



TECHNOLOGIES FOR LITTORAL OPERATIONS

Underwater Warfare and Stealth Above the Surface

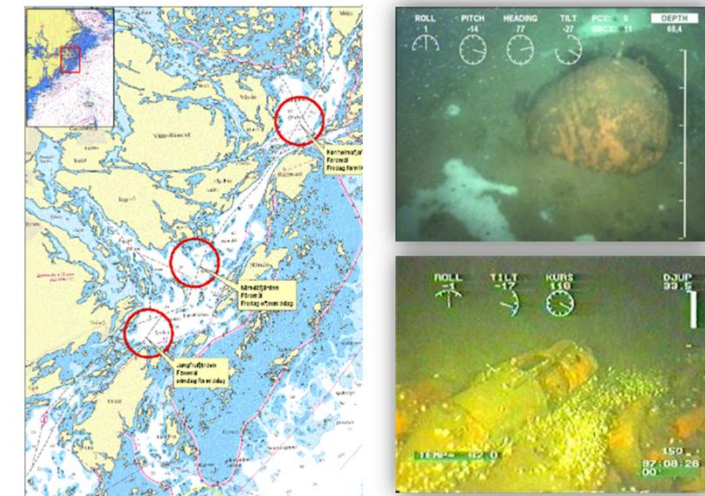
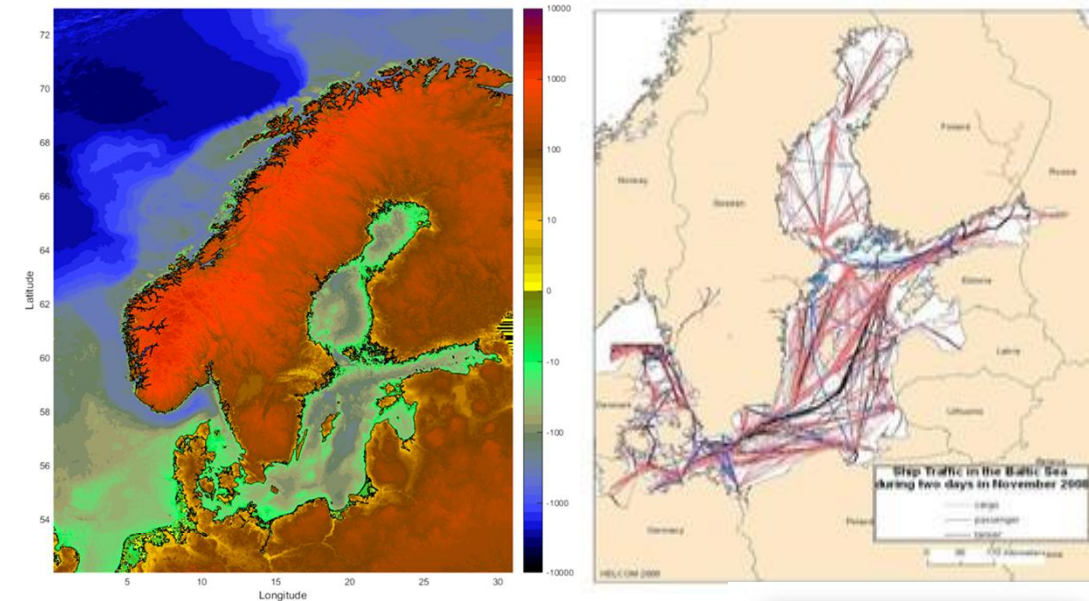
Littoral OpTech East 2015
Tokyo, Japan

Dr. Roger Berg
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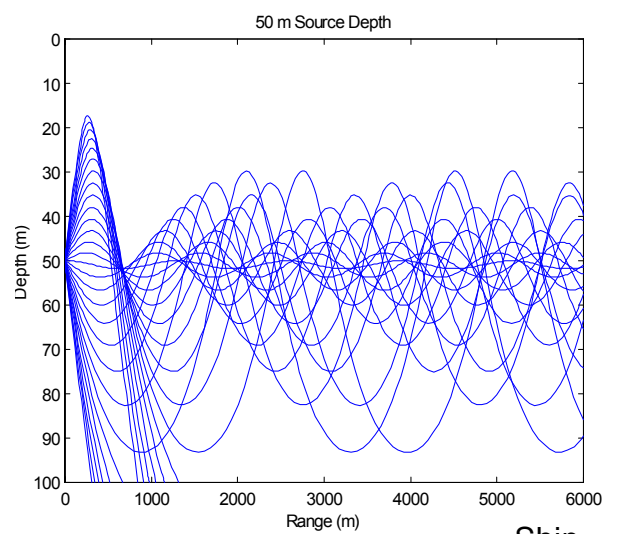
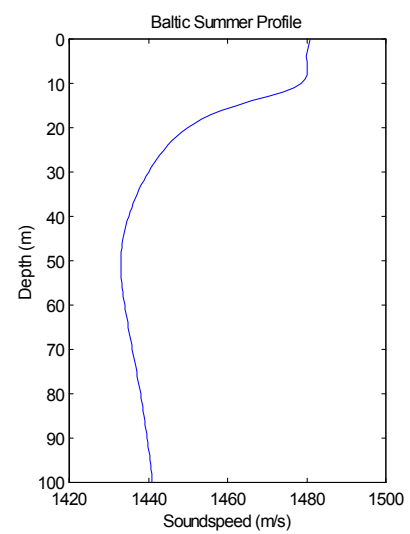
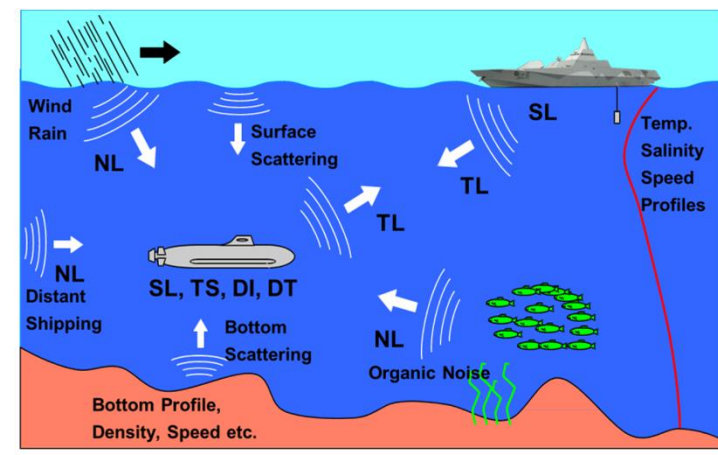


EXTREME LITTORAL OPERATIONS - THE BALTIC SEA OPERATIONAL ENVIRONMENT

- Very shallow (50 m in average)
- Low and varying salinity (ca. 0-10 ppt)
- Complex hydroacoustic conditions
 - Strong seasonal variations
 - Layers in temperature and salinity
- Muddy water, organic material, poor visibility
- Complex archipelagos, heavy sea traffic
- Large number (> 50 000) of unexploded mines and ordnances
- Summary: Very complex operational environment
- Swedish Navy are experts in this operational area



EXTREME LITTORAL OPERATIONS - THE BALTIC SEA OPERATIONAL ENVIRONMENT



Submarine

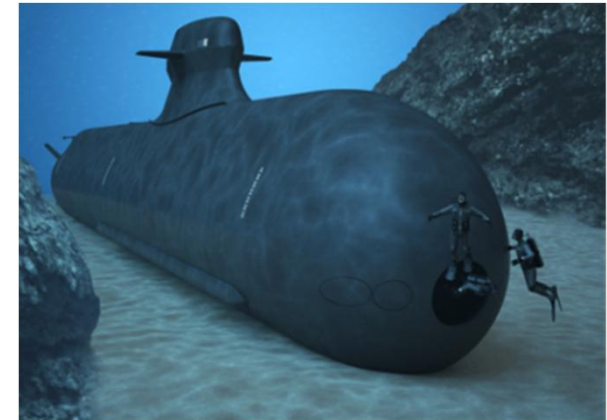
Ship

↓ 50 m

↑ ← 5000 m →

EXTREME LITTORAL OPERATIONS - NAVAL TECHNICAL REQUIREMENTS

- Submarine and Naval Surface Ship requirements:
 - Fast reaction times
 - Low signatures
 - High maneuverability
 - High shock resistance
 - Sensors and weapons able to handle a cluttered and confined situation
 - Mine Counter Measure ability
 - Shallow draught
 - Bottoming capability (submarines)
 - Long submerged endurance - Air independent propulsion (submarines)
- Saab Kockums has designed submarines and naval ships to fulfill these requirements



100 YEARS OF SUBMARINE EVOLUTION



Svärdfisken (type 1st class) 1914

Bävern 1921

Delfinen class (type B1) 1936

Neptun class (type B5) 1943

Hajen class (type A10/2) 1957

Draken class (type A12) 1962

Sjöormen class (type A11) 1968

Challenger class (type A11) 2002

Näcken class (type A14) 1980

Rescue

S-SRV (type R351) 2003

URF (type R35) 1978

SRV (type R20) 2004

Näcken-ALP class (type A14S) 1989

Västergötland class (type A17) 1987

Södermanland class (type A17S) 2004

Archer class (type A17S) 2011

Gotland class (type A19S) 1999

Retrofit

Collins class (type 471) 1993

Blue water

Kockums A26 submarine

Littoral waters and Blue waters

SUBMARINES DURING THE COLD WAR



Army Brigades

Costal Defence

Surface Attack

Air Attack

Submarines



Ventspils

Gottland (SW)

Öland (SW)

Helsinki

Kaipėda

Sassnitz

Kaliningrad RUSSIA

ock

Swinoujście

Elbląg

A26 – THE NEXT GENERATION SUBMARINE DESIGNED FOR LITTORAL OPERATIONS AND BLUE WATER

High Performance Sensors

Excellent Manoeuvrability

Extreme Stealth

Stirling AIP System

Outstanding Shock Resistance

Automation

Low Life Cycle Cost

Excellent Habitability

Modular Design

Flexible Payload Concept
Special Forces Operations Support

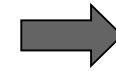


THE KOCKUMS STIRLING AIP SYSTEM

- Increases submerged endurance dramatically
 - High efficiency
- Low signatures
- Proven
 - Operational since 1989
 - Used in all RSwN submarines and by other navies
 - High availability
- Low life cycle cost
 - Cost effective solution and easy to maintain
- Simple logistics
 - Low sulfur diesel and standard LOX
- Can be refitted into existing submarines



Mk 3 Kockums Stirling module



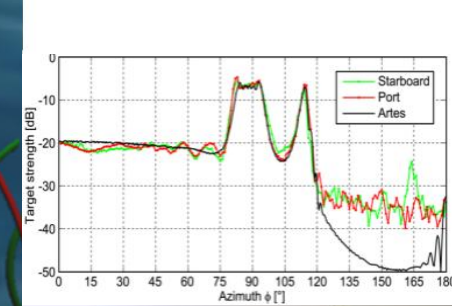
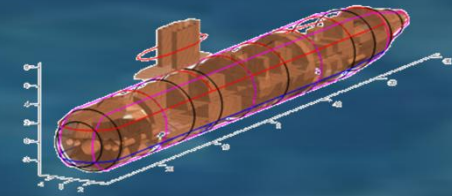
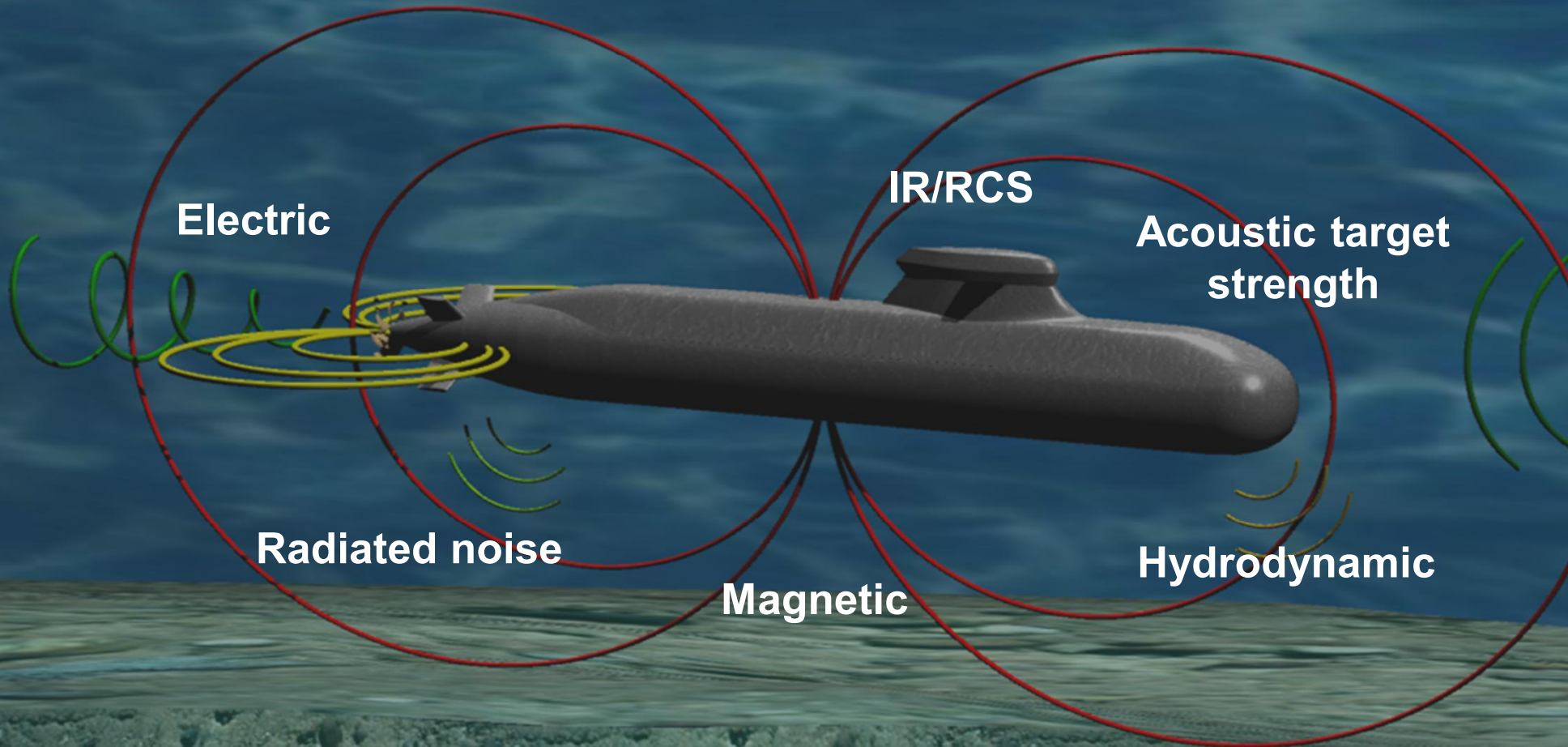
A26 Kockums Stirling module



**AIP replenishment at sea
(LOX, fuel & weapons)**

SUBMARINE SIGNATURE MANAGEMENT

- Submarine design with extremely low signatures
- Long experience – Proved in Gotland Class
- Advanced modelling capabilities for prediction and reduction methods
- Measurement and analysis capabilities including laboratory facilities

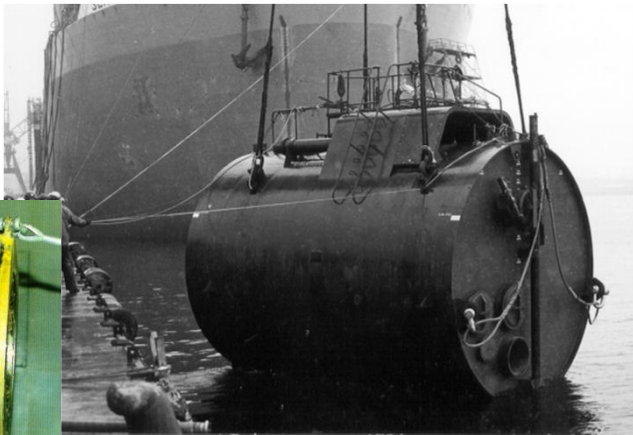


SUBMARINE EXTREME SHOCK RESISTANT DESIGN

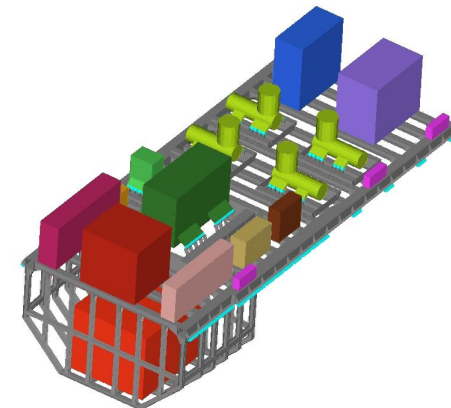
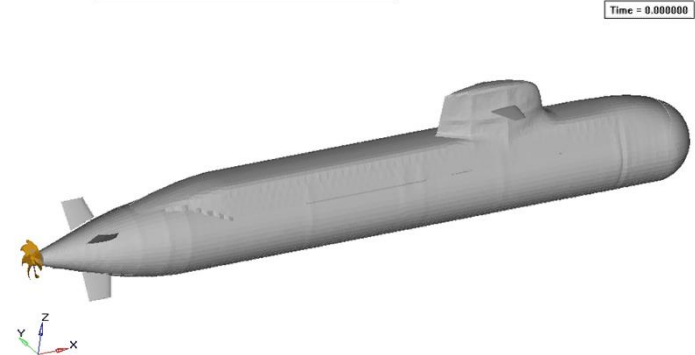


TESTING

SIMULATION



Full scale testing since 1961



FULL SCALE SUBMARINE SHOCK TEST – FIRST OF CLASS SINCE 1961



THE VISBY CLASS CORVETTES DESIGNED FOR LITTORAL OPERATIONS



- True stealth – Above and below the surface
 - Carbon Fibre Construction - RCS, IR, Noise, Magnetic
- High speed and excellent maneuverability
 - Light Carbon Fibre Construction – Fast, shallow draught
 - Gas turbines and water jets
- Multi-mission capability
 - ASuW, ASW, MCM
- Excellent sensor and effector suite
- High shock resistance
 - Full scale shock tested

LITTORAL OPERATIONS - THE MINE COUNTER MEASURE TOOLBOX

- Dedicated MCMV (Koster Class) - Organic MCM (Visby Class)
 - Low signatures
 - Non-magnetic composite hull and degaussing system
 - Low noise design and propulsion system
 - High shock resistance – Full scale tested
 - Mine hunting sonars
 - Off-board systems – PVDS/ROV-S and mine disposal systems
- Autonomous Sweeping System (SAM3)
 - High shock resistance
 - High sweeping signatures – Magnetic, acoustic and electric
 - Full autonomy



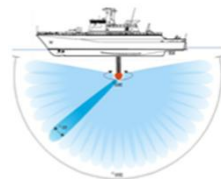
PVDS / ROV-S
SAAB DE Mk III



ROV / MDV
SAAB DE Mk II



Sonar



Uw Pos



Expendable MDV



Divers



THANK YOU!

Dr. Roger Berg
Head of Technology Management
Saab Kockums, Sweden

