DEFEATING THE MINE THREAT
SAAB NAVAL MCM

THE MINE THREAT
CURRENT APPROACH
THE PLATFORMS
THE TOOLBOX
WHY MINES

The weapon that has damaged more U.S. naval ships in the last 60 years is not the torpedo, the deck gun, the anti-ship missile or the terrorist attack.

It's sea mines.

Fifteen U.S. Navy ships have been sunk or damaged by mines since World War II, almost four times more than any other weapon.

Note:
That the majority of the damaged vessels believed that they were outside the minefield.
Activated by:

- Physical Contact
- Influence
  - Magnetic
  - Electric
  - Pressure
  - Acoustic
  - Sonar transmission

A modern mine discriminates a valid target by using combinations of activation criteria's
NEW THREATS

- Stealth Mines – low target strength
- Multisensor fused
- May be laid – or placed – ideally
- New signatures: seismic, electrical,
- New sensors in old mines
- Anti-sweep/anti-hunt devices

- In the littorals: some mines will be unhuntable or unsweepable!
NEW THREATS

- Easy for a terrorist to influence the economy by putting explosives in choke points
- A few statically positioned mines would stop all traffic for a long time before it considered safe again.
- What's needed to mine?
  - A small boat like fishing boat, RIB, normal pleasure craft

The question is not IF it will happen it’s WHEN.
**SWEDISH NAVY BACKGROUND**

- **Heritage**
  - Baltic sea conditions
  - Heavy traffic
  - Heavily mined
  - Sweden dependents on sea transportation
  - Due to the fact that Sweden is neutral means the we can’t rely on assistant from someone.
  - These hard conditions have forced the navy to develop high competence in MCM. Especially from WW2 onwards.

~165 000 Mines about 35% remains
HYDROACOUSTICS IN THE BALTIC SEA

A very complex MCM environment due to:

- Very shallow water (50 m on average)
- Low salinity (ca. 8 ppt)
  - Low acoustic absorption
- Strong seasonal variation in temperature
- Layers in temperature and salinity
  - Complicated sound speed profiles
- High level of reverberation
- Poor low frequency transmission
- Muddy water, organic material, poor visibility
JOINT MISSIONS

• Example “Open Spirit”
  – Latvia, May 2014
  – Annual joint operation to clear underwater explosives
  – 19 MCMVs from 13 countries

• Three groups
  – NATO standing SNMCMG1
  – “Nordic Group”
  – “German” Group

• Post mission analysis
  – “Nordic Group” found 51 mines + 1 torpedo
  – NATO SNMCMG1
  – “German Group” 21 mines together

“Nordic Group” 4 MCMVs
- M75 Vinga from Sweden
- M77 Ulvön from Sweden
- M14 Sturkö from Sweden
- M343 Hinnöy from Norway

NATO SNMCMG1 8 MCMVs
- M857 Makkum from The Netherlands
- M916 Bellis from Belgium
- M351 Otra from Norway
- M313 Admiral Cowan from Estonia
- M642 Cassiopee from France
- M647 L’Aigle from France
- M621 Flaming from Poland
- M-06 Tālivaldis from Latvia

“German Group” 7 MCMVs
- M1069 Homburg from Germany
- M1068 Datteln from Germany
- M1064 Bad Bevensen from Germany
- M1065 Dillingen from Germany
- M917 Crocus from Belgium
- M53 Skalvis from Lithuania
- M-05 Viesturs from Latvia
CURRENT APPROACH

Sweeping

Hunting
THE FUTURE APPROACH

Sweeping

Hunting
THE SHIP

Multi role

Lean arrangement

Survivability

Adaptable over time

Proven design

Signatures

Life Cycle Cost

Main Data (approx.)
- Length O.A.: 80.0m
- Breadth: 12.5m
- Draught DWL (Hull): 3.1m
- Displacement DWL: 1000-1250t
- Hull structure: Composite or Steel
- Superstructure: CFRP
- Classification: DNV +1A1 LC R0 Naval E0 (navdist)
THE NEXT GENERATION CORVETTE FAMILY
BASED ON PROVEN SOLUTIONS

Mission Modules
(StanFlex)

Unmanned Vehicles
(SAM, Piraya)

Stern Launch & Recovery
(Swedish Coast Guard)

Steel / Hybrid Design
(P28 corvette)

Littoral Mission Vessel

NG Corvette Family
OPV, FAC, ASW, ASuW, MCM, Multi-role

Visby class corvettes
Stealth technologies, Multi-role, Composite Hull

Shock Resistance
(Koster, Styrsö, Visby StanFlex, etc)

MCM Technologies
(Koster, Styrsö, Visby, SAM etc)

ASuW Systems
(Stockholm, Gothenburg, Visby, Koster etc)

Stealth Technologies
(Visby, Smyge, Koster, Gothenburg etc)
THE NEXT GENERATION CORVETTES

- 55m Fast Attack Craft
- 73m Visby Export
- 80m Offshore Patrol Vessel
- 88m Multi Mission Corvette
- 98m FLEXpatrol
### MCM – DIFFERENT PHILOSOPHIES

<table>
<thead>
<tr>
<th>Dedicated</th>
<th>Multi-functional</th>
<th>Mothership</th>
<th>Unmanned</th>
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<tr>
<td><img src="image1" alt="Dedicated Image" /></td>
<td><img src="image2" alt="Multi-functional Image" /></td>
<td><img src="image3" alt="Mothership Image" /></td>
<td><img src="image4" alt="Unmanned Image" /></td>
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- Medium to high signatures
- Medium shock resistance
- Low to medium speed
- Medium defence capability
- Low to medium cost

- Mobile by air, sea and land
- Dependent on support
- Low cost
USV – UNMANNED SURFACE VESSELS

**PIRAYA**
Light USV

- Length: 4.3 m
- Displacement: 400 kg
- Speed: +20 knots
- Payload: 100 kg
- Capabilities:
  - Sensor carrier
  - Patrol / surveillance
  - Communication hub

**DOLPHIN**
Mid-size USV

- Length: 11 m
- Displacement: 12 t
- Speed: 35 knots
- Payload: 2 t
- Capabilities:
  - ASW
  - MCM
  - Communication hub
  - Patrol / surveillance

**P16**
Large USV

- Length: 17 m
- Displacement: 22 t
- Speed: +50 knots
- Payload: 3 t
- Capabilities:
  - Anti USV Warfare
  - Communication hub
  - Patrol / surveillance

**- Very Large USV**

- Length: 50 m
- Displacement: 300 t
- Speed: +35 knots
- Payload: Full combat suit
- Capabilities:
  - AAW
  - ASuW
  - ASW
  - Carry Light USV’s
UNMANNED SYSTEMS – HANDLING AND INTERACTION

- Integrated mast: Sensors and communication UAV, USV
- Hangar: Storage and service UAV
- Stern ramp: Launch and recovery USV, UUV
- Heli-deck: Take-off and landing UAV
- Mission bay: Storage and service USV, UUV
THE TOOLS
THE UNDERWATER ADVANTAGE

MCM systems
- Double Eagle
- AUV62-MR
- MuMNS

Weapon systems
- HW Torpedoes
- LW Torpedoes

UW Defence systems
- SeaWasp

Training systems
- AUV62-AT

Commercial UW systems
- Sabertooth
MINE COUNTERMEASURES (MCM)

CAPABILITIES FROM DETECTION TO DISPOSE OF SEAMINES

AUV system for:
- Covert MCM operations
- Large area search
- Autonomous mine search
- Seabed mapping

SEARCH - DETECT

Hybrid (AUV/ROV) system for:
- Autonomous mine search
- Mine hunting
- Mine disposal
- Seabed mapping

SEARCH – DETECT

ROV system for:
- Mine hunting
- Mine disposal
- IED Operations

SEARCH - DETECT - DISPOSE
The Double Eagle

- Controlled via tether
- Launched from/recoverable by ship or shore
- Very stable vehicle i.e. capable of performing high resolutions sensor surveys and mine neutralization
- Low magnetic signature
- Very high reliability
- Can be fitted with camera, tools etc
DOUBLE EAGLE – MINE HUNTING
PVDS CONFIGURATIONS

PVDS – Propelled variable depth sonar

Belgium
France
Netherlands
Finland
Sweden
Poland

Proven, in Service
DOUBLE EAGLE
MODULARITY & SCALABILITY

VEHICLE CONFIGURATIONS

DE MkII MDS
DE MkII PVDS
DE MkIII PVDS
DE MkIII PVDS
DE MkIII SAROV
DE MkII SAROV

PROPULSION PACKAGES

DE MkII
DE MkIII

ENERGY PACKAGES

PAYLOAD SAMPLES
PAYLOAD MODULARITY GIVES MISSION FLEXIBILITY

BENEFITS:
USING THE SAME VEHICLE FOR A VARIETY OF MISSION
SEA WASP - COUNTER IED SYSTEM
SEA WASP - COUNTER IED SYSTEM

Developed by merging of technologies

Purpose
• Search, identification and disposal of potential explosives, such as IEDs (improvised explosive devices) in ports, harbours and coastal waterways for maritime traffic.

Customer
• US CTTSO (Combating Terrorism Technical Support Office)

Users
• Police, FBI, Navy counter IED and other law enforcement agencies in the United States
SEA WASP – COUNTER IED SYSTEM
EXAMPLE OF MERGING TECHNOLOGY (UK-SWEDEN)

In 2016 Saab participated with Sea Wasp in the UK Royal Navy’s military exercise and demonstration Unmanned Warrior, held in Scotland and Wales.

Sea Wasp, a waterborne security system specially designed to deal with the modern threat of waterborne IEDs in harbour areas.
MULTI SHOT MINE NEUTRALIZATION SYSTEM
A VITAL PART OF THE UK/FR MCM PROGRAM

The MMCM programme is a key milestone in the transformation of mine countermeasures capabilities and the future operational use of unmanned naval systems.

This major UK-French programme will develop a new industrial capability/technology for underwater and robotic detection.

Saab has been working with BAE Systems and Thales to design a unique mine disposal system based on a new Saab remotely Operated Vehicle (ROV) launched from a Unmanned surface vehicle (USV)
MCM AUTONOMOUS SYSTEMS

AUV62

- Long range autonomous missions
- Launched from/recoverable by ship, submarine tube or shore
- Very stable vehicle capable of performing tasks like high-resolution sensor surveys

Double Eagle SAROV: a hybrid AUV/ROV

- Medium range autonomous missions or controlled via tether
- Launched from/recoverable by ship or shore
- Very stable vehicle capable of performing tasks like high-resolution sensor surveys
- Can be equipped with extras such as camera and tools
- Hovering capability
- Extremely high manoeuvrability, 360 degrees in pitch and roll
WHY TO USE AN AUV FOR MINE HUNTING?

"Force Multiplier", i.e. parallel activities
- AUV - Search phase
- Ship unit - Identification phase
- Ship unit - Disposal phase

The AUV carries out its task:
- Covertly
- With High Endurance. (>24h)
- With High Precision.
- At a Very High Coverage Rate.
- With a Very High Probability of Detection.
- Virtually Unaffected by the Sea State.
- Without Exposing Personnel to the Hazards of a Mine Field.
MCM DE SAROV – HYBRID
TWO CAPABILITIES WITHIN ONE VEHICLE

- Autonomous Underwater Vehicle (AUV)
- Remotely Operated Vehicle (ROV)
- Surveillance, reconnaissance
- 0-8 knots in AUV mode
- 10+ hours running time at 5 knots
- Up to 1 km range in ROV mode
Hunt were you can – Sweep were you must
TOMAS SWEEP

The sweep has the same signature as the ship that should pass the area

Pros: Fast, simple, robust
Con: Only activates mines if they have an influence trigger.
Principle of influence minesweeping:
To emulate underwater signatures to mislead the mine to believe it’s a real and valid target and thereby detonate.
Target & mine setting mode & mine jamming
**SWEEP FLEXIBILITY**

**Mine Setting Mode & Mine jamming**
Influence sea mine with known trigger parameters

- Single-SAM 3

Mine setting signatures

**Target Setting Mode**
- Degaussed naval vessel
- Single- or multi-SAM 3

Low signatures

**Target Setting Mode**
- Cargo vessel
- Multi-SAM 3

High signatures
SAM 3 MAIN FEATURES

- Unmanned
- Efficient / Fast in shallow waters
- Transportable in a 40” container and assembled by four (4).
- Flexible sweep signature output with multi vehicle functionality
- Extremely high shock resistance
- Can be combined with TOMAS Sweep rods.
Questions ?