication systems, the biggest issue has already been mentioned; bandwidth. Pushing out data continuously demands more bandwidth then is available. On top of that Norway`s primary radio did not have TDM[10]-functionality, which meant that there was a need for an additional radio to transmit data. With the MLU[11] of our primary radio TDM will be added, but the bandwidth is still relatively low. This does force the developers of the BMS in Norway to be quite elaborate in their design and data package distribution. This is positive in the sense that our BMS might be "better" built, but it also takes longer and cost more money.

When it comes to security the BMS development is bound to using our secure means of communication. This lags the development because of the challenges mentioned when it comes to

[6] Chemical Biological Radiological Nuclear
[7] Command, Control, Communication and Computer Information System
[8] Heads Up Display – the informational display in the cockpit
[9] Close Air Support
[10] Time Division Multiplexing – transmitting several things on one carrier signal by synchronising when the different things are to be recieved. This would mean that it would be possible to send both data and voice over the same frequency.
[11] Mid-Life Update

our communication systems. Typically the BMS developers could make a proof-of-concept on a modern smartphone in one tenth of the time it would take to make it work with our secure radio. I have seen with my own eyes the Normans system ported to an Android phone and I know for a fact that the developers used university IT-students to make it happen, relatively quickly I might add.

By intercultural communication I do not mean between ethnicities or across nations, I mean between the computer proficient man developing the software, and the analogue soldier or officer. Both are extremely smart and at the same time extremely stupid in the eyes of the other. This is easily explained with an example. The FACNAV has an "Offset Waypoint"-function where you enter a distance and a direction from your own position, and it gives you back an accurate grid on the point you are observing. This functionality is ingenious when plotting an observed enemy into the BMS. As for the Normans you could the same, but couldn`t enter the numbers manually. With the Normans you had to have an advanced and expensive Vectronix PLRF[12] hooked up to the machine. The PLRF provides two numbers to the machine: distance and direction. I tried to explain to the developers that I wanted that function available in the GUI[13], so that I could enter distance and direction manually and get a grid. I compared it to the "Offset Waypoint" function in the FACNAV and even showed them how it looked. The development team was reluctant to make such a change because they couldn`t see the use of it. After 2 weeks they had figured out what I needed was an "Offset Target" and was quite proud to present the result. The issue we were experiencing was simply an issue of semantics, whereas he saw a waypoint as something you navigate to by GPS and why would you navigate towards the enemy HQ, and I saw it as a dot on a map with a 10 digit grid that I could report to make artillery rain from the skies.

How does the BMS help with planning and leading operations?

Both Thucydides and Clausewitz point out some of the basic challenges with warfare; logistics, "the fog of war", intelligence that has no value. These are but a few of the challenges they describe, but they are just as relevant today. "The fog of war" refers to how uncertain everything is in the chaos of war. It is hard to know anything with certainty. Intelligence has no value if it is delivered to the decision maker too late, and it has no value if it is exaggerated by a frightful scout. The BMS is designed to fix these issues and give situational awareness on the battlefield. By having all information from sensors available on one platform connected in a network the time from sensor to decision maker to effector is shortened drastically. This is the principal function of a BMS and how it helps in leading an operation.

As for helping with planning it is a time saving tool. It is easy to do a LOS-analysis to decide possible positions for an observation post. It is easy to use the map tools to pick out grid references and calculate routes. It provides a platform to quickly share information such as reference points and other map overlays. All reports are standardised within the system so with the press of a button one can start filling out the logistical report and the Combat Support platoon can read all the reports on their own BMS.

Challenges

While the advantages are many and most are quite obvious to a soldier, the challenges are not always as obvious. The topmost challenge I`ve observed is probably the lack of procedure. The

[12] Personal Laser Range Finder
[13] Graphical User Interface

Norwegian Armed Forces have today one of the most advanced BMS`s in the world, an excellent tool to help with so many of the challenges on the battlefield, but that was also the case for the UK with the Maxim machine gun in the late 1800`s. If you read the early history of the machine gun in "On Infantry" you might laugh, because how to use a machine gun tactically is today a basic infantry skill. It is a similar case with this "new" technology BMS. There are many questions left to be answered, and Hærens Våpenskole (Norwegian equivalent of TRADOC) is hard at work in planning how it should be used, how we are to educate soldiers and how we are to harness the power of the BMS without becoming a victim of its disadvantages. For there are disadvantages, but we have not necessarily recognised them all. One could draw parallels to what the digitisation did for artillery. There are very few artillerists today who can shoot with their battery without a computer. The skill of calculating ballistics and firing the cannons manually are made obsolete by the computers and is no longer a honed skill. So what skills are rendered obsolete by the BMS? Orienteering maybe? Whatever the skill lost in the future may be, it is scary to think about how fragile a computer is considering network security or maybe even electromagnetic pulses.

Conclusion

The BMS provides a solution to many of the problems that arise in battle, but it is a relatively young technology. While it is an excellent tool for the commander it is just as important to be aware not to become complacent towards its use. It is an additional tool, but does not in any way make leadership obsolete. To look your subordinates in the eyes when issuing an order has in no way become less important. The biggest challenge for the young officers in the years to come will be to figure out the perfect balance between using the BMS as a tool and leadership, and also to make better procedures for its usage. Hopefully there won`t be any Cadets a hundred years from now laughing at our stupidity in the book "On Technology".

Javelin

What is a Javelin?

Javelin is the name of an Anti-Tank (AT) weapon system. It is has a passive homing capacity by using an IIR[14] in the warhead, which is just a fancy word for a thermal camera. Passive homing means that it homes onto the target without sending out any signals, it only senses the target`s signals. In the case of the Javelin it locks on to the heat signature of the target. It is also a F&F [15] and top attack system. F&F meaning that after launch the missile will steer itself and the soldier does not need to hold the shooting position. The reason for going with a top attack is that most armoured vehicles have less armour on top compared to the front and sides.

[14] Imaging InfraRed
[15] Fire and Forget

Figure 3 - a Javelin launching its missile[iii]

The maximum range of the Javelin Norway has bought is 2500m. This range is a limitation both because of the sight and the missiles fuel. The maximum range of this model has been stretched as far as almost 2700m. The lock on is done with the thermal camera in the missile and not the sight, and the camera in the missile is a cooled thermal camera. Cooled thermal cameras have cheaper lenses and are dependent on the cooling of the sensor to get a proper thermal image on longer distances. The Javelin`s missile has a very short battery life time for the thermal camera and it cannot be deactivated once activated. This is one of the challenges a Javelin shooter has. Activate the missile and you have four minutes or so to launch, and you can`t launch until the sensor is cooled and that will take 15-30 seconds. The missile itself has a conical shaped tandem charge, whereas the first is meant to destroy reactive armour and the second would penetrate the rest of the armour. The Javelin can take out all known armoured vehicles. (Holtane, 2014-11-12 Leksjon Javelin[iv])

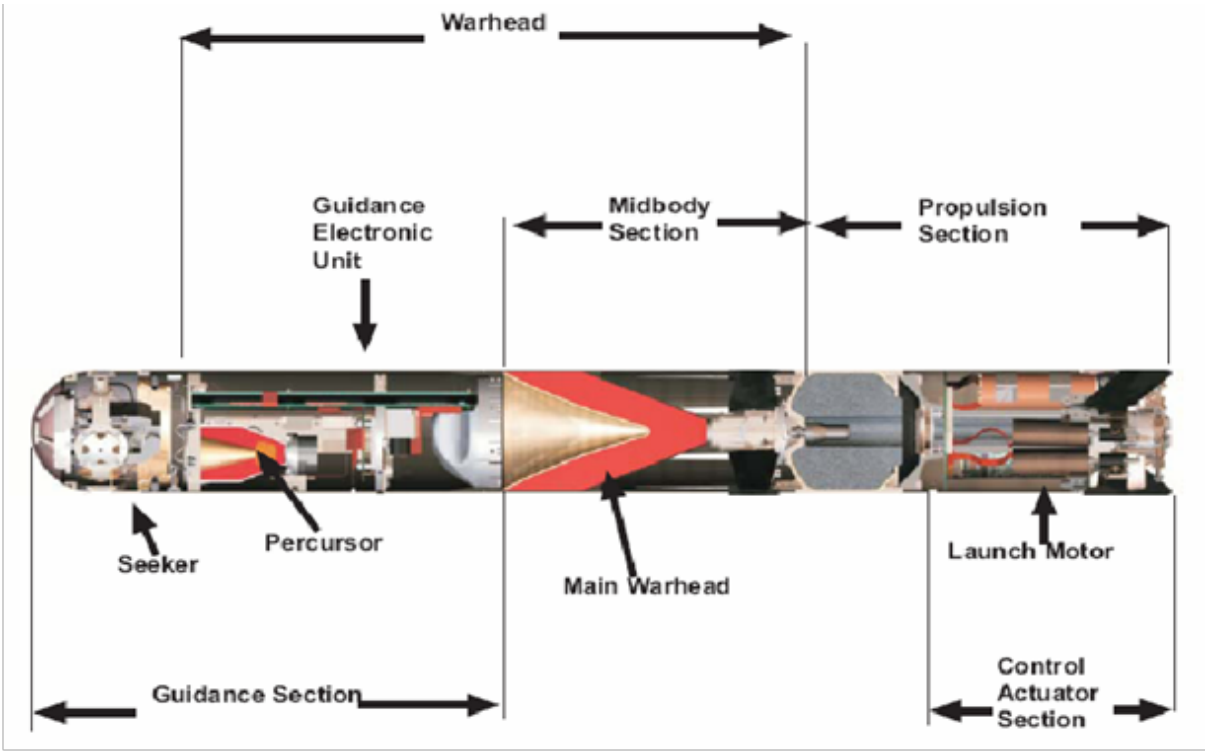

Figure 4 - The Javelin Missile[v]

How does the Javelin help in leading and planning operations?

The Javelin can`t be said to help a company commander in whether leading or planning operations in the same way as a BMS can. The Javelin is not a leading or planning tool, but it does make a difference to the commander having the capacity within his unit. The commander`s concern is to be knowledgeable about the weapon system, so that he does not plan in disharmony with its capacities. That begs the question, what are the pros and cons of the Javelin as a weapon system.

Pro

It is a medium range AT weapon, but still "long" range when compared to M72. With its top attack it will penetrate most known armoured vehicles. It has a soft launch feature which means you can launch it from inside a building or cramped space. The precision after lock on is guaranteed and can`t be affected by human error. It is relatively light and flexible, and with F&F it provides better safety for the shooter compared to most TOW[16] based AT weapons. Possibility to take out enemy tanks with precision and without having to have own tanks present.

Cons

As previously mentioned the Battery Coolant Unit has a very short lifespan of only four minutes. If the missile is activated and not shot within those 4 minutes, the BCU has to be replaced. There are two BCU`s per missile. The lock on is done by a thermal camera, so weather that is bad for thermal imagery (i.e. snow, hail, rain) may result in a failure to use the weapon system. Even though the maximum range is 2500m it is very hard to get a lock on at these ranges because of the limitations of the sights. The cost of a missile is high so educating Javelin shooters is expensive.

Summary – conclusion

The Javelin is an advanced world-class AT weapon that has the ability to penetrate most known armour. It gives the commander an extra capability to utilise in his plan. The most important thing for the commander would be to know just enough about this weapon technology so that his plan uses the weapon platform "correctly". It may for instance not be smart to plan with a Javelin 2400 meters from the engagement area on a snowy day. This point is of course transferable to most technologies and weapon systems that are present in the leaders command. So the example of Javelin proves that a military leader has to learn a bare minimum of military technology to enable himself to do his job.

[16] Tube-launched, Optically tracked, *Wire-guided* missile

[i] http://callofduty.wikia.com/wiki/File:Call_of_Duty_Black_Ops_II_Multiplayer_Trailer_Screenshot_44.png Screendump at: 2014-11-13

[ii] Riisnæs, Rune (2013) *NorBMS – Quick Overview* online: https://kgv.doffin.no/app/docmgmt/downloadP(Kristiansen, 2014)ublicDocument.asp?DVID=82176&FMT=1&AT=15&ID=15314 Downloaded at: 2014-11-13

[iii] Holtane, Halvard (2014) *2014-11-12 Leksjon Javelin.pptx* Downloaded from itslearning at: 2014-11-13
[iv] Holtane, Halvard (2014-11-12) *Leksjon Javelin* ved Krigsskolen.
[v] Holtane, Halvard (2014) *2014-11-12 Leksjon Javelin.pptx* Downloaded from itslearning at: 2014-11-13

Levert	14. november 2014 14:12 av KIM ODDAR KRISTIANSEN
Deltakere	KIM ODDAR KRISTIANSEN
Tittel	Kunskapstest i Miltek
Status	Godkjent
Vurdert av	HALVARD HOLTANE

Kommentar

Fakta: Særdeles god gjennomgang av BMS, ikke minst med kandidatens egne erfaringer. Betydningen av de operative brukeres evne til å være i tett dialog med systemutviklerne, slik kandidaten som et glimrende eksempel har vist, var det særlig interessant å høre om (NORMANS-prosjektet).

Når det gjelder Javelin, er de fleste viktige egenskapene dekket på en grei måte. Det kunne vært skrevet litt mer om CLUen, bl.a. som et svært godt observasjonsmiddel. Det er et bra poeng at kandidaten understreker at låsingen på målobjektet gjøres gjennom missilets sensor og ikke det vesentlig bedre (og dyrere) faste, uavhengige kamera knyttet til CLUen. Det begrenser rekkevidden i dårlig vær. En litt spissfindig kommentar angående det du skriver om kjøling og billigere linser: CLUens termiske kamera kjøles også ned (til ca. -200 grader), men har i tillegg dyre linser. (Nedkjølingen reduserer den elektroniske støyen som ellers vil forringe signalstyrken i den termiske strålingen).

Drøfting: **Svært grundig og god drøfting**, spesielt av **BMS**, basert også på egne erfaringer. Bra å ta utgangspunkt i tidløse utfordringer ved krigføring (jf. Thucydides og Clausewitz) når en skal vurdere muligheter og begrensninger ved ny teknologi.

I drøftingen av **Javelin** kunne også nevnes at CLU som et svært godt observasjonsinstrument, kan bidra til et bedre informasjons- og beslutningsgrunnlag for sjefen.

Struktur: Meget bra og med gode overskrifter over hovedtemaene.

Språk: **Svært bra** (engelsk, i god tverrfaglig ånd, slik undertegnede gjerne skulle sett mer av også utenom "engelsktimene").

Kildehenvisninger: Meget bra og formelt korrekt oppsatt oversikt bakerst.

Layout: Meget bra, bl.a. med illustrerende **figurer** og forklarende **fotnoter**.

Helhetsinntrykk: **Svært solid og selvstendig arbeid** (A)