The Swedish next generation Light Weight Torpedo (LWT) system "Torpedsystem 47"

Update on the development of TS47, which is developed and optimized for ASW in extreme littoral waters with high sea traffic intensity

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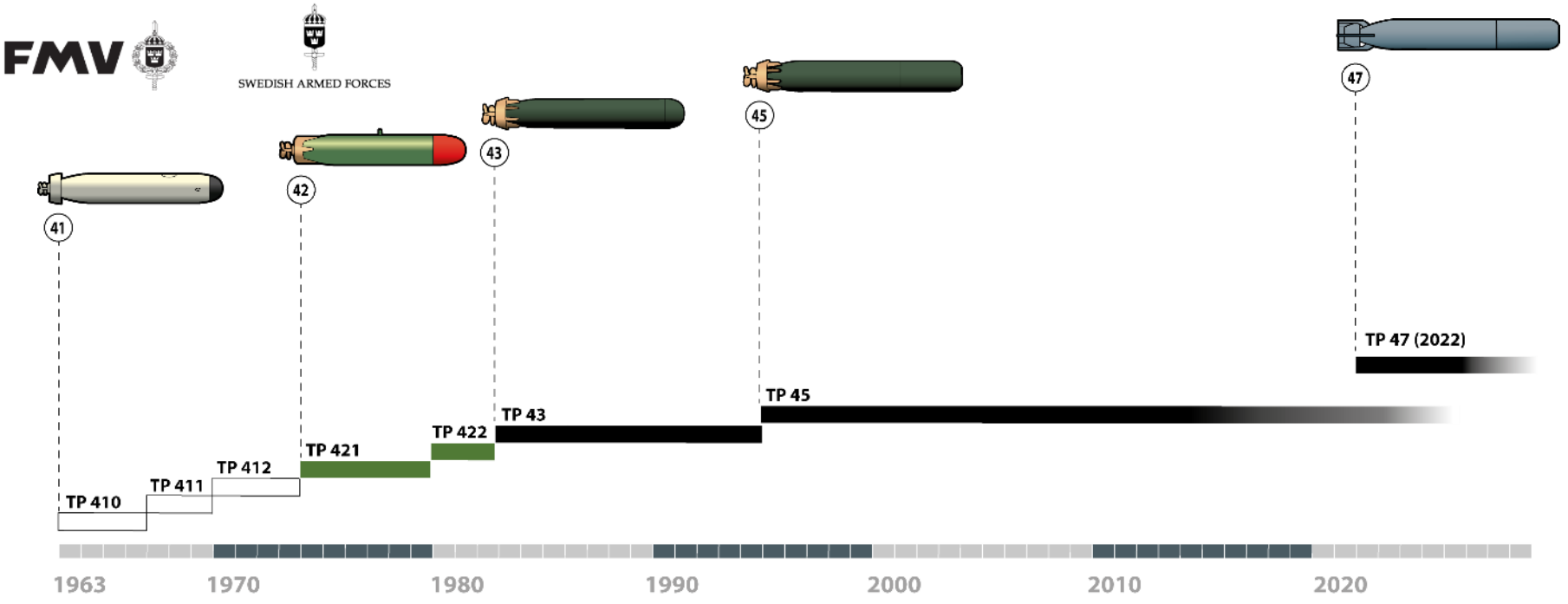
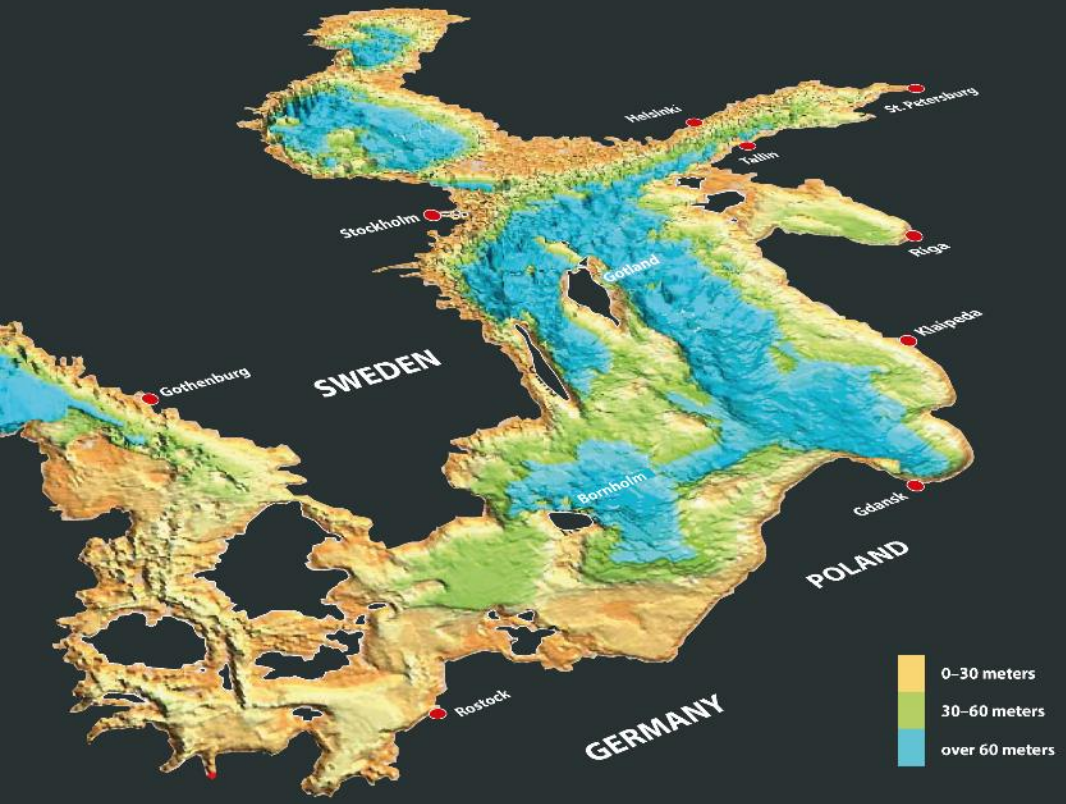
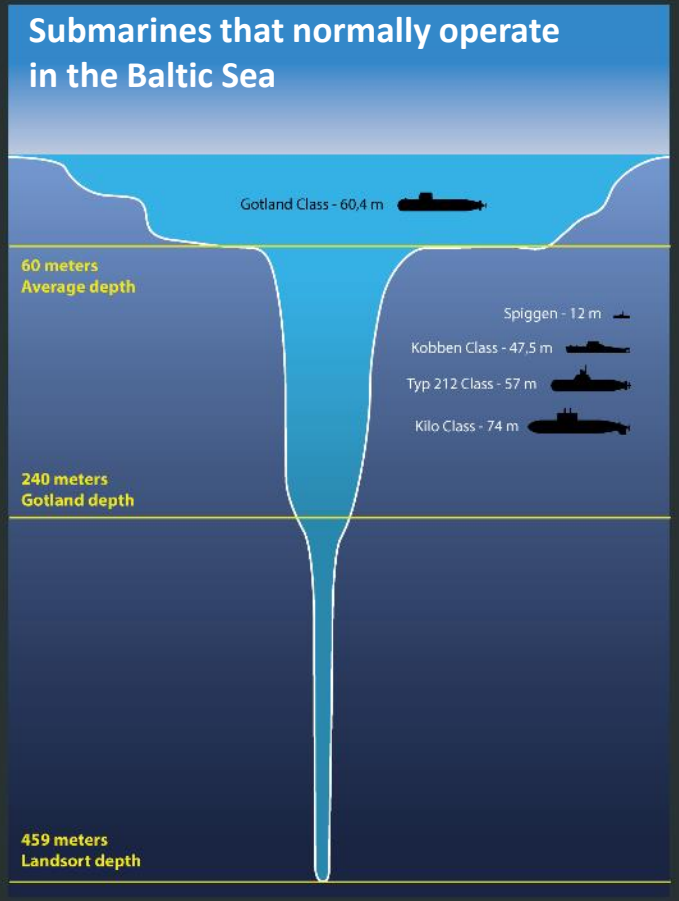
Project Manager NLT (TS47)

Swedish LWT history Timeline 1963–



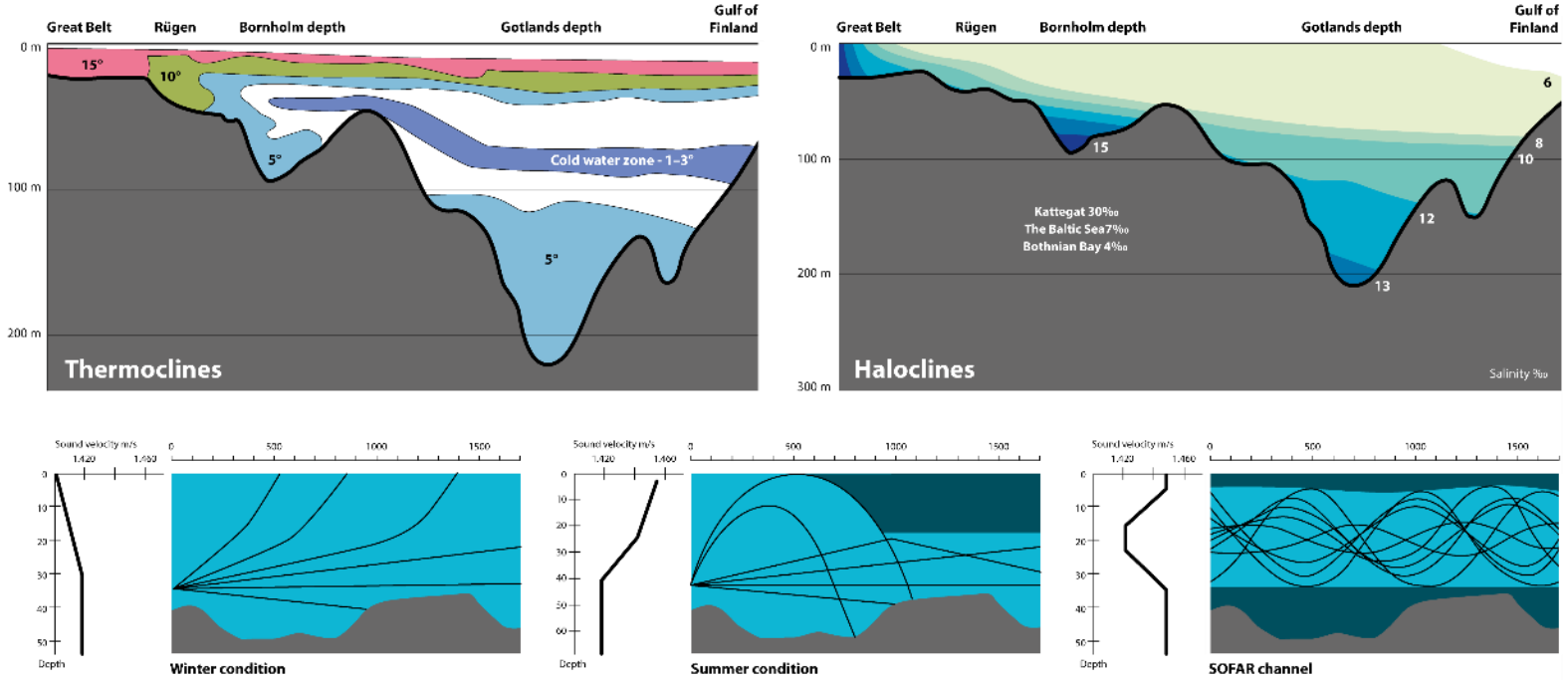
Underwater topography of the Baltic Sea





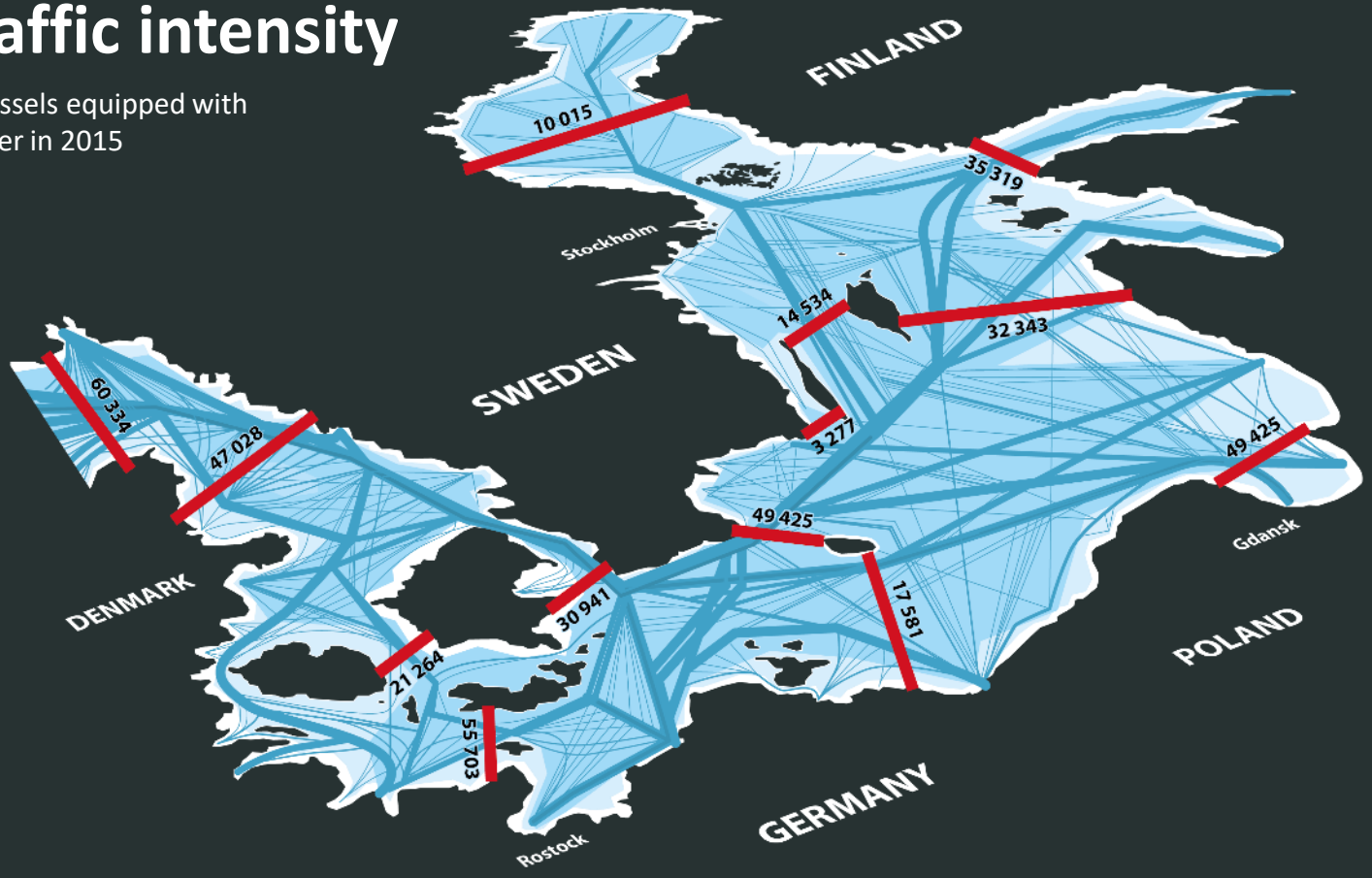
SOFAR channels in the Baltic Sea

Representation of the conditions in the Baltic Sea a typical summer day. The water mass is layered due to difference in salinity and temperature. Between some layers channels form where sound can travel very long distances. In these channels submarines prefer to use their sensors.

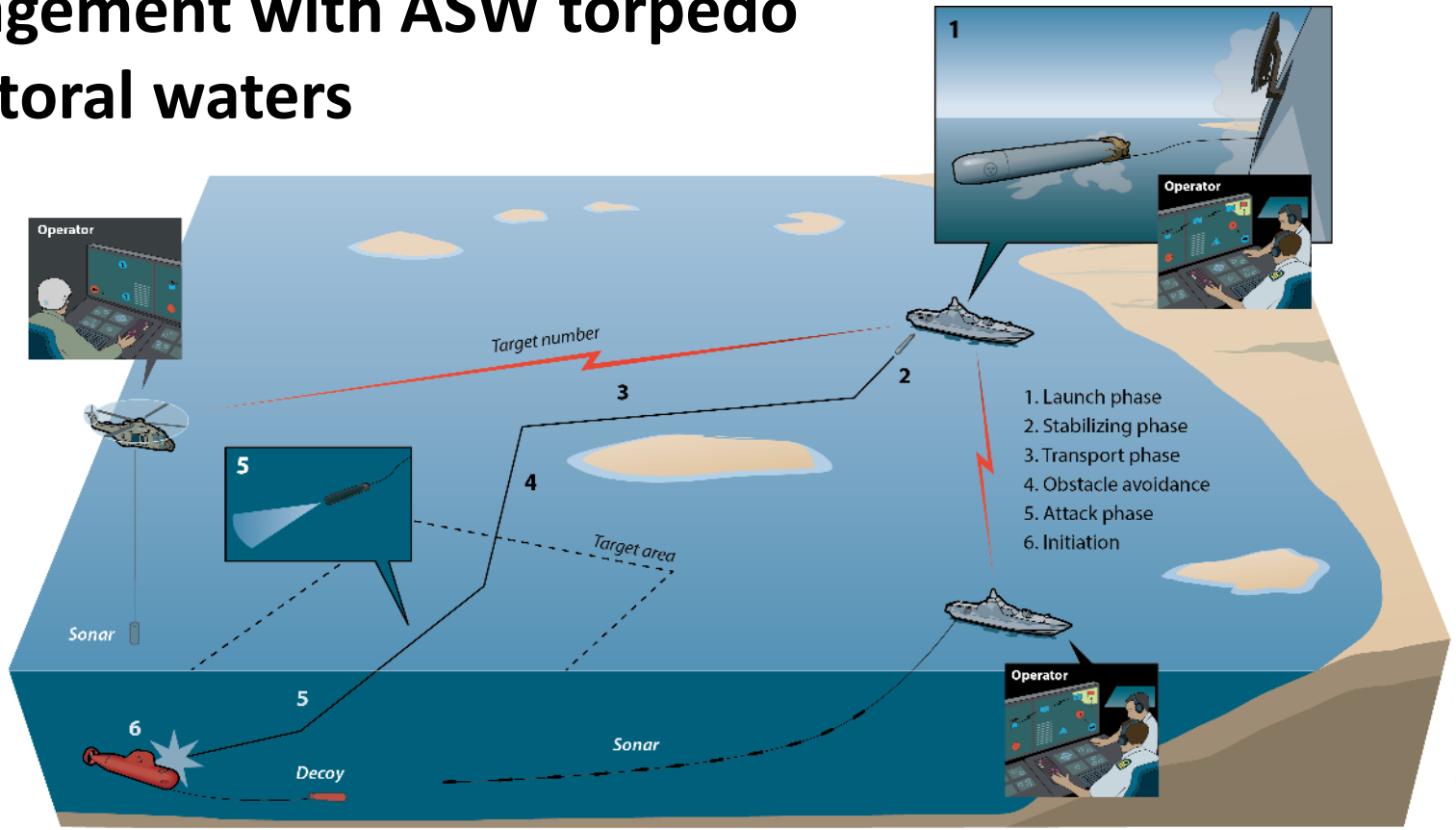


Sea traffic intensity

Passages of vessels equipped with AIS-transponder in 2015



Engagement with ASW torpedo in littoral waters

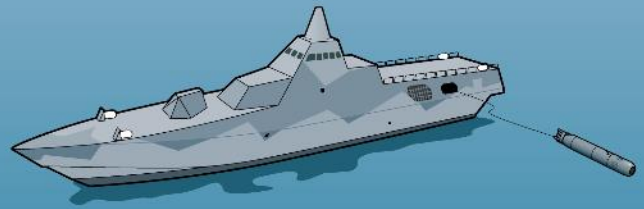


Overview of launching platform types

Helicopter 14F (prepared for)

(ASW Configuration)

- Use own sensors or relayed information to locate and track target.
- Launch torpedo 47 with wire guidance hovering or as fire and forget.



Visby Class Corvette

- Use own sensors or relayed information to locate and track target.
- Launch torpedo 47 with wire guidance or as fire and forget.

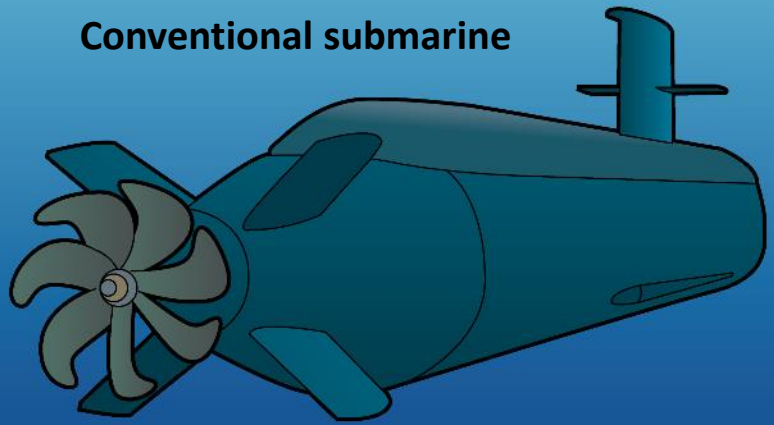
Gotland Class Submarine (In future Blekinge Class Submarine)

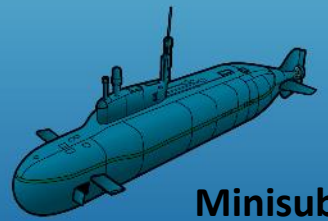
- Use own sensors to locate and track target.
- Launch torpedo 47 with wire guidance or as fire and forget.

Possible threats

Swimmer Delivery Vehicle (SDV)

Conventional submarine





Minisub

Torpedo System 47

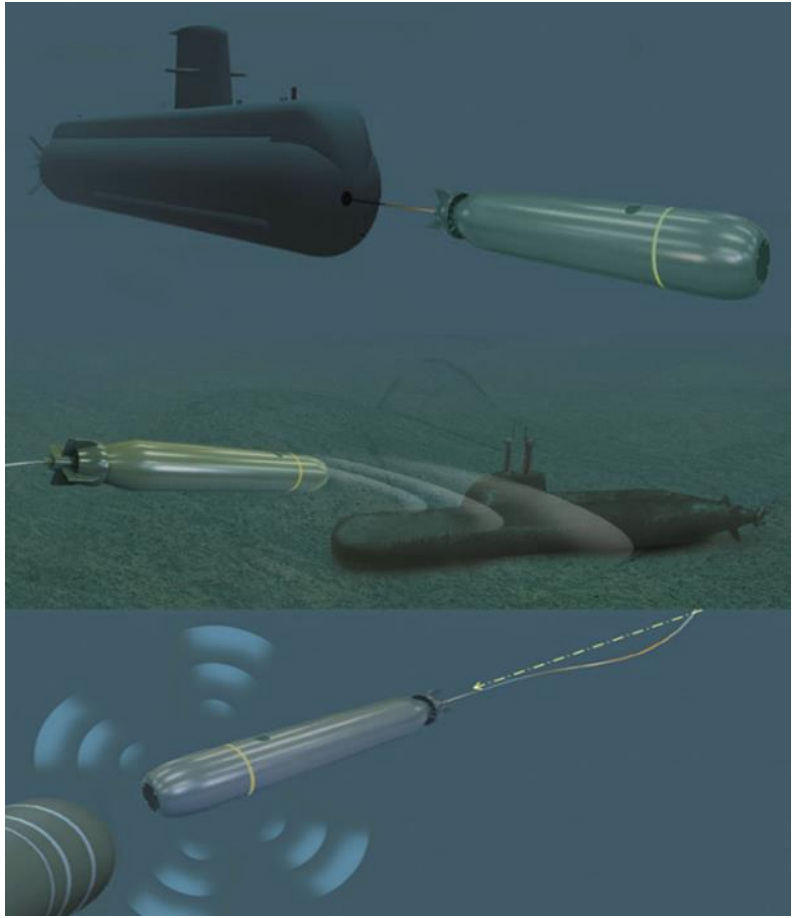
A new generation Lightweight Torpedo System for:

- Anti Submarine Warfare – ASW (primarily)
- Anti Surface Ship Warfare – ASuW (secondarily)
- Torpedo defence

Key functionality:

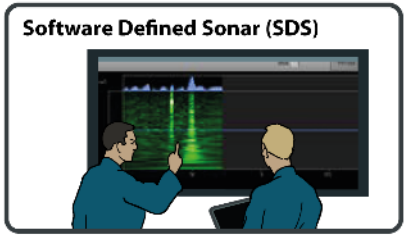
- Shallow water operations (Baltic sea)
- Complex scenarios
- Low speed capability
- Communication capability
- A modular design to accommodate future upgrades and new functionalities
- Adaptation to international missions

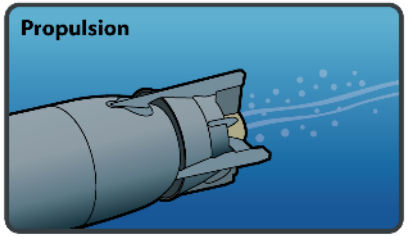
Torpedo 47 will replace the currently operational Torpedo 45.

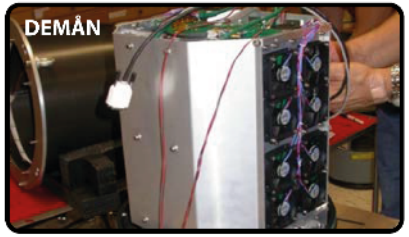


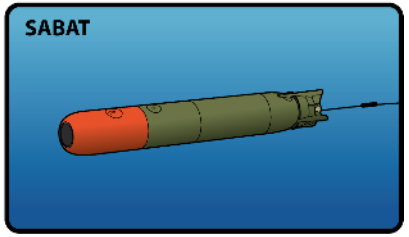
Critical success factors in torpedo system development

Development projects since Torpedo 45 was delivred







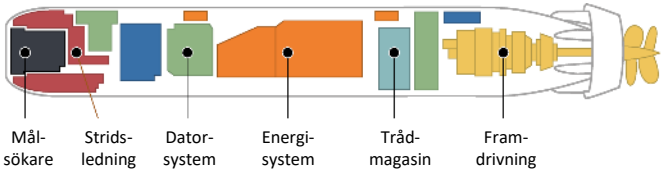


Activity/Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Design Environment for Pump-Jet													
Study Propulsion TP45													
Software Defined Sonar (SDS)													
DEMAN Demonstrator Homing System													
Mod Guidance Functions TP62													
Software for new Proximity Fuse													
Threat Adaptation TP62													
Upgrade ZoKITS TP62													
Sapphires Phase 3													
Development and Manufacturing of AUV62-SABAT													
Export Contract AUV62-AT													
NLTG													
NLT Phase 2													

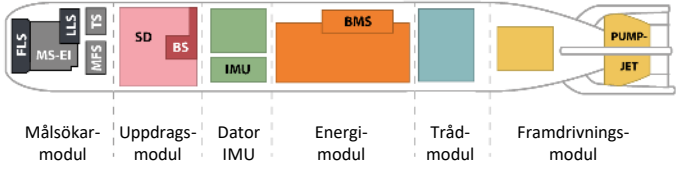
Design to cost

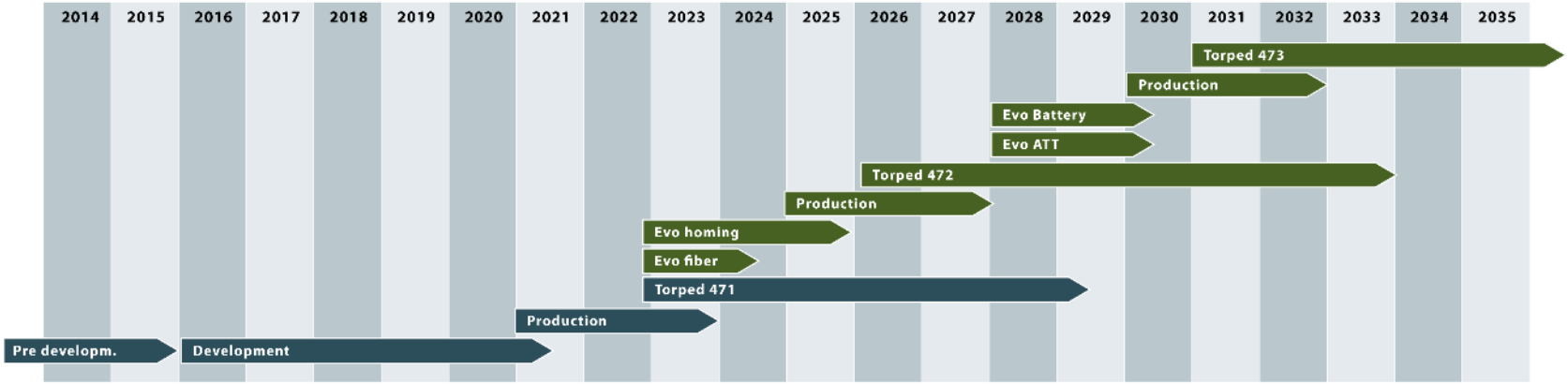
Strategy for evolutionary development • Modular design • COTS • Life Cycle (LCC)

Torp 45 – 1 st generation modular design

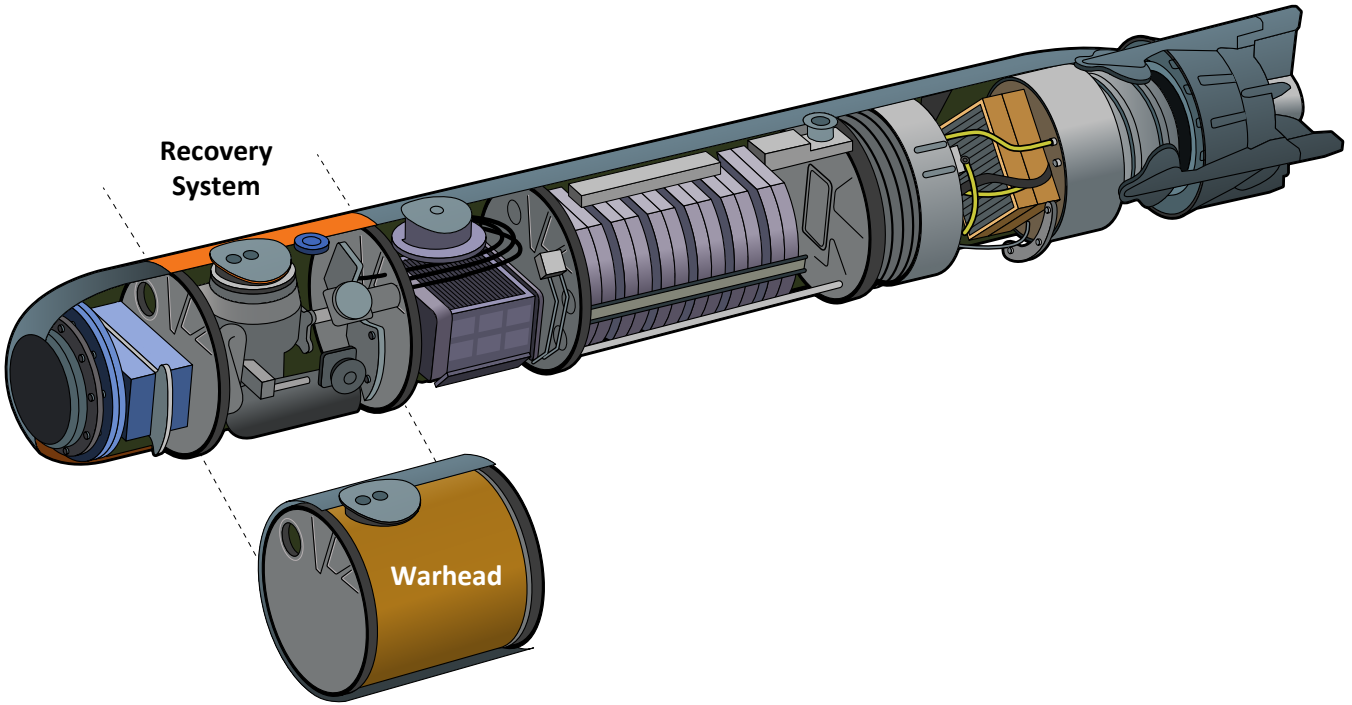


Torp 47 – next generation modular design





Torpedo 47 – System Overview



Homing system

Next generation Swedish developed FLS

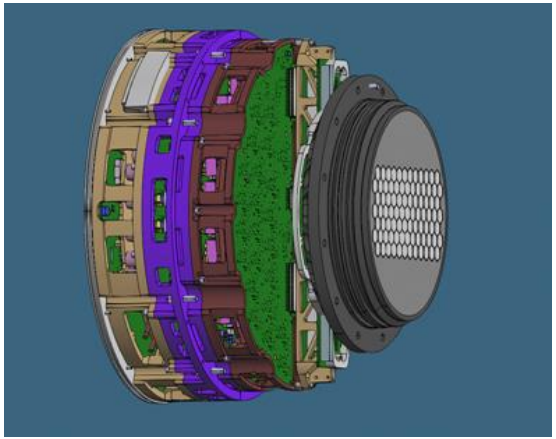
Fully digitized

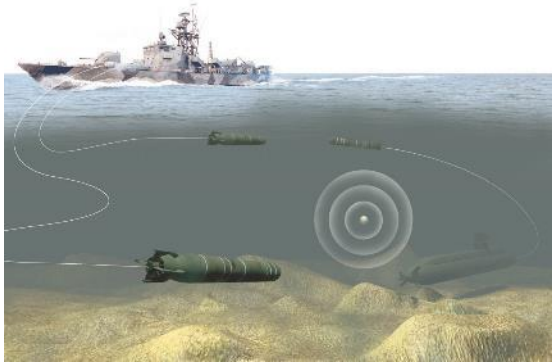
Active/passive operation

Flexible beamforming and signal processing

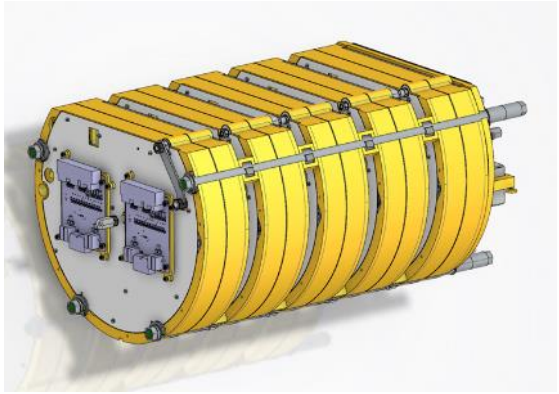
Optimized for littoral waters(Baltic Sea) operations with capability to function in blue water

- Higher frequency compared to blue water
- Resolution is prioritized over range





Endurance



Li-Ion cells (LiFePO4)

Safety aspects prioritized over performance

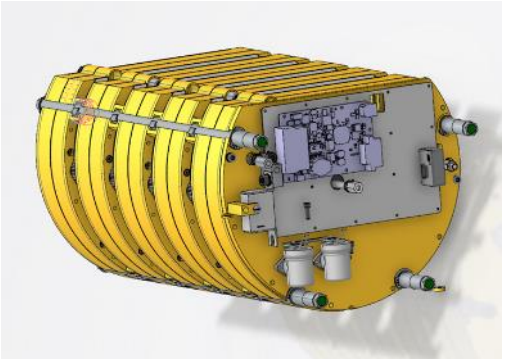
Submarine, Surface Ships & Helicopter

Modular design and standardized I/F for upgrade ability

Same battery for warfare and exercise configurations

Cost effective solution

Simple maintenance



Maneuverability

High performance INS

Electronically controlled brushless DC-motor

Direct drive pumpjet

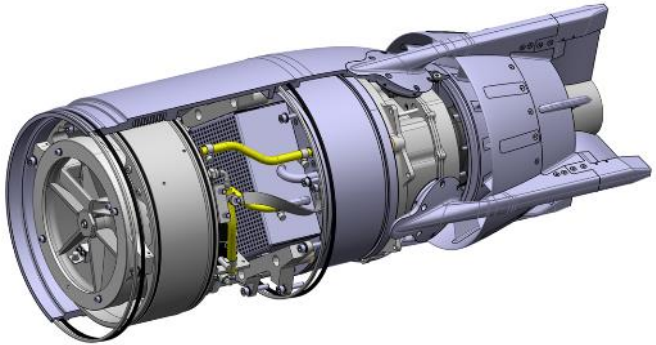
Efficient propulsion over large speed range

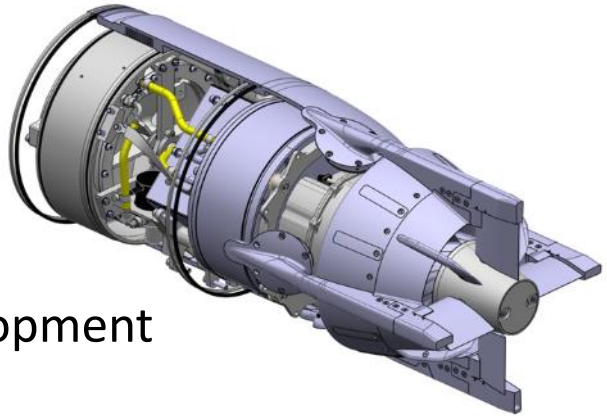
Low signature

Cavitation resistant

High maneuverability

Modular design well suited for evolutionary development





Communications

Galvanic wire communication

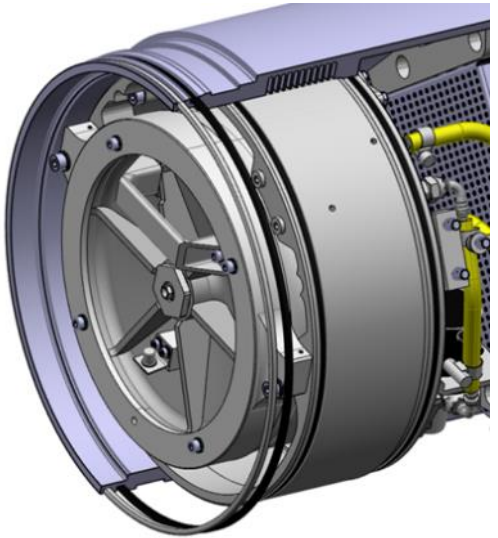
Prepared for optical fiber

From all platforms throughout the complete torpedo run

Enables:

- Update of target data
- Termination of torpedo run
- Increased safety for friendly units
- Torpedo control (direction, speed, depth…)

Fire & Forget Mode available



Excercise module

Exercise with full operational performance and capabilities (depth, speed, range, homing….)

Cost effective training

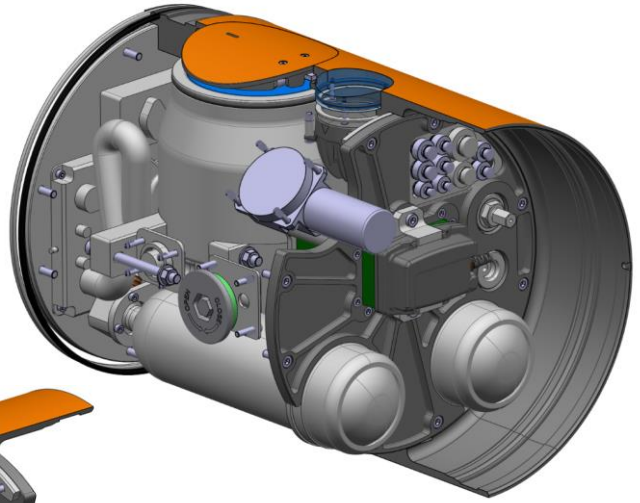
Extensive registration

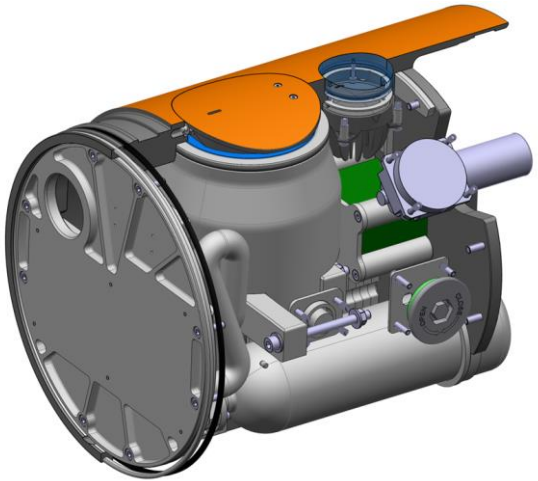
Tools for technical and tactical

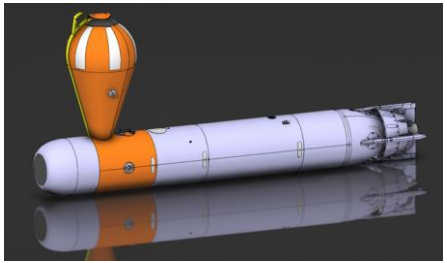
Evaluation

Same concept as for todays:

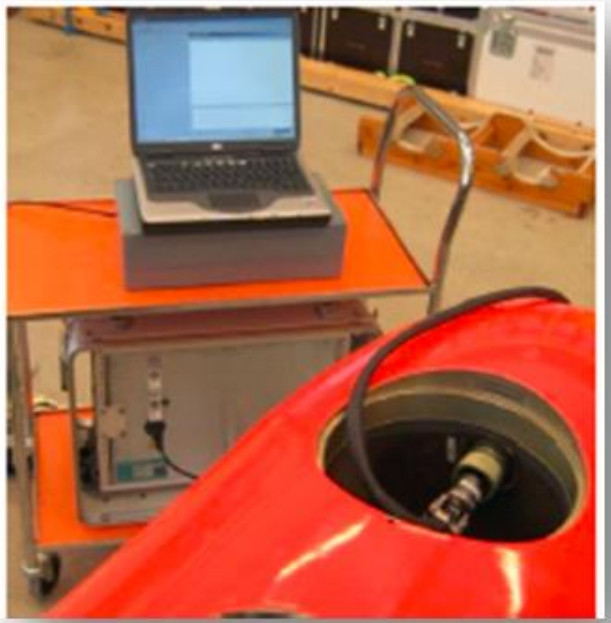
- Torpedsystem 45
- Torpedsystem 62

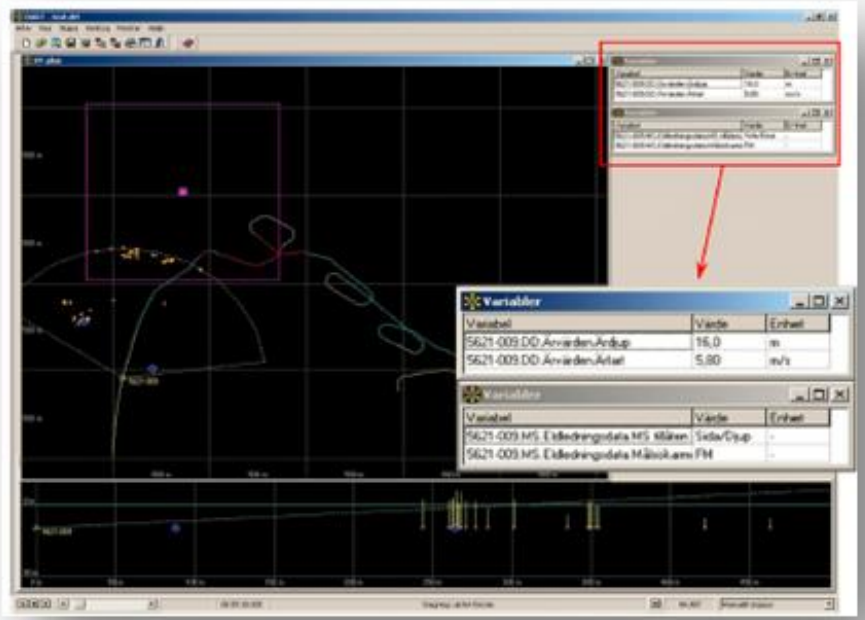






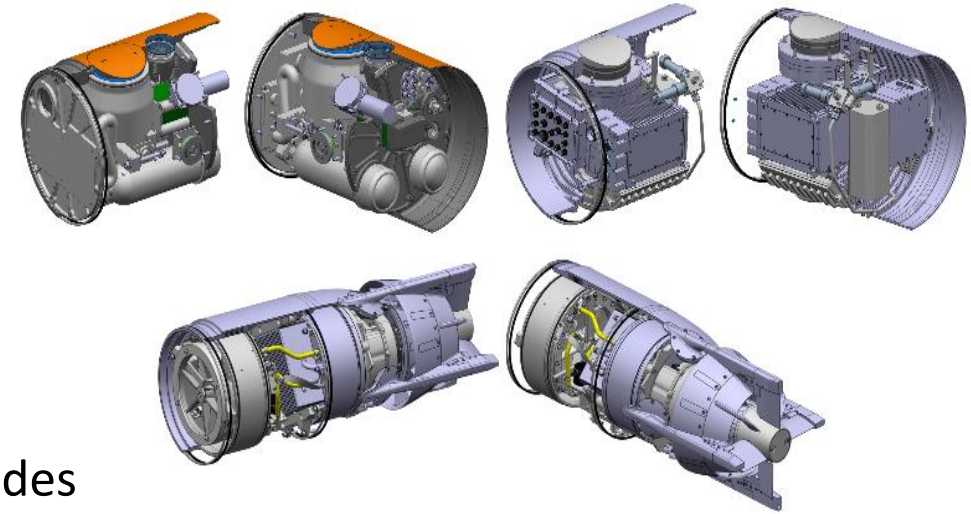
Technical & Tactical evaluation





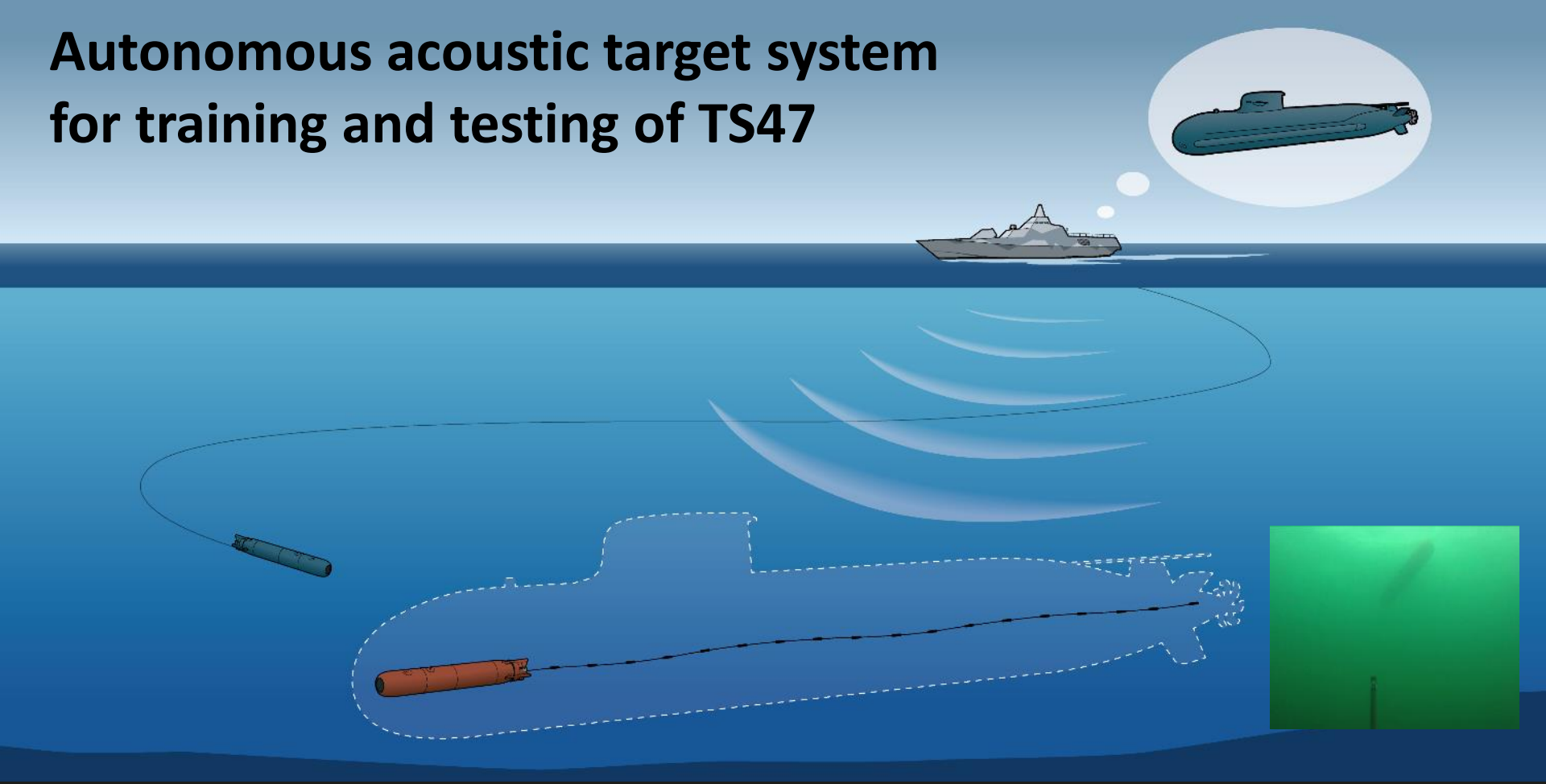
Model Based Definition (MBD)

To maintain high pace in the development, Model Based Definition(MBD) has been an important tool to make the design changes between the different prototypes smooth and easy.

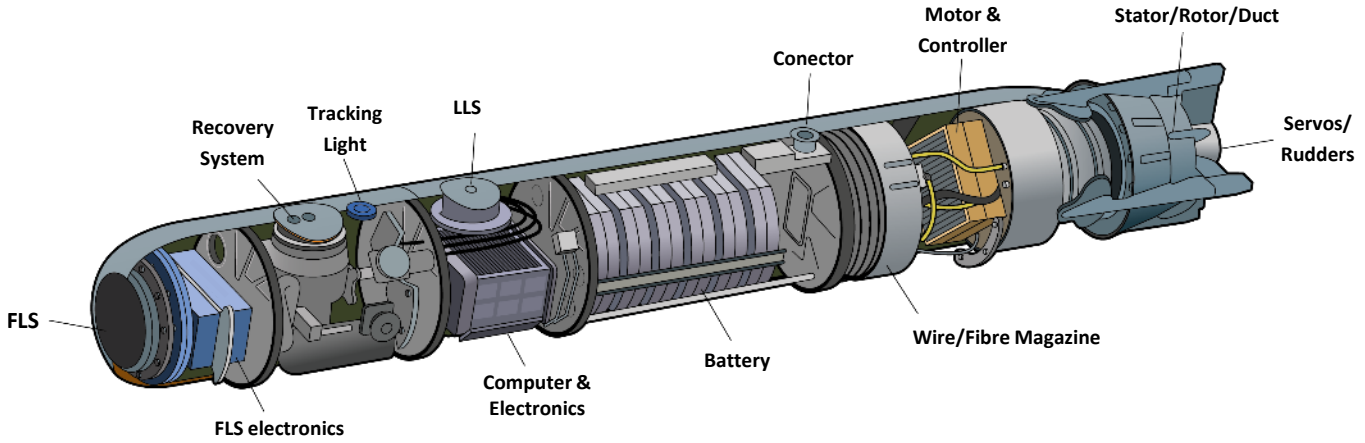


Will make it easier for future upgrades

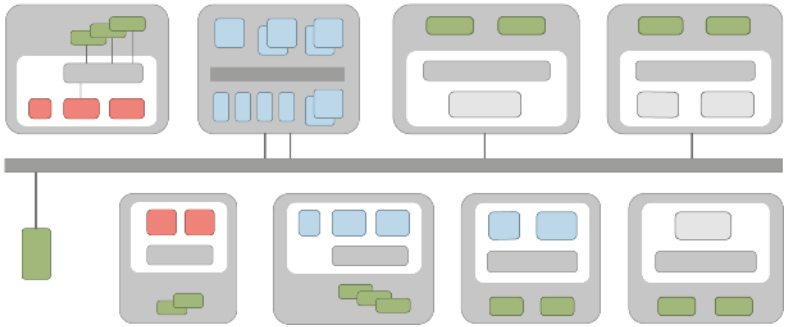
Autonomous acoustic target system for training and testing of TS47



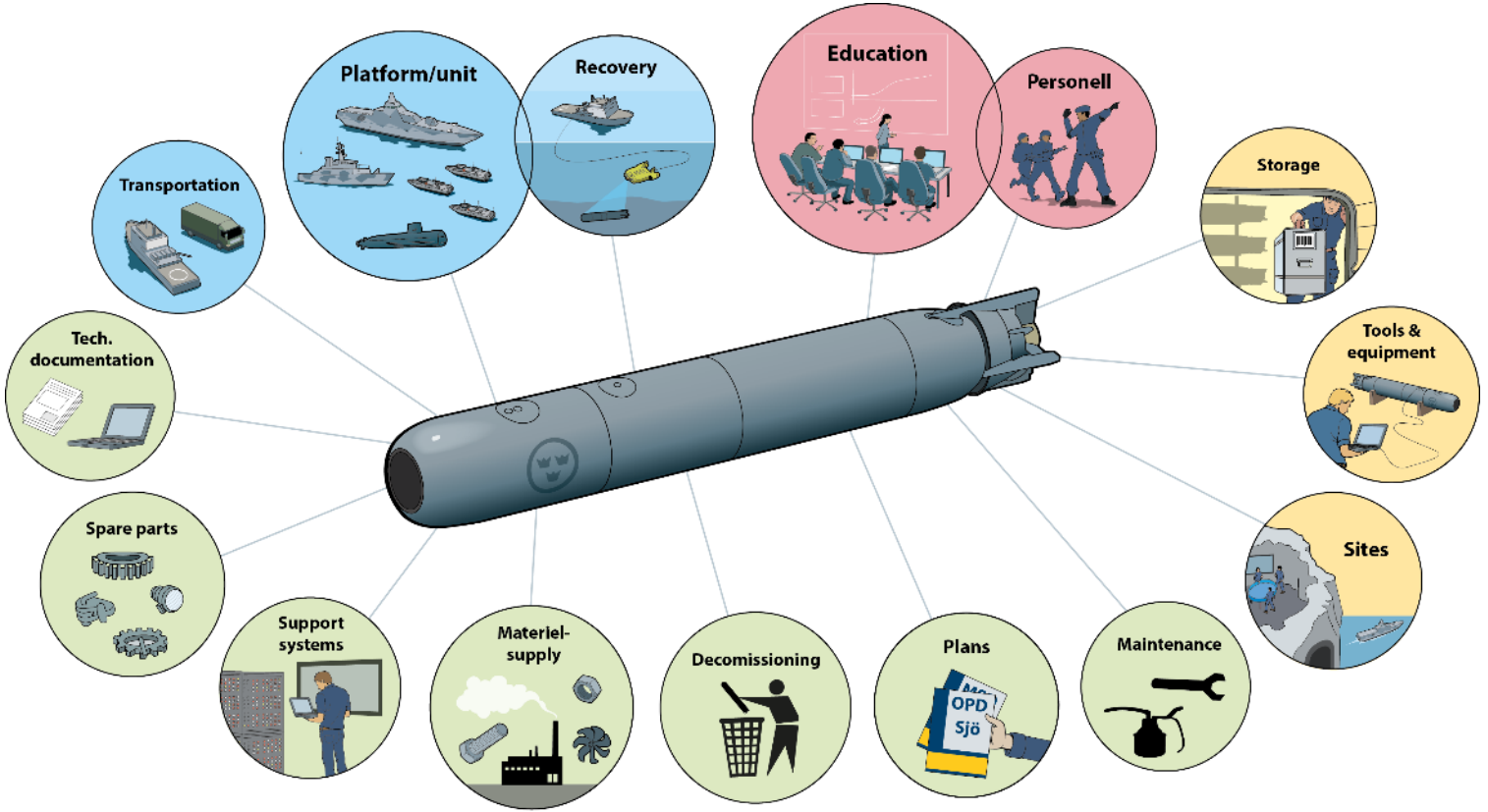
Torped 47 – design principles and performance



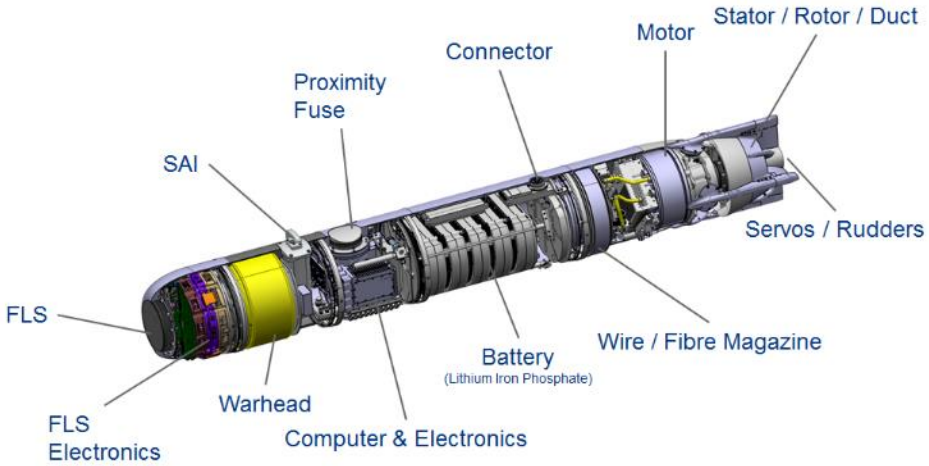
Dimensions	400 mm x 2850 mm
Weight	Ca 340 kg
Speed	10- to ≥35 kts Prepared for≥45+ kts
Endurance	≥ 20 km (>1h) Prepared for ≥ 50 km
Battery	LiFePO4, >100 recharging
Propulsion	Electronic DC-motor / Pumpjet
Homing system	Active & Passive (Fully Digital) Prepared for HF
Warhead	IM compliant, omni-directional, PBX
Communication	Galvanic wire, Prepared for Optical fiber



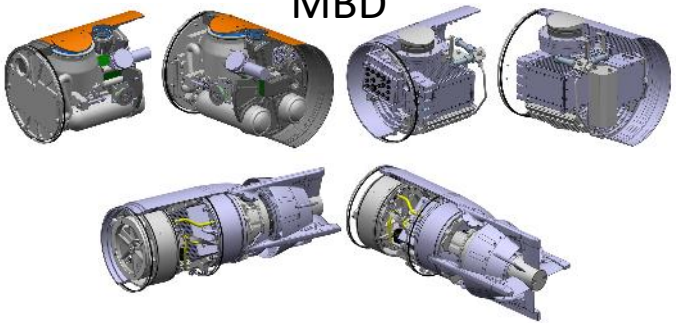
Torpedo System 47



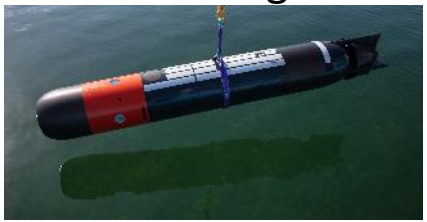
Progress in development of TS47



MBD

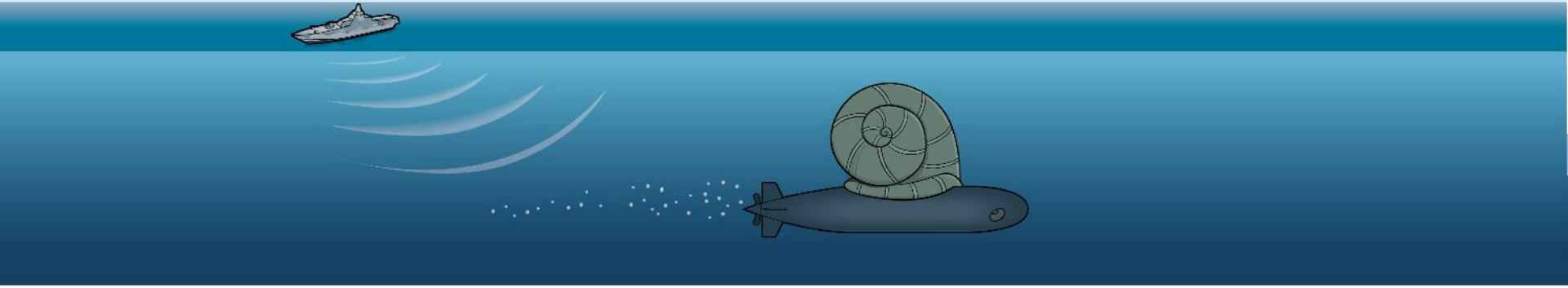


Testing

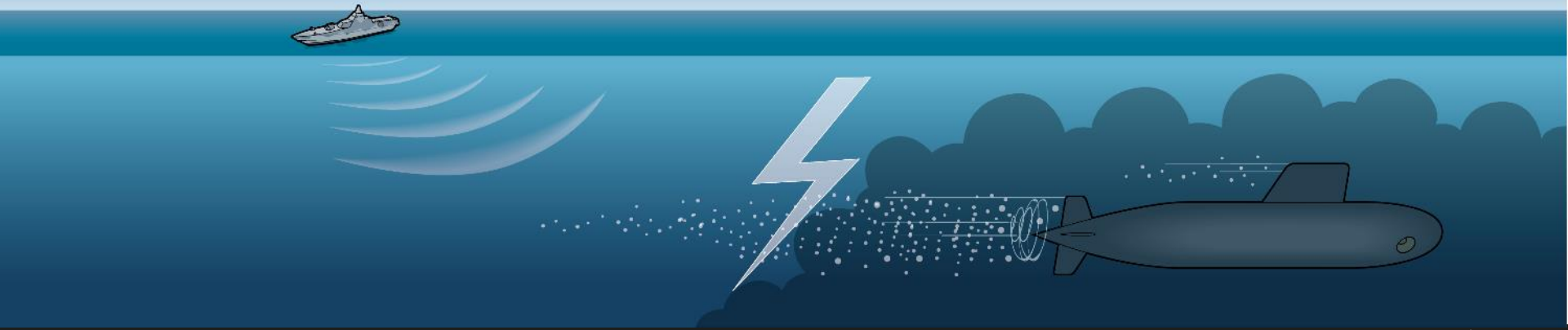


International cooperation

The opportunity to a successful ASW attack comes like a snail…



…and disappears like a flash




SWEDISH DEFENCE MATERIEL ADMINISTRATION
FMV