Battlefield Management System (BMS)

Royal Netherlands Army

Introduction

The Royal Netherlands Army (RNLA) has embarked on a long-term programme using network-centric warfare principles to improve command and control (C2) capabilities during operations. Several projects have been and are being combined to achieve the program's goals, starting with the development of the Integrated Staff Information System (ISIS) for C2 at Brigade level and higher. A milestone in the program was the implementation in practice of the Army Tactical Command and Control Information System (ATCCIS) standard in ISIS. In parallel the development of a "battalion and below" C2 system: the Battlefield Management System (BMS) was initiated. BMS is intended to support the command chain at battalion staff level and below, all the way down to individual vehicles.

BMS is designed to improve information flow and C2 in the mobile environment. The system is to be deployed in all battalions and equivalent units throughout the RNLA, including armored infantry and tank battalions, reconnaissance units, fire support (PzH2000) units and logistics units. In principle, BMS terminals for the use of the unit or vehicle commander will be installed in all radio-equipped vehicles, including the Fennek wheeled armored reconnaissance vehicle, the Boxer armored personnel carrier, Infantry Fighting Vehicles, wheeled vehicles such as the Mercedes-Benz all-terrain vehicles, trucks, and the Leopard-2 main battle tank. Depending on the operation, BMS terminals may also be installed at fixed, base locations.

Plans include also the installation of one or two larger workstations, which are used by the staff personnel, in armored vehicles that are part of a Command Post element.

BMS terminals and workstations are connected to one another by data communication links, which enables information exchange among the stations (vehicles). Information is presented to the user superimposed upon a map image of the area.

The BMS system consists of two main capability packages: situational awareness and planning. The exchange of situational awareness data contributes to a better Common Operational Picture among the unit elements. The planning package supports commanders at all levels in creating and transmitting plans, which are presented to users as overlays (operation overlay, obstacles overlay, etc.).

A major element of the BMS project is the integration of equipment in vehicles and weapon systems. There are major difficulties in integrating BMS in legacy armored fighting vehicles and the Leopard-2 main battle tank, due to the lack of space. In newer vehicles, such as the Boxer, the Fennek and the new Infantry Fighting Vehicle, where the integration of C2 systems was taken into account during the design of the vehicles, the difficulties of integration are fewer.

The scope of the BMS project also includes the various training tasks (operator, system management and maintenance) and integration in simulators

Project phases

The BMS project consists of 3 phases:

- Demonstration
  definition of functional requirements
- Pilot
  evaluation of added value
- Series
  operational deployment

A side effect of the demonstrator phase has been the development of a BMS system with a system-integrator role for the Ministry of Defense's C2 Support Centre.

Project-specific issues

The BMS project has some specific issues, which need specific attention. The three main items here are the operational context in which the system will be used, a highly mobile environment and specific communication means.

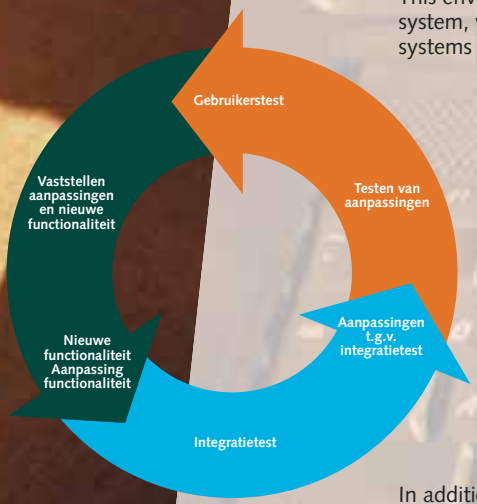
- **Operational context**
  While the focus at the division and brigade levels is on planning and monitoring operations, commanders at lower levels are responsible for carrying out operations. That requires more 'near real time' C2 capabilities based on detailed, up-to-date information. It also has an inherent danger of information overload. To deal with both of these aspects, specific functionality in communication and man-machine interface is required. Since the use of a BMS system is normally not a user's primary task, ease of operation is an essential element. The first activities in the BMS project were therefore aimed at defining the operating concept that was implemented in the demonstration system. The system is based on a touch screen interface with large buttons and no keyboard or mouse.

- **Infrastructure**
  During deployment, Command Posts at the lower echelons often use some armored vehicles with a minimum of space and comfort. These CPs require a high level of maneuverability. Power is usually drawn from 24v batteries.

- **Reliability and availability**
  The reliability of the BMS system is essential for operations. That places specific constraints on the whole system, taking into account the absence of technical support in the operational area. BMS project architecture is based on a concept in which an Information Bus carries the data and where no "single point of failure" exists in the topology (no client-server concept).
- **Integration in vehicles**
  Integration of computer equipment in vehicles requires specific attention to items including ease of operation, readability, and other human factors. In addition, the selection of equipment should take into account the specific vibration and shock requirements and especially, the EMC protection.
- **Integration with sensor systems**
  To achieve maximum effectiveness, the BMS system will be integrated with the various sensor systems in vehicles, including the positioning systems, laser range finder and other target sensors, and integration with weapon systems such as the self-propelled howitzer. In the demonstration phase, some integration steps, such as the connection with the navigation system in the Leopard-2 and an external laser range finder, were already implemented.

- **Limited communication bandwidth**
  At battalion level and below, the primary communication media are VHF and HF combat net radios. Characteristic of these media are:
  - the limited reliability of the communication link, depending on the operational area and interference by jamming or natural phenomena;
  - Limited bandwidth and half-duplex transmission:

This environment creates severe limits for data communication. In the demonstration version of the BMS system, various COTS communication devices were evaluated and implemented. The information distribution systems have been designed in such a way that the load on radio networks is limited as much as possible.



Evolutionary development.

Focus during the demonstrator phase was on defining the functional requirements. In order to enable users to provide feedback and input, a demonstration system was built using an evolutionary development approach. Once per half year, a new version of the software is issued which includes change proposals from the users. This demonstration version was also deployed during exercises.
To support the evolutionary approach, 13 Mechanized Brigade was designated as 'digital brigade' with the task of providing user input. This allowed a direct interaction between users and developers, which proved to be a very effective method of cooperation.
This development process will continue during the next phase in the project, the Pilot phase. During this phase, the system will be deployed on a larger scale. 13 Mech Brigade will continue to have a major role during the Pilot phase.
Besides this 'mainstream' development track, the BMS system was deployed during a Non-Article 5 Crisis Response Operation, as well. For this purpose, a "production version" of the BMS software was developed and tested.

In addition, a Marines battalion used the system in its Main Command Post during exercises in order to gain experience in using this type of C2 system. This activity proved the concept of the contribution to a Common Operational Picture, the usability of the system and the relative ease of use, which is needed for training.

Time line

The Pilot phase started in September 2003 and will run until mid 2005. The Series phase will then follow. During 2004, the migration to the C2 Workstation Framework will take place.

Communication equipment

Various types of communication equipment are implemented in the BMS system. The demonstration version supports the use of VHF radio (PR4G), LAN connections and encrypted PSTN lines. Experiments with wireless LAN and NTDR (data radio) were also carried out.

Related projects

The BMS project has many points of contact with other projects in the Ministry of Defense of the Netherlands. Examples include the TITAAN project, the use of HF radios, the further development and implementation of the C3I Architecture (the common base for C2 applications in the RNLA), the ISIS system, vehicle projects including the Fennek, the PzH2000, the Boxer, the IFV project and the introduction of new communication equipment.