Introducing HF 2000 in the Swedish Armed Forces

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HF2000 System Overview

- Joint HF system for Swedish Armed Forces
- 3G ALE with enhanced frequency management functionality
- Embedded net planning tool
- Legacy mode support: 2G ALE and Fixed Frequency
- Legacy operation support (Link 11, SELCAL etc)
- Split site operation (ethernet and dial up links)
- Equipment range from 100W to 10kW
- Radio resource exchange over WAN
- Link adaptivity: Frequency, Data rate, Power
- Intergration to high capacity networks (Multi station IP)

Interoperability

Supported standards

- STANAG 5066 (BFEM)
- Mil-Std-188-141 (2G ALE)
- STANAG 4538 (3G ALE)
- STANAG 4285 (75-2400b/s)
- STANAG 4539 (3200-9600b/s)
- Mil-Std-188-110 (75-9600b/s)
  ISB operation (19200b/s)

- (STANAG 4538 xDL mode under developement)

Equipment

- **100 W Transceiver**
- **400 W Transceiver**
- **1 kW Transceiver**
- **5/10 kW Transceiver**
  - Remote controlled switching between 2 x 5 and 10 kW mode.
- **Navy Cabinet**
  - 2 x 500 W Transceiver or
  - 1 x 1 kW Transceiver
  - 3 Recievers
  - Dynamic PA and antenna control
- **Reciever**
- **Radio Station Control Unit**
  - 2 internal modems
  - Interfaces to radio, audio, PABX, IP
- **100W AMU**
- **1 kW AMU**

Fixed Infrastructure, Backbone network

- **Large Radio sites**
  - Separate Transmit and Receive sites
  - Connection to defence IP network
  - Transmitter site
    - 1 x 5/10 kW
    - 4 (6) x 1 kW
  - Receiver site
    - 7 x Receivers

- **Small Radio sites**
  - 2 x 1 kW Transceivers

- **Ip and Email gateway**

Control site (Navcommcen)

RX

TX
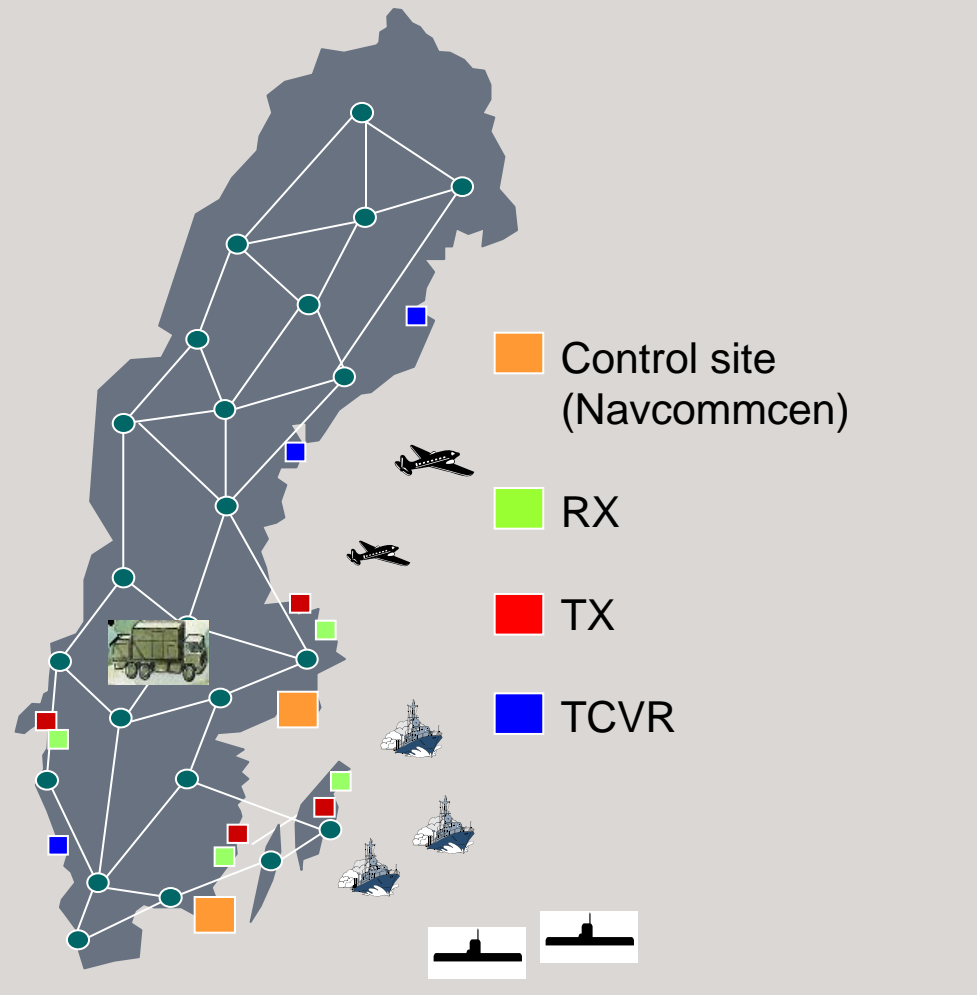
TCVR

HF2000 – Naval Platforms

■ Navy Cabinet, 100 W Tcvr and AMU (1-12 stations)
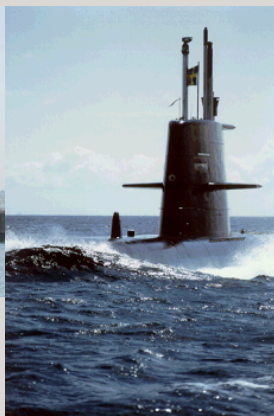
Visby class	Stealth Corvette
Stockholm cl	Corvette
Göteborg cl	Corvette
Gotland cl	Submarine
Trossö	Auxiliary
Carlskrona	Command ship
Koster cl	MCM vessel
Styrsö cl	MCM vessel
Händig	Patrol vessel
Jägaren	Patrol vessel
Combat boat	Amphibious

HF2000 – Air Force

- Airborne Radio Station Control Unit using existing radios

- C 130 (Rockwell Collins HF9000D)
- NH 90 (SELEX SRT 170)

HF2000 – Army

- 1 kW Tcvr in transport cases
- 100 W Tcvr in transport cases

- Separate TX and RX capability.
- Deployed with tactical dipole and logperiodic arrays.
- Multiple station IP functionality enables up to 4 stations to be coupled for increased data capacity.


1 kW Transport Case

Traffic Types

- IP
  - National VPN Crypto
- Voice
  - PABX
  - Audio Switch (3 manufacturers)
  - Local Audio
- Email
  - Integrated email server
  - Central email server
- DLCU
  - Battle Force Email (SV-7)
  - Encrypted voice (Kryapp 8201, SY100)
- Plain Text (3G ALE)
  - National Crypto connected to national MHS

- BTD (C2 Traffic)
  - National Crypto connected to C2I
- 2G ALE
  - Voice
  - AMD
  - S5066
  - National MHS
- 8-bit text (Modem only)
  - Fixed Frequency
  - ACP 127 (SV-7)
- External modem
  - Link 11
- HF Burst Mode
  - National waveform for submarine and special forces
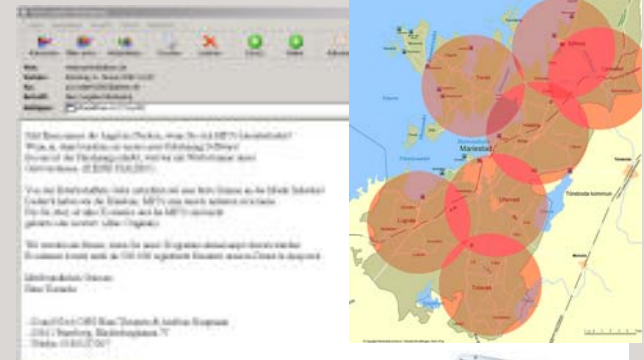
Challenges (1)

- Installation:
  - Size and Space
  - No existing IP network (IP Services)
  - Co-location (Embedded PPS)
  - Stealth aspects (Visby Class antennas)
  - Submarine specific requirements
  - Platform specific audio switches
  - Strict security policies in the Defence IP network
- Configuration Management:
  - Software/Firmware Upgrades
  - Node/Platform specific configurations
  - Overall Net data management

5/10 kW Tcvr

Challenges (2)

- **Traffic:**
  - Crypto (Traffic specific in simultaneous development)
  - Telephony (Different PABXs)
  - Connection to IP-networks/applications, e.g. TCP/IP timeouts
  - Backup to high capacity networks (e.g. Satcom)
- **Training:**
  - In general it has been a big leap from legacy HF systems
  - Different operator skills required
  - Interchange of knowledge between radio personnel and network technicians

1 kW Tcvr

Challenges (3)

- Fielding:
  - Setting to work requires deeper knowledge than for legacy HF systems
  - Knowledge of whole communication link and not specific equipment required

- Operation:
  - New HF-system is creating new roles and new tasks.
  - Lot of work is needed to review communications publications and standard operating procedures in order to use the systems capabilities.

Navy Cabinet

Benefits

- Once set up correctly the system runs with none or very little operator intervention

- Frequency management is far less time consuming through the automatic frequency pool generation

- More effective use of the HF spectrum

- Experience from operations has shown a very high HF channel availability (e.g. Sweden-Gulf of Aden)

- The ability for each station to support all kinds of traffic types has simplified operation and lead to general savings in number of HF channels required.

- The system´s fault indication has significantly reduced repair times and costs.

Further developments

- xDL including xDL+
    - To achieve full interoperability with Swedish army HF manpack (Harris 5800H)
- Inclusion of tactical data links
- Implementation of HF2000 waveform in Swedish SDR programme
- Instantaneous channel access
    - Faster link establishment
- Encrypted voice over SIP networks
- Wideband HF
- Routing/Relay/ADHOC capability

Stationsstyrenhet