



KONGSBERG

ComBatt

Command and Control Information Product Suite  
for Tactical Army Operations



[www.kongsberg.com](http://www.kongsberg.com)

Introduction  
Command and Control  
Fire Support  
Battlefield Management  
Management Tools  
Technology

## Delivering outstanding system performance by combining technology and experience



### Our mission

We shall be the preferred supplier of mobile, robust and complete information solutions to military customers in key markets. Our products are built for army operations at tactical level and include software, hardware, communication, system integration and integrated logistics support. We shall be recognized for the quality of our products and solid deliveries.

### Our philosophy

Success depends on customer satisfaction. We achieve our goals by actively listening to our customers and understanding their needs, and then translating those needs into successful products and solutions. Our employees work together in a global network of knowledge, guided by our values, giving rise to innovation and world class performance.

# Introduction

## What is ComBatt?

ComBatt is a family of products suitable for operations from Division to Squad level. The products have been developed in close cooperation with the Norwegian Armed Forces through the NORTaC-C2IS project. Since ComBatt was fielded in 2002, it has been continuously evaluated and modified based on the user's experiences in large multi-national exercises as well as in international operations in Afghanistan (ISAF).

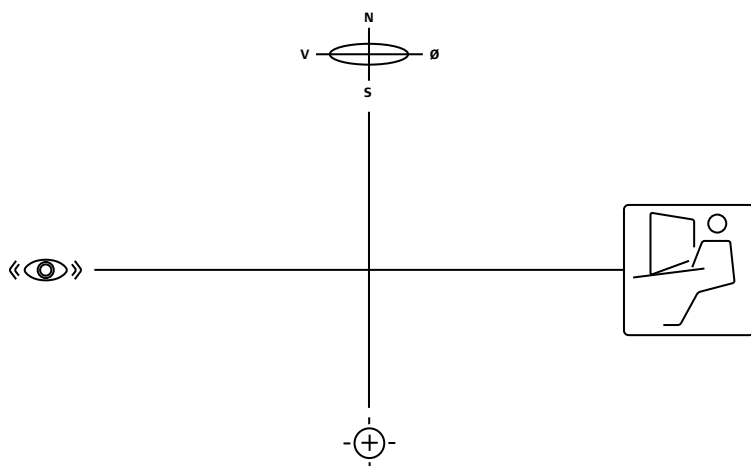
The spiral development process coupled with user interaction and deployment in operational environments has produced a functional, intuitive and easy-to-use system.



ComBatt has been deployed to the Norwegian contingency of the ISAF forces in Afghanistan.

ComBatt is an interoperable, distributed information system providing users with an efficient and powerful tool that accelerates the decision (OODA)\* process, improves quality and reduces cost.

The ComBatt family of products ensures an optimized, consistent information flow from Division level to squad level, from observation post to gun or from Main Battle Tank commander to helicopter pilot.



\* The observe, orientate, decide and act (OODA) loop.



Scalability, from one user to several hundred users.

## Main applications

The ComBatt family of products consists of the following main applications:

- ComBatt C2IS including Situation Awareness, Plan – Order, Intelligence and Order of Battle
- ComBatt Advanced Fire Support System (AFSS)
- ComBatt Battlefield Management System (BMS)

In addition a Management Tools suite is offered to support the system implementation, roll-out and maintenance.

The ComBatt products are optimized to use the available networks and bandwidths, from high capacity LAN/WAN through Tactical Radio Links and down to tactical radios with narrow band width.



Situation awareness

## Situation Awareness

The situation awareness application provides an automatically distributed, commonly Recognised Land Picture, that displays friendly and hostile units and installations on digital maps. Other geographical objects like areas, borders, volumes and coverages are available to enhance the overview of the battlefield for monitoring and planning purposes.

The military symbology used in ComBatt is in accordance with NATO Mil-std 2525B/APP6A “Common Warfighting Symbology”.



Plan/Order tool, textual part.

## Plan - Order

ComBatt enables the receipt, development and automatic distribution of standard NATO plans and orders. The tools within ComBatt support the creation and display of any map overlays associated with the operational plans and orders. The map overlay attachments may be organised in courses of action and phases, e.g. (zulu time + 4) and so on.

ComBatt supports collaborative planning wherein different elements of a plan can be prepared at the same time. Portions of the plan can then be distributed to users as they are completed.

The application provides templates according to NATO Stanag 2014 (Edition 9). National templates may also be added.

# Command and Control

## Intelligence

The intelligence officers at the different levels are supported with functionality for fusion of available information and tools for establishment and maintenance of the official enemy situation. The enemy situation is normally linked with the assumed enemy order of battle. The intelligence tool also supports handling of asymmetric conflicts or Military Operations Other Than War (MOOTW).



Intelligence application

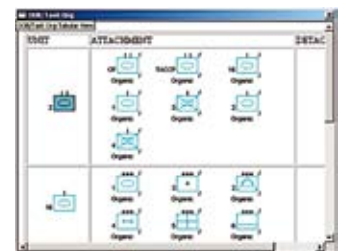


Typical command post interior

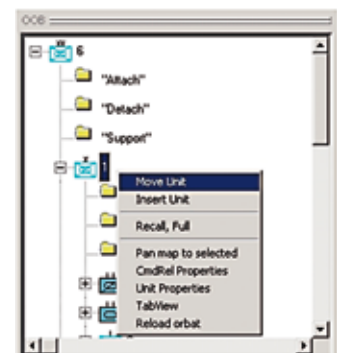
## Order of Battle

ComBatt includes a tool for generating and maintaining the Order of Battle (OOB) and the task organisation for friendly units, assumed friendly units, neutral units, not known units as well as hostile (enemy) units. The tool has the same functionality as commercial browsers and allows the user to establish new task organisations. The OOB may be changed simply by the users "drag and drop" actions.

The OOB tool enables the operator to make real time attachments and detachments in order to optimize the organisation during a specific mission. The commander's guidance, which controls the use of fire support in manouvre units, may also be set up and monitored using the OOB.



Order of battle, tabular view.



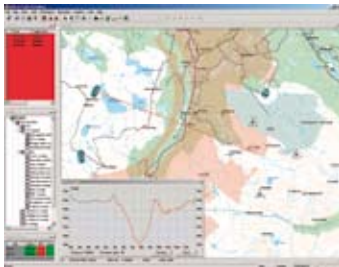
Order of battle, tree view.



155 mm Tube Artillery



81 mm Mortar



Optimal planning of Fire Support assets.



Interoperability is achieved through commitment to international standards.

## Advanced Fire Support System (AFSS)

The objective of the ComBatt AFSS is to provide the right amount of firepower at the right place at the right time. The fire support application is seamlessly integrated with the C2 functions and the system optimises the use of the weapon sub-systems to:

- Enable the use of multiple weapon platforms simultaneously
- Enable the ability to plan and execute multiple rounds for simultaneous target impact
- Engage multiple targets simultaneously
- Reduce the shoot-and-move cycle
- Assess the target to use the most effective weapon at the right time
- Reduce the amount of personnel needed for artillery operations

ComBatt AFSS provides assured engagements meaning safety measures are incorporated into the system to minimize blue-on-blue incidents and increase safety during operations. ComBatt AFSS supports multiple weapon platforms like Tube Artillery, Mortar and Rocket Artillery. The ballistic data is calculated by the integrated NATO Armaments Ballistic Kernel (NABK).

ComBatt AFSS supports all phases of a fire mission, from initial planning, through deployment, target engagement, damage assessment and reporting.

## Fire Support Planning

Fire planning process is an integrated part of the Plan/Order process where the Commanders intent is the overall guideline.

Detailed fire planning includes establishment of automatic target priority rules. Different tools like Line-of-Sight (LOS) and coverage are available for the optimal deployment of sensors. The suite of sensors includes both automatic as well as man-in-the-loop sensors. Forward Observer Instruments, Artillery Localization Radar and weather sensors are interfaced into the system.

The weapon deployment planning is supported by automatic algorithms including weapon range or coverage and suggested possible artillery areas including manoeuvre routes and availability also for logistic support functions.

In peace time the system includes firing range planning functions where safety templates are an important factor.

Tactical safety measures and graphics may be drawn directly on the screen using symbology according to international standards, for example No Fire Area (NFA), Restricted Fire Area (RFA), Fire Support Coordination Line (FSCL) and No Fire Line (NFL).

# Fire Support

## Fire Support Deployment

Based on the fire planning process, the fire support deployment is executed. The Artillery Survey functionality recommends detailed positioning of own weapons and sensors for the best accuracy.

Near and far crests are established as well as basic firing data. Meteorological analysis is performed based on up to date information from the available weather sensors. Data from the weather sensors is based upon international standards like STANAG 4082 METCM.

Other important factors for improved accuracy and precision impact like Propellant lot  $V_0$ , Weapon bearer wear and Propellant temperature is taken into consideration. ComBatt AFSS includes support functions for manoeuvre operations and guides the user in identifying optimal firing positions, possible hiding positions and future loading positions.

The current ammunition status is acquired and used as input for calculation of possible fire mission solutions.

## Engage targets

Through the target acquisition process the data from various sensors is received and processed. Based upon advanced sensor fusion and data analysis capabilities, the different targets are selected and prioritised. Targets may be pre-planned, but the system is capable of executing fire missions on time sensitive targets.

Tactical evaluation is performed and the automatic fire mission analysis includes selection of weapon platform, ammunition category and amount/number of rounds. The system takes into consideration tactical guidance, ammunition status and available units in support. Tactical safety checks are also performed according to safety measures.

Technical evaluation is performed where the automatic fire mission analysis is concentrated on the appreciation analysis including error budget, aim-point distribution and effectiveness analysis. The ballistic data is calculated using NABK algorithms from the NATO S4 software suite and technical safety checks are automatically performed based on defined safety templates. The use of NABK makes the system easily configurable for new weapon platforms and ammunition categories.

Coordinated execution of the fire mission is performed and the system supports both autonomous and non-autonomous weapon platforms. Standard artillery procedures for execution of fire missions are used according to commands, method of control and type of fire mission. The commander may keep track of detailed fire mission status, weapon status and ammunition status at all times. In addition there is a high level of redundancy through semi automatic or manual backup procedures in case of system degeneration.

## Damage assessments

ComBatt AFSS includes functionality to support the Battle Damage Assessment process where information is gathered, analysed and the battle damage- and intelligence reports are produced. These reports are used as input for corrective actions and planning of new fire missions.



Fire support deployment



Improve the shoot-and-move cycle



NABK is used for improved accuracy and flexibility.

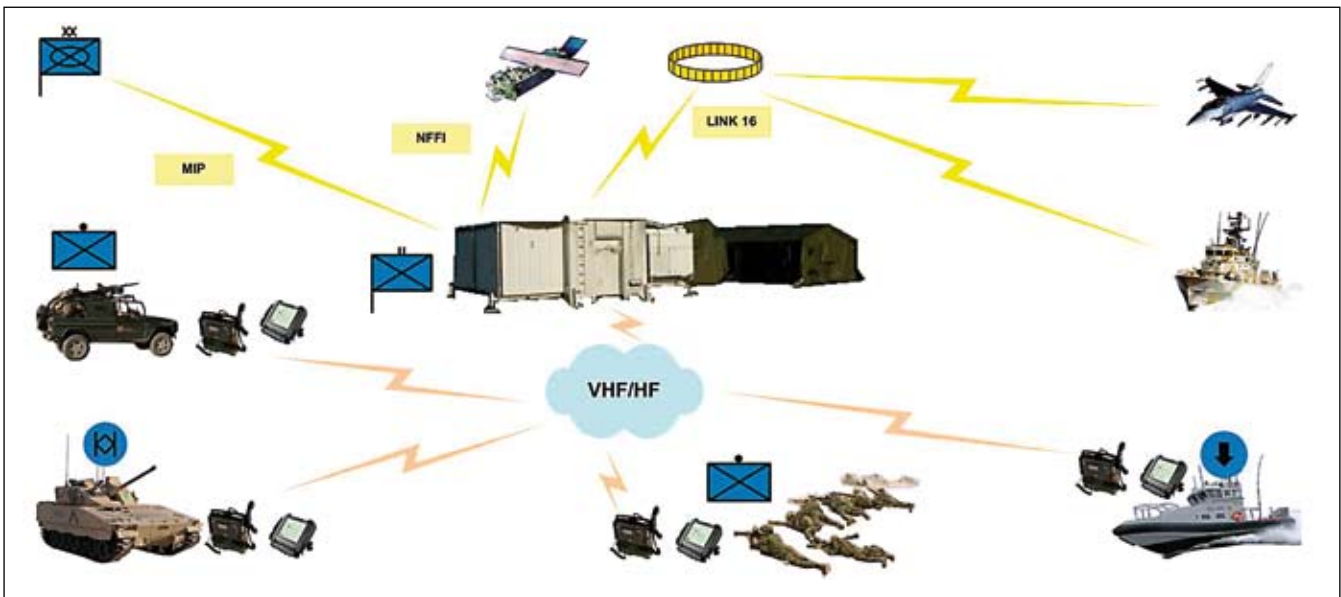


Different types of sensor information support the Battle Damage Assessment process.

## Battlefield Management System (BMS)

The ComBatt BMS supports manoeuvre operations at the company, platoon and squad level in near real-time. The application provides functionality and information to the commanders in order for them to maintain situation awareness and increase the efficiency and speed of the command and control process in order to maximize the combat capability of existing forces. ComBatt BMS has the same capabilities as ComBatt C2IS, but is configured with another Man Machine Interface (MMI) and runs on rugged tablet computers. This ensures consistent information flow from Division level to a Main Battle Tank.

ComBatt BMS handles the tactical part of BMS including Blue Force Tracking. The tactical part is vehicle independent, "a C2IS on the move".



Main purpose: Where am I, where are my buddies, where is the enemy?



ComBatt BMS in a Leopard main battle tank.



The Remote Weapon Station Protector M151.

The ComBatt BMS software can be installed on computers where size, capacity and performance are based upon operational requirements and physical space. Because the physical space available in most vehicles is limited, the MMI in ComBatt BMS utilizes a touch screen.

Great effort has been put into the work in achieving a system that is easy to learn and use. Special considerations are given to the fact that the user often will experience stressful situations where amongst others the lack of sleep is an important factor.

Low bandwidth communication channels, radios, are used to exchange information between the different vehicles equipped with ComBatt BMS nodes.

## Battlefield Management/Management Tools

ComBatt BMS is interfaced with KONGSBERG's market leader Protector Remote Weapon Station (RWS). This integration increases safety and optimizes the use of sensors and effectors. The risk for "blue-on-blue" incidents is significantly reduced and warnings are issued if own units are within the sensors field of view. The commander may conduct several sensors and receive selected sensor pictures. Every vehicle may send call for fire, enemy observations and receive weapon slew requests.



ComBatt BMS User Interface. Note the visualisation of the RWS's field of view.

## Management Tools

ComBatt includes necessary tools for system and data management and maintenance. The tool's includes data initialisation, database administration, import/export as well as definition of organisations, user rights and privileges. Maps and aerial or satellite pictures may easily be added.

The databases are organised hierarchically and ComBatt provides functionality to create and build a new hierarchy, change existing hierarchy, create databases, move or remove databases and load data into the databases. It is also possible to maintain the hierarchy and databases online during operations in order to add new databases or sub-hierarchies, move databases within the hierarchy, alter properties, remove, replace and synchronize databases.

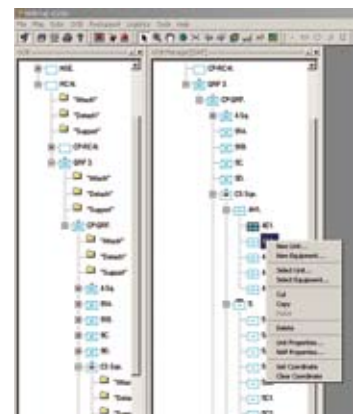
As a part of the database management application, the replication hierarchy in ComBatt is defined and maintained. A replication link is a contract set up between two databases. They may communicate via LAN or tactical network with limited bandwidth. In order to reduce the amount of data transfer on the network, filters may be added to the replication link. These filters are set to accommodate the amount of data transferred to the minimum bandwidth of the connection. The flow of information may be set up as a one way or two way flow.

ComBatt provides functionality for an operator to create, add, move and delete organisations as part of the order of battle. An operator is typically able to generate and maintain order of battle through:

- Editing order of battle by creation from organisation type data
- Creating, storing, retrieving and deleting organisations
- Editing organisations by copy/cut/paste operations
- Editing organisation data
- Editing materiel data



Database creator



ORBAT manager



## Interoperability, standard interfaces

- MIP DEM
- ASCA/CTIDP
- NFFI
- MTF
- MAPI
- IP
- Link 16
- ADatP-3
- NABK

## Data model

The operational database is based on the latest release of NATO MIP defined data model. A mixture of message based exchange mechanisms and database replication handles information exchange services between Headquarters and Command Posts. This ensures distribution of consistent information throughout the organisation.

Database replication is used between higher level Command Posts (Division to Battalion). A message transfer mechanism is used from Battalion level and downwards.

## Service Oriented Architecture

The technical architecture is modern, service oriented and extendable. The design is based on the concept of web services, using a publish - subscribe paradigm and CORBA as the underlying infrastructure or inter-process communication.

The architecture is focused on:

- Modularity and defined interfaces
- COTS or MOTS hardware
- Interoperability
- Scalability, from Division to Squad level and from only a few users to several hundred users
- Push - Pull information distribution based on optimized data volumes
- Users are alerted automatically
- Survivability and redundancy
- Autonomous operation when communication is lost
- Ease of operation in the Battlefield
- Security

## Platform, standards, COTS

The system is based on optimal use of COTS hardware, software tools and services, such as:

- Standard or rugged PC's
- Microsoft Windows
- CORBA middleware
- Sybase RDBMS and replication services
- ESRI GIS tools
- Microsoft .NET User Interface Services
- Commercial XML editors
- Military messages handling systems

## Communication

ComBatt is designed to be deployed in mobile Command Posts using Tactical Communication Network and/or radio network with limited bandwidth. It is optimized for use during difficult and deteriorating communication conditions and KONGSBERG's EriTac system and Multi Role Radio family (MRR) is a recommended choice.



The KONGSBERG VHF radio family.

## We're there for you, whenever and wherever you need us

Kongsberg Gruppen (KONGSBERG) primarily targets offshore, merchant marine and defence markets. The bulk of the Group's activities address the international arena, with Europe, the USA, the Middle East and Asia as the most important markets. KONGSBERG has two business areas: Kongsberg Maritime mainly addresses the offshore industry and merchant marine, while Kongsberg Defence & Aerospace's operations are directed at the defence and aerospace markets.

KONGSBERG has facilities world wide and has approx. 3 400 employees, some 500 of whom work outside Norway. The Group is one of Norway's largest industrial engineering communities, and its range of products is characterised by a high technology content. KONGSBERG's products have to function under the most demanding conditions as they are used from ocean depths down to 11 000 metres and up to solar panels on space probes that spend years hurtling through outer space.



### Solid competence reduces cost

KONGSBERG has consistently recognised the importance of supporting its products and systems with professional training.

We tailor our training courses to our customer's requirements.



### Upgrading pays

Product and system upgrades can improve your system/vessel operations and reduce overall maintenance costs. We ensure that existing products and systems can be extended and/or upgraded to meet customers' future requirements.

[www.kongsberg.com](http://www.kongsberg.com)

**WORLD CLASS – through people, technology and dedication**

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