Integrated Communications Systems for Patrol Boats and Multirole Vessels
SCALABLE COMMUNICATIONS SYSTEMS FOR CUSTOMER-SPECIFIC MISSIONS
In the past 40 years, Hagenuk Marinekommunikation has successfully designed, delivered and integrated more than 560 customized communication systems for numerous international navies – on all kinds of platforms.

In response to customer demands, Hagenuk Marinekommunikation (HMK) also provides sophisticated Integrated Communications Systems (ICS) for internal and external communication specially tailored for patrol boats and multirole vessels.

These systems are composed of products of HMK’s renowned product families SEICAM® and HF RADIO SERIES 3000 for tactical communications as well as proven commercial products from reliable vendors. Our expertise and experience enables us to design scalable solutions which fit any vessel size and mission type. In order to adapt to future tasks, all our communication systems can of course be upgraded to incorporate new features and functions.

Typical operational scenarios for HMK’s ICS on patrol boats and multirole vessels

- Search and rescue missions
- Maritime protection and security tasks, e.g. open sea drug interdiction
- Military aid to the civil power (MACP)
- Vessel boarding
- Fishery protection

Different tasks require individual solutions. Whatever your mission is, HMK ensures proper communication!

Communication Bands

Depending on your particular mission requirements, the ICS can cover the civilian and/or military HF, VHF, UHF, GMDSS and SATCOM band as well as any radio traffic including

- Ship – ship
- Ship – shore – ship
- Ship – aircraft
- Ship – satellite

via radiotelephony, teletype or telegraphy. Furthermore, data links in the reliable frequency bands can be provided. Interoperability with NATO/PfP and other partners is realized by standardized tactical communication links.
**System Overview**

**Typical architecture of Integrated Communications Systems**

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| Crypto subsystem | Acc. to customer requirements or government furnished equipment |
| Internal communication | Digital Audio and Data Distribution System (SEICAM® 3000 / 5000) |
|                   | Message Handling and Control Subsystem (SEICAM® 2000 / 5066) |
|                   | Ship’s telephone subsystem (PABX) |
|                   | Other subsystems on request |

**System of Subsystems**

The typical Integrated Communications System (ICS) is based on HMK’s SEICAM® architecture for external and internal communications and can comprise various subsystems. The ICS is capable of simultaneous multi-channel operation. Channel capacity depends on the actual vessel type and mission but usually covers 10 to 20 radio circuits and 50 to 250 intercom channels. The system can be controlled via a central operator console, usually in the communication center. In order to reduce the operator’s workload, automated message exchange and information handling for all kinds of messages is available (option “SEICAM® 2000”).

An ergonomic console design as well as an intuitive graphical user interface provides user-friendly operation. The incorporation of scalable state-of-the-art equipment in a redundant system design provides excellent reliability and configuration flexibility. All components meet the applicable environmental requirements for EMC, EMI, shock, vibration, humidity and temperature as well as acoustic noise levels.
Main Subsystems in Brief

**VLF/HF Communication Subsystem**
The VLF/HF subsystem is based on the HF Radio Series 3000 product family of software-defined radios. It includes transceivers and transmitters with 150 W / 500 W / 1kW nominal output as well as VLF/HF receiver.

The equipment has been designed especially for naval ship applications including co-located antennas. The radios provide simultaneous voice and data channels for long range communications in the HF frequency band (transmit 1.5 MHz to 30 MHz, receive 10 kHz to 30 MHz). Each HF link includes a dedicated transceiver with an associated antenna system; furthermore, a proven broadband configuration which requires no antenna tuners and can be fed by multiple transceivers.

Various embedded waveform options are available, including multifunction data modems, automatic link establishment (ALE), tactical link modes and HF e-mail acc. to MIL/STANAG standards.

**VHF Communication Subsystem**
The VHF subsystem is composed of several VHF transceivers for voice and data communications in the VHF aircraft and maritime frequency bands (100 MHz to 156/174 MHz), including control facilities, guard receivers, antenna filters and antennas. The subsystem can be combined with the UHF band (225 MHz to 400 MHz) for tactical line-of-sight voice and data communications. Optionally, VHF equipment for tactical communications with land-based forces in the VHF low band (30 MHz to 88 MHz) can be included.

**V/UHF Subsystem**
The V/UHF subsystem usually includes several commercial UHF and/or V/UHF transceivers with appropriate guard receivers for monitoring of IMO emergency frequencies, UHF and/or V/UHF filters and dedicated antennas to provide line of sight voice, telegraphy and data communications with other ships or aircraft in the tactical band (225 MHz to 400 MHz). Optionally, the UHF high-band (450 MHz to 512 MHz) can be covered.

**Satellite Communication Subsystem INMARSAT**
The satellite communication subsystem provides commercial INMARSAT fleet broadband service. The service provides up to 512 kbps for voice and data communications. A flexible mobile data packet service (MPDS) is also available, where users are charged for the amount of data sent and received rather than the time connected to the link. Using such INMARSAT services, the patrol vessel becomes a node in the Intranet or coastal WAN network, which provides a continuous, flexible and reliable connection with the land-based authorities or home base. An UHF / SHF SATCOM system can also be integrated for military communications.
SEICAM® Family

IP-based Digital Audio, Video and Data Distribution
SEICAM® 5000
The SEICAM® 5000 belongs to the next generation of integrated IP-based audio, video, and data distribution systems. The intrinsic generic IP network infrastructure for internal and external communications allows us to implement technologies such as VoIP and fully touch-screen operated user terminals (UST 5200) with optional video and equipment-to-bus interfaces (EBI) for reduced cabling. The system provides distribution of all kinds of concurrent traditional audio and data. It can be configured to support video and multimedia services and seamlessly interfaces with any existing ship communication system.

Message Handling and Control System SEICAM® 2000
The Message Handling and Control System SEICAM® 2000 is an intelligent, multi-tasking and multifunctional computer system which can be integrated into the ICS. This subsystem is normally equipped with one or more hardened SER 5005 U workstations with IMUS application software for message handling and system remote control as well as message preparation and exchange.

SEICAM® 2000 provides:
- Message handling and formatting acc. to standards ACP 127, JANAP 128, ADatP-3 etc.
- IT security level E2
- Network management for central control of the entire external and internal communication system
- Communication planning (COMPLAN)
- Optional X.400 server and certified X.400 filter
- Expandable system design

IP-based HF Messaging System SEICAM® 5066
The HF messaging system SEICAM® 5066 provides a platform for data communication over HF radios and complies with the requirements of STANAG 5066 ed. 3. The standard defines the interface for data communication applications to a shared radio modem which uses efficient and adaptive wave forms, data compression, automatic repeat request (ARQ) and automatic link establishment (ALE) for efficient and error-free data communications via a new generation of sophisticated radios.

STANAG 5066 applications includes ACP 127 messaging and HF e-mail by using a standard e-mail client like MS Outlook which can be extended to formal X.400 military messaging acc. to STANAG 4406 Annex E (PMul) – a protocol for reliable messaging in bandwidth constrained and delayed acknowledgement environments. This service extends the terrestrial X.400 network to wireless short and long range deployments and uses the ACP 142 protocol to provide unicast and multicast messaging in the HF environment under emission control (EMCON) and priority conditions.

Extensible messaging and presence protocol (XMPP) is an instant messaging service used extensively on the internet and is now made available over STANAG 5066 radio communication. The SEICAM® 5066 system is composed of a software-defined HF transceiver, either type TRX 3015 T with 150 W, type TRX 3050 T with 500 W or type TRX 3100 T with 1 kW RF output power, a state-of-the-art high-speed radio modem MDM 3003 E and a computer-based messaging terminal (STANAG node), which is scalable from a single stand-alone application up to a large client-server architecture.
Main Subsystems in Brief

**Crypto Subsystem**
If secure communication of sensitive data is required, the following crypto equipment can be integrated:
- HF voice crypto (NBSV)
- UHF voice crypto (WBSV)
- HF/UHF/TTY/DATA
- Broadcast crypto facilities for national broadcasts
- WAN crypto for secure intranet or internet access
- Data crypto for military tactical links

Any such voice and data equipment can be integrated and controlled via SEICAM® 3000/SEICAM® 2000 but is normally provided as government furnished equipment (GFE).

**Ship’s Telephone Subsystem**
For administrative telephone services, a fully software-programmable commercial ship’s telephone subsystem can also be provided. This enables the switching of a large number of subscribers (PABX) and includes the appropriate interfaces for access to the public switched telephone network (PSTN). The telephone exchange also establishes the connection to the public telephone network via shore connection boxes when the vessel is in port or via the INMARSAT system when at sea.

For coastal shipping, a cellular telephone can be integrated to allow access to the public telephone network. Dialphone links from the USTs as well as the INMARSAT terminal which are connected to the SEICAM® distribution node can also be routed via the vessel’s telephone subsystem.

**GMDSS Subsystem**
The GMDSS Subsystem is designed to transmit/receive distress calls and safety information acc. to IMO carriage requirements for operation in sea areas A1 to A4. The system configuration is based upon commercial type equipment such as a compact GMDSS console equipped with a MF/HF radio transceiver and the HMK DSC controller-receiver DSC 3002, telex and telephone facilities, an INMARSAT-C terminal and a VHF transceiver with telephone and DSC controller. Outside the console, several VHF waterproof handheld transceivers are also part of the GMDSS system.

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**PRINCIPLE OF A DATA COMMUNICATION / MESSAGING**

![Diagram of data communication principle]

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**DSC Controller-Receiver DSC 3002**