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Photo credit: Fredrik Ringnes, Norwegian Armed Forces



KONGSBERG

# COMMUNICATIONS IN THE EXTREME



Photo credit: Ole-Sverre Haugli, Norwegian Armed Forces

KONGSBERG specialises in developing advanced technologies, to provide extreme performance for extreme conditions. Working together as a global team, we have created an integrated portfolio of solutions, for businesses, partners and nations operating from the depths of the sea to outer space and to the digital frontier.

Two centuries of innovation, transformation and delivering results has made Kongsberg Defence & Aerospace (KDA) a recognised global technology leader and a leading supplier within defence, surveillance, space, aerostructures and Maintenance Repair and Overhaul. We take pride in developing advanced solutions and products of strategic importance, for markets around the world.

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## TACTICAL COMMUNICATIONS SYSTEM - for Air Defence and trunked wide area networks

The KONGSBERG Tactical Communications System (K-TaCS) is the preferred solution for advanced Air Defence applications and tactical backbone wide area networks in more than 40 countries around the globe.

### The scenario

The enemy is approaching with a number of fighter aircrafts. Time to detect and the ability to react rapidly is vital. In the crucial moment, the enemy starts jamming the communications infrastructure hoping to neutralize our Air Defence capabilities. The invisible element communications must function during this stage, ensuring that sensors, decision makers and weapon systems are fully coordinated fighting the approaching enemy. After holding the enemy back, rapid relocation of all sites and command posts is needed in order to prepare for the next phase of the operation.

### Our solution

The KONGSBERG Tactical Communications System K-TaCS is designed and developed to support this challenging scenario. K-TaCS reacts to severe jamming conditions through activation of advanced anti-jamming capabilities of the radios and by the ability to perform immediate rerouting when transmission links are down. These features are essential to the survival in the vital seconds of an enemy attack.

When redeploying, swift re-establishment of the complete site and network is performed in order to be able to support the officers in their mission. The weapon- and CSI systems will be supported throughout a redeployment.

K-TaCS is a fully distributed system where autonomous operation ensures rapid establishment of the communication node and network. The intuitive, easy and user-friendly man machine interface ensures that the operator makes the right decisions at all times. In a military operation it is not possible to do exact planning and configuration of the network in advance. That's why K-TaCS automatically adopts to the network structure without the operator having to do any specific configuration.



K-TaCS supports common and specialized IP services and has an embedded call manager for telephony. The SIP server is fully distributed and it does not depend upon a master-node in the network. The IP networks are automatically adjusting to the actual network structure without intervention of the operator. Its ability to use a number of connections (e.g. fibre, radio links and satellite) ensures that connectivity is achieved whenever possible.

The product family of radio links ensures high capacity connections for distances typically 40 km. The radio's state-of-the-art RF design ensures that transmit and receive frequencies can be effectively utilized in the entire frequency band. Advanced filtering makes it possible to have a number of radios closely collocated. Embedded encryption ensures secure connections.

Advanced ECCM anti-jam capabilities such as adaptive frequency hopping, adaptive power control and frequency evasion are supported. State of the art Forward Error Correction (FEC) and modulation techniques are employed. These advanced features enable communication in an adverse environment, making K-TaCS the preferred choice in e.g. Air Defence applications.



## THOR SOFTWARE DEFINED RADIO

### - dual channel radio for maximum connectivity

The THOR Tactical Software Defined Radio is based on the latest SDR technology. A high capacity UHF waveform has been added to the patented VHF ECCM waveform with its superior range and coverage. THOR is optimized for use by mechanized infantry as well as in time critical fire support applications.

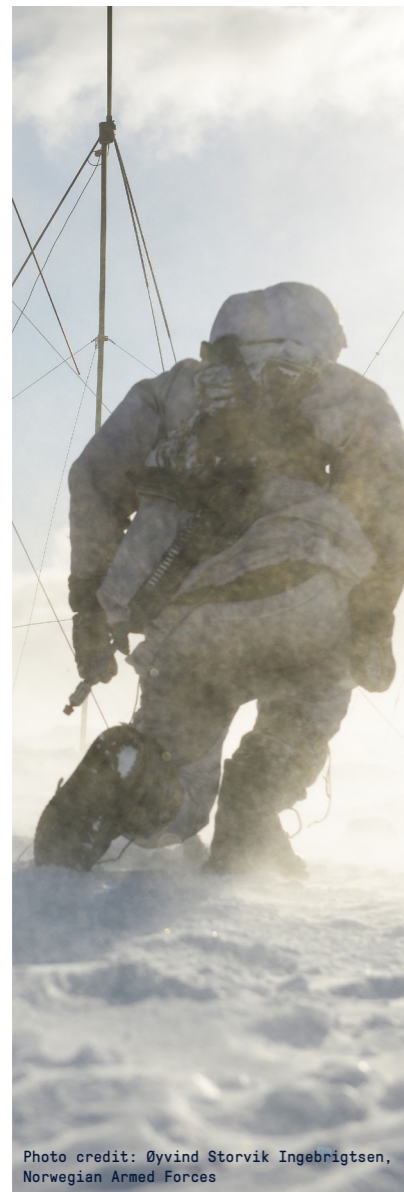


Photo credit: Øyvind Storvik Ingebrigtsen, Norwegian Armed Forces

#### The scenario

The operation starts. The company advances in its formation and some vehicles go to the left of the hill, some to the right. They are out of sight of each other. There is a counter attack on the right hand side. Artillery support is needed. A forward observer locates the enemy and sends the position to the artillery. The platoon commander fears what he might find on the other side of a hilltop. A drone is launched and the enemy is located. This information needs to be shared within the platoon as well as within the company.

#### Our solution

The THOR Tactical Software Defined Radio from KONGSBERG is designed to support these challenging operational scenarios with a continuous change in the communications environment. The ability to do immediate change of waveform ensures connectivity when the transmission environment or the destination changes.

THOR is a true dual channel radio where both radio channels may utilise the complete frequency band, e.g. dual VHF radio, dual UHF radio or one VHF and one UHF. THOR is a true SDR in accordance with the latest SCA standard.

THOR supports advanced waveforms for long-range narrowband operation as well as high capacity waveforms for shorter distances. Superior range, coverage and multipath capabilities are ensured through the use of the patented VHF spread spectrum ECCM waveform. Frequency hopping and embedded encryption capabilities further adds to the inherent robustness of the THOR radio.

THOR's ability to do multi-hop routing combined with short transmission delays and time tracking makes it the preferred radio for time critical fire support applications such as the NASAMS Air Defence system.

In a military operation, there will be changes in the organisation, the mission and in the communications requirements. Unlike other radio systems where tedious pre-planning and detailed pre-configuration are needed, the THOR radio networks are designed to adopt automatically. A radio can easily enter and leave a network as long as it has the correct radio parameters of the network.

The patented waveform of THOR makes it well suited for use in complex environments, e.g. in mountainous terrain and in urban environments. Several NATO nations have used the radio in international operations in environments where their own equipment failed. This is due to the superior multi-path and colocation capabilities of THOR

THOR supports commonly used waveforms as well as the new NATO NBWF interoperability waveform. A radio will be in operation for many years and will be used in applications not yet defined. The THOR SDR is therefore designed for easy loading- and adoptions of waveforms. KONGSBERG is also open for customization of waveforms to fit requested applications.

#### FEATURES

- Dual channel radio VHF&VHF, VHF&UHF or UHF&UHF
- Optimized for use in advanced fire control and weapon systems, e.g. NASAMS
- Patented MRR VHF waveform
- High capacity UHF waveform
- VHF and UHF interoperability waveforms.
- Advanced ECCM capabilities
- Advanced IP-networking
- No need for tedious planning

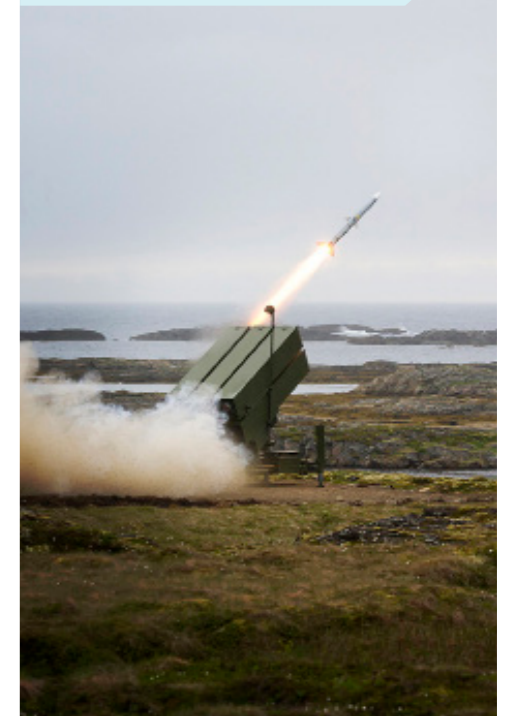


Photo credit: Fredrik Ringnes, Norwegian Armed Forces

# SUPPORT IN THE EXTREME



Photo credit: Torbjørn Kjosvold Ingebrigtsen, Norwegian Armed Forces

## ADVANCED DIGITAL VEHICLE INFRASTRUCTURE - data and voice within and between vehicles

To support the world's most sold Remote Weapon System, PROTECTOR from KONGSBERG, solutions for advanced digital vehicle infrastructure have been designed. These ensure flow of data and voice within as well as between vehicles.

### Empowering Focus on the Mission

In the midst of critical missions, where every second counts, our advanced digital vehicle infrastructure serves as the backbone of the battlefield communications. Complex environments, ranging from the confined spaces within armored vehicles to the chaotic expanse of the battlefield, demands a solution that operates effortlessly and navigates both internal and external connections.

### Elevating Operational Efficiency

The heart of our digital vehicle infrastructure lies in its mission-centric design philosophy. It can be as easy as integrating the state-of-the-art THOR SDR Radio System, empowering the soldiers with a reliable and versatile communications tool that can adapt to changing situations. The internal router serves as the critical node that intelligently routes digital information over available transmission systems, optimizing bandwidth usage and minimizing latency. As the mission parameters for the vehicles expand more advanced solutions are available to provide the required functionality & efficiency of use.

In the crucible of combat, clear communication can be the thin line between victory and defeat. KONGSBERG intercom system establishes a flawless link between crew members within a vehicle, fostering a cohesive and efficient team environment. Whether in the heat of battle or during crucial tactical maneuvers, our intercom system ensure that every word is heard, contributing to the synchronization and success of the mission.

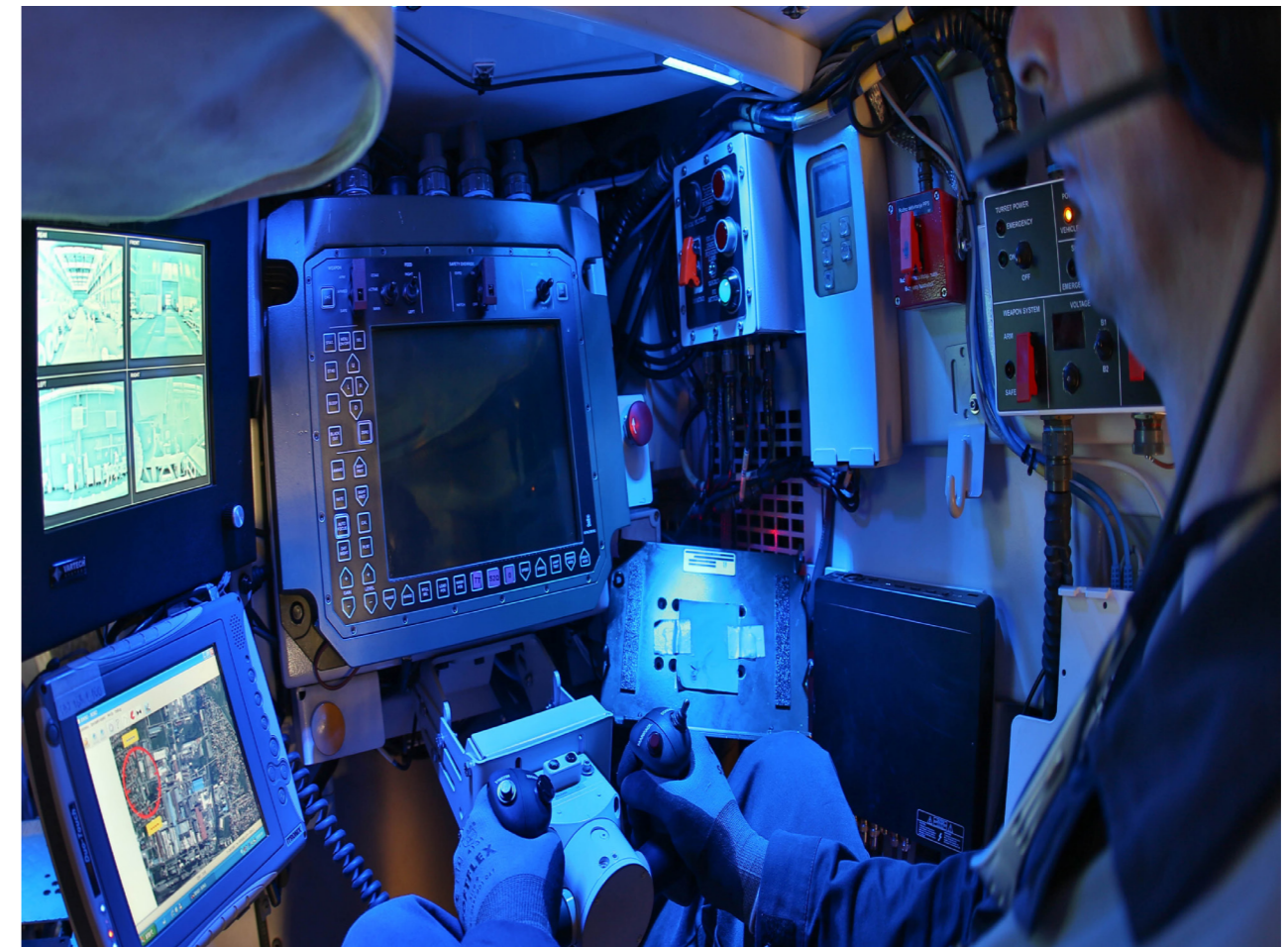
For larger vehicles with multiple users of battle management systems and radios systems the KONGSBERG intercom provides the necessary switching capacity to distribute both data and voice for the vehicle communications system. The crew can easily access external radio networks and internal vehicle communication voice groups through the advanced PTT unit. Advanced voice processing assists the user in the comprehension of the multiple voice streams.

To effectively enable communication to recipients outside the vehicles, KONGSBERG routers are able to interface multiple transmission systems where the characteristics of each radio system is explored. This design ensures that the technology works for the user, not the other way around.

### Robust Encryption for Uncompromised Security

In the era of cyber threats and data breaches, our encryption devices are designed to meet NATO standards safeguarding critical information from malicious actors. Military communication demands the highest level of security, and our encryption technologies ensure that every bit of data transmitted remains confidential and protected. This empowers military units to operate with confidence, knowing that their communications remain secure and the integrity of the information intact.

*We believe that in the dynamic realm of modern warfare, victory is determined not just by the strength of weapons, but by the efficiency and reliability of C5IS systems.*



TURN-KEY  
COMMUNICATIONS SYSTEMS

## TURN-KEY COMMUNICATIONS SYSTEMS - from concept to finalization

KONGSBERG has successfully delivered complete communications networks including systems for vehicles and command posts to multiple customers. Our mission is to deliver systems supporting the customers operations.

### Turn-key systems

KONGSBERG has a long tradition of supplying complete communications turn-key systems. These include complete shelters with operator positions, infrastructure and communication networks. The solutions are tuned to operational needs and can be adapted to smaller vehicles, larger shelters, tents and fixed installations.

KONGSBERG provides and integrates antennas and masts from the most renowned suppliers. Combined with automatic antenna alignment, such solutions reduces the time and resources needed to establish and tear down a site.

KONGSBERG understands that technology should empower, not impede. Our goal is to ensure that technology becomes an enabler of success, allowing warriors to focus on the mission, not the machinery.

## KONGSBERG Through Life

Designed to provide maximum availability and life cycle cost predictability. Our wide range of support options are tailored to meet your specific operational needs. Dedicated key account managers will ensure a professional follow-up.

The KONGSBERG Through Life concept is a two-step model. A Basic Agreement for continuous and recurring services and a wide selection of On Demand services to book when needed.

### Basic Services

The customers get access to KONGSBERG'S unique competence and expertise. A dedicated point of contact coordinates the fundamental logistical support needs.

### On demand Services

KONGSBERG offers a comprehensive array of support services to satisfy the customers unique needs. All these services can be included in the basic agreement as recurring services, or can be ordered ad hoc as supplements.



## On-site engineering support

Flexible, professional and dedicated expertise



The Field Service Engineers (FSE) can be deployed to assigned locations 48-96 hours after receiving your order. The FSEs are highly skilled technicians with extensive experience and knowledge for trouble-shooting and repair.

### FSE-Support may include:

- Operator- and maintenance-training classes at your desired location
- Integrations of equipment into new vehicles
- Participating in the supply / repair-chain in field exercises
- Short or long-term deployment in theatre of operation
- Updated documentation
- Other customer-specific requests

## Routers and switches



**TR608** is a compact IP router also applicable for use in highly mobile installations. It ensures connectivity in dynamic networks where multiple wireless and wired transmission links are available.

**IPX600** is a core- and access router. It has an embedded call manager supporting voice connections. It supports TDM trunks in addition to IP.

**ES624** is a managed Ethernet switch with support for Power over Ethernet



## Combat net radios

**THOR** is a radio supporting the VHF and UHF frequency bands. It is a dual channel radio where both channels have identical performance and can be configured freely. It can be equipped with extremely robust fast frequency hopping narrow band combat net radio waveforms, tactical wideband waveforms and air-ground-air waveforms, to name a few. THOR is SCA compliant. Frequency range: 30 - 1500 MHz.

## Radio links



**RL532B** is a Band 3 Point-to-Point radio link with a full duplex data rate of 34 Mbit/s. Frequency range 1.35-2.69 GHz.

**RL542A** is a Band 4 radio link with a full duplex data rate of 100 Mbit/s. It can be used in Point-to-Point as well as Point-to-Multipoint set ups. Frequency range: 4.4-5.0 GHz.e.



## Vehicle infrastructure

**EIS** is an Ethernet based Intercom System. It can be used as the Ethernet backbone of a vehicle as well as supporting voice connections within the vehicle as well as towards radio networks

**AMES** is a family of managed Ethernet switches.

**RIU** is a Radio interface Unit that connects legacy analogue radios to the modern IP infrastructure of a vehicle.



# WORLDWIDE OPERATIONS

KONGSBERG is an international corporation with strong Norwegian roots. Collaboration with our customers, partners and suppliers, and a commitment to understand the context where our technology is applied, are important driving forces behind the corporation's international development and growth.



RELIABLE  
COMMUNICATIONS  
IN EXTREME  
CONDITIONS