Swedish Torpedo Development

Navy Tech 2025 in Helsinki

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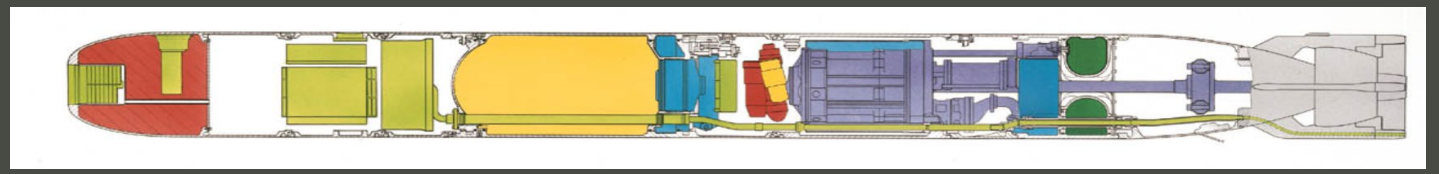
Försvarets materielverk (FMV)

Topics



- Introduction
- History
- Light Weight Torpedoes
- Heavy Weight Torpedoes
- Torpedo Interface System (TIS)
- Q&A

From ”Neutral for 200 years” to..

- When NATO formed; Finland could not become a member. Sweden then worked for a nordic defence alliance. It was not feasilbe and resulted in that Sweden went ahead ouside alliances in order to be able to stay neutral i case of war.

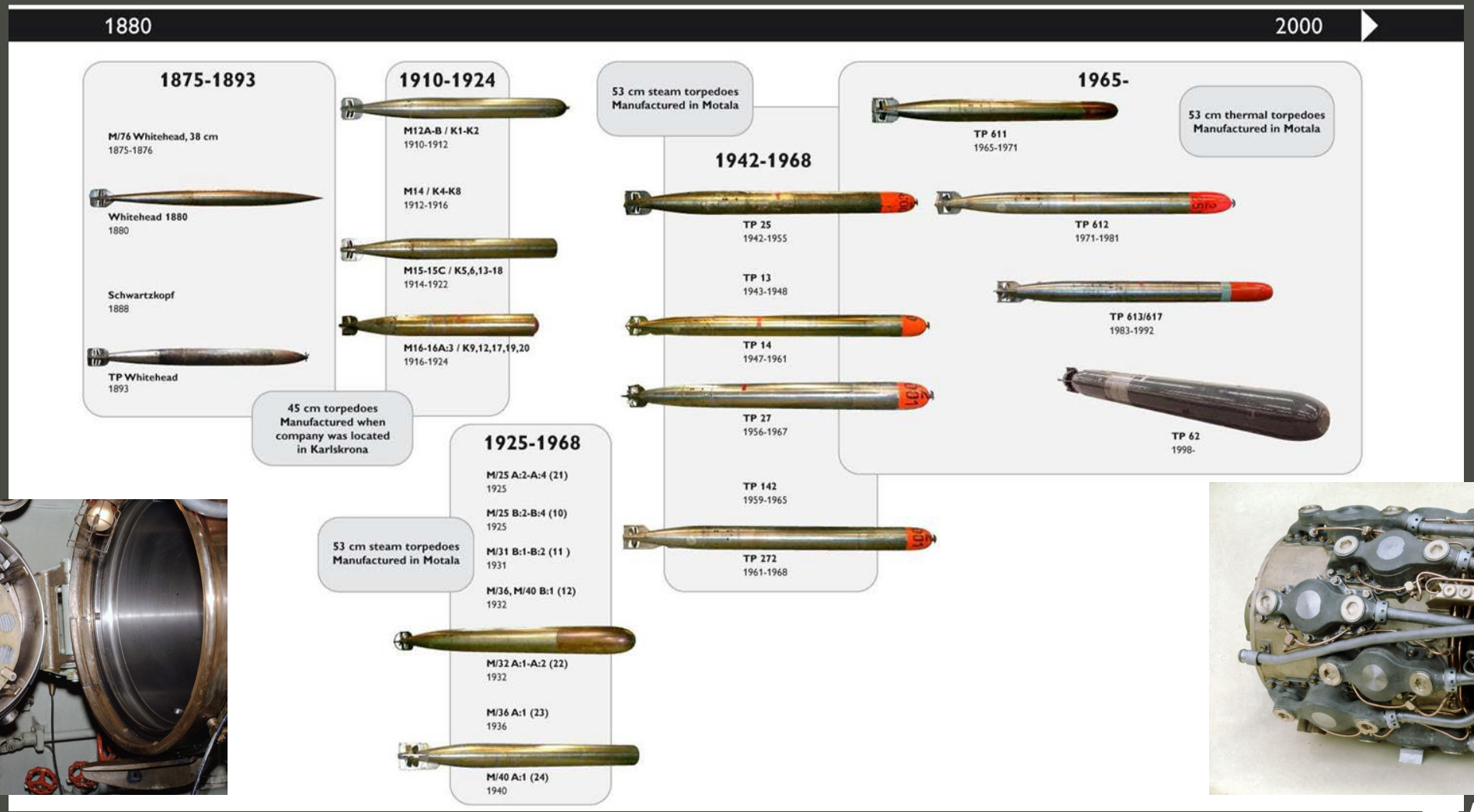
- Resulting in:
  - a need for defence independence
  - massive defence investments during cold war up to the 70-ies

  - an national defence industry within a heavily industrialised society (technocracy)
  - the ambitious defence industry strategy and defence independency resulted in advanced torpedo development
  - continous development and rapid introduction of new technologies

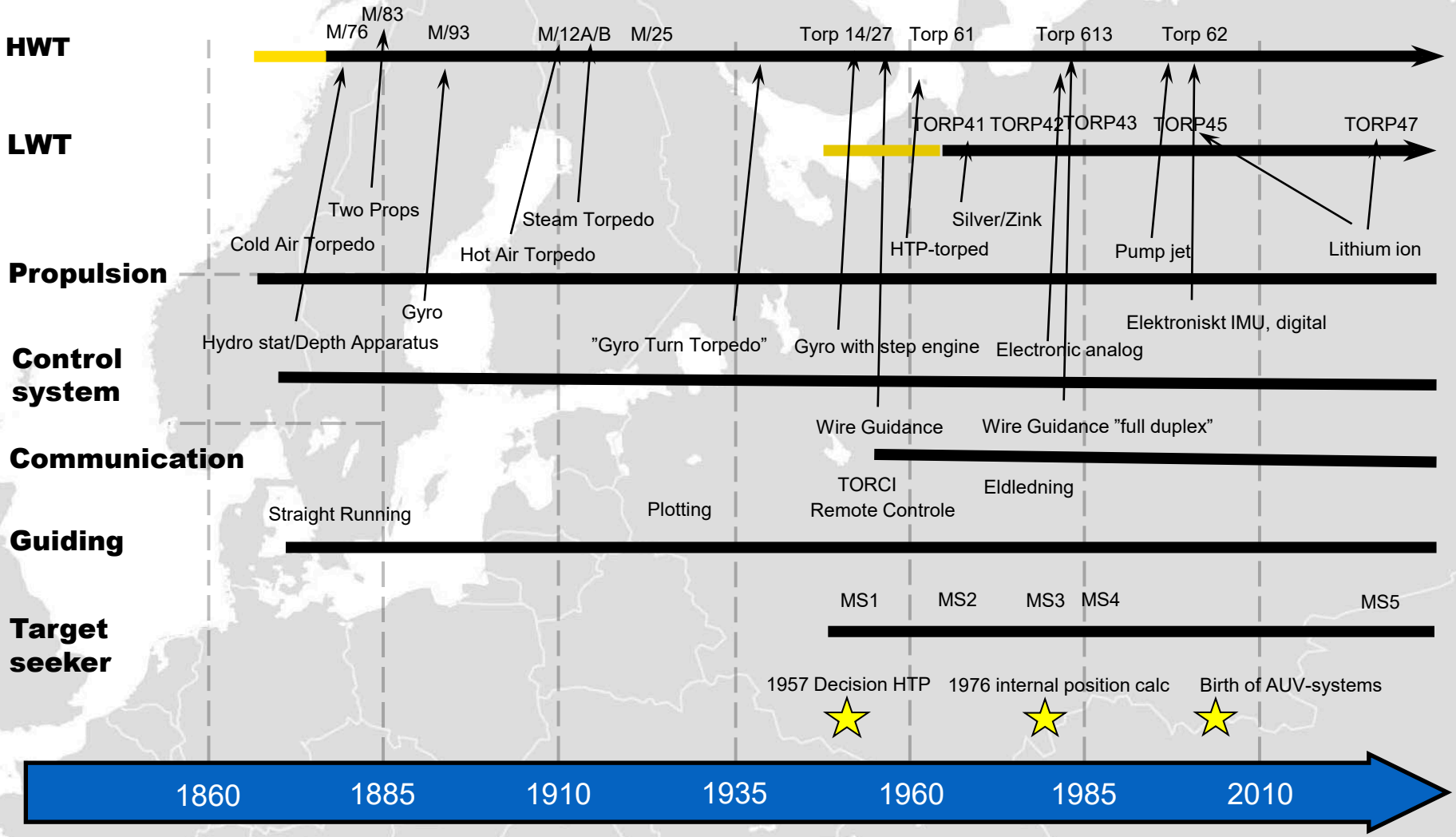
  - Whats the engineering solution as replacement for today and in the future?

Evolution and the ”Technical Platform”.

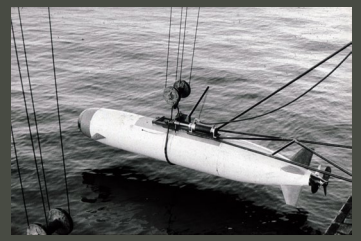
150 years of Swedish Torpedoes



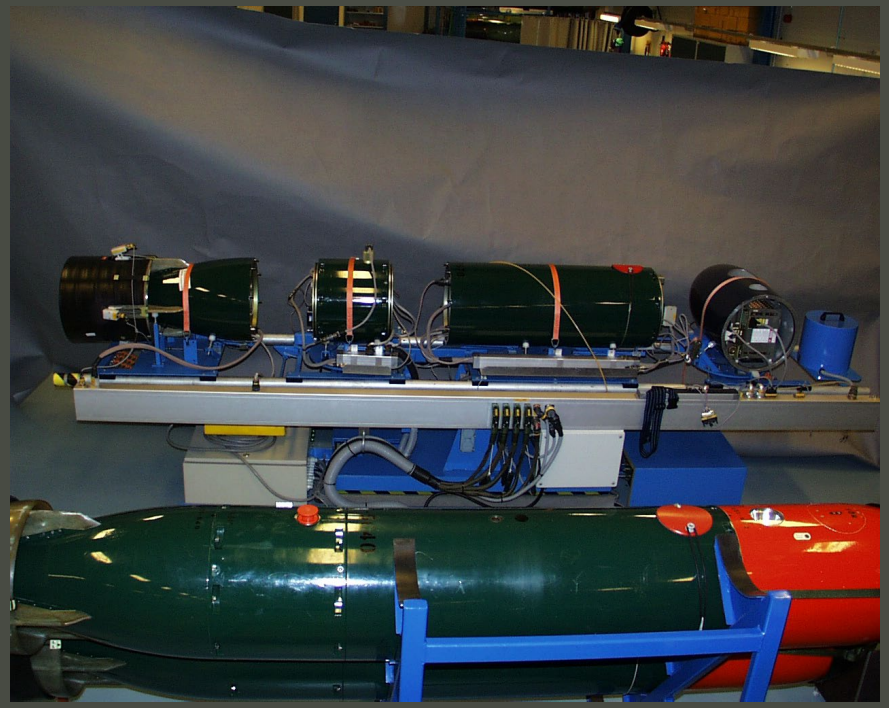
Torpedo: Evolutionary development within 150 years

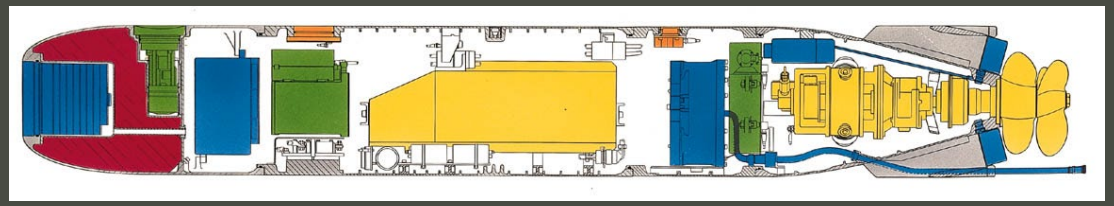


60 years of ASW torpedo systems

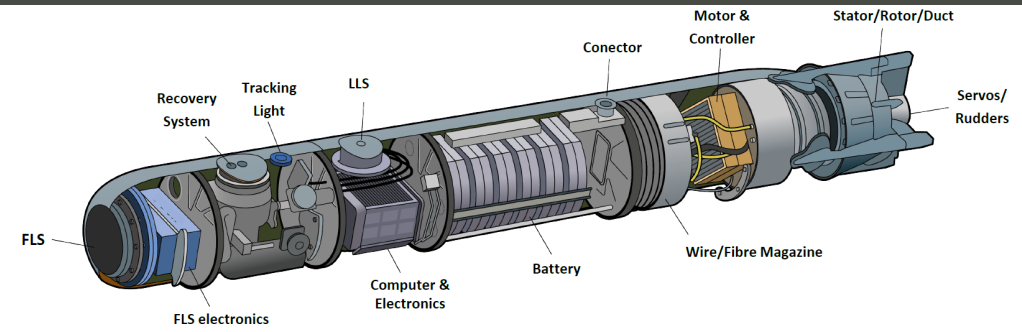


Torped 45

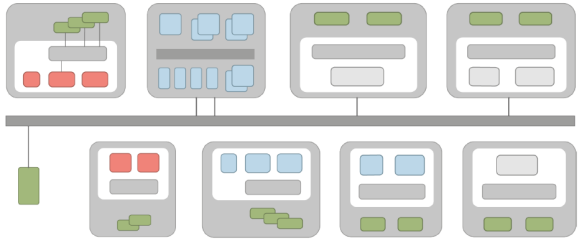




Torped 47 – under deliveries from 2023

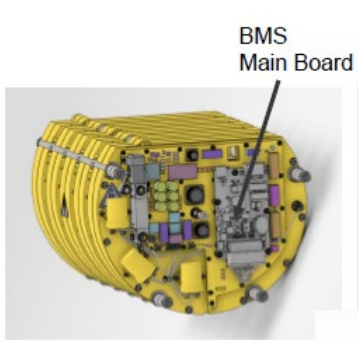


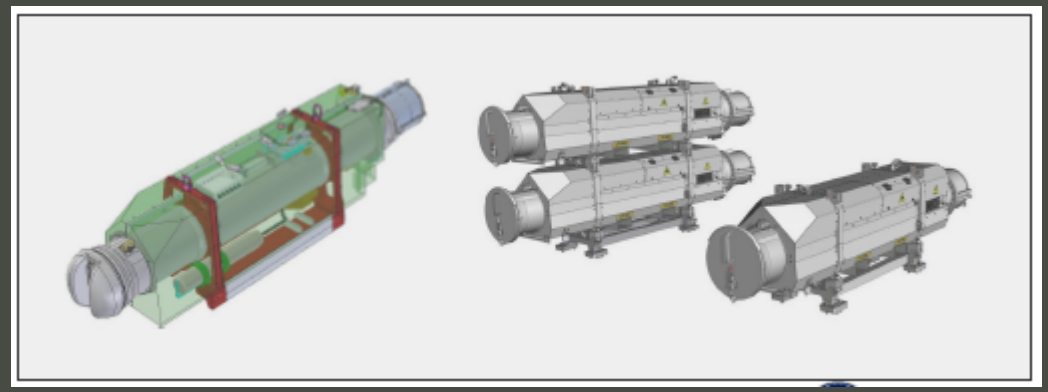
Dimensions	400 mm x 2850 mm
Weight	Ca 340 kg
Speed	10- to ≥35 kts Prepared for≥45+ kts
Endurance	≥ 20 km (>1h) Prepared for ≥ 50 km
Battery	LiFePO4, >100 recharging
Propulsion	Electronic DC-motor / Pumpjet
Homing system	Active & Passive (Fully Digital) Prepared for HF
Warhead	IM compliant, omni-directional,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



Torpedo 47 – Battery

- Weight: 55 kg (Complete Battery Module - 84 kg)
- Length: 723 mm
- Diameter: 400 mm
- # Cells 525 (5P105S)
- Cell Type: AN123 (LiFePO4) (Lithium Iron Phosphate)
- Energy Contents 4.2 kWh
- System Voltage 346 V





Capability Growth in Light Weight Torpedoes

- New Launch Platforms and combat methods
- Commonality with Torped 62 gives increased passive capabilities on surface targets (tracking)
  - Torped 47
- Increased energy by swithing to Lithium nickel manganese cobalt oxides (NMC) ”doubling the energy”
  - Torped 45
  - Torped 47
- Add on procurement for the Luleå Class Corvettes
  - Torped 47
  - Surface Tubes, Tub M/20
- Wake Homing

- Optionally
  - Fibre Guidance
  - Anti Torpedo, anti AUV functionality
  - Increased Band Width Target Seeker (multi frequency)

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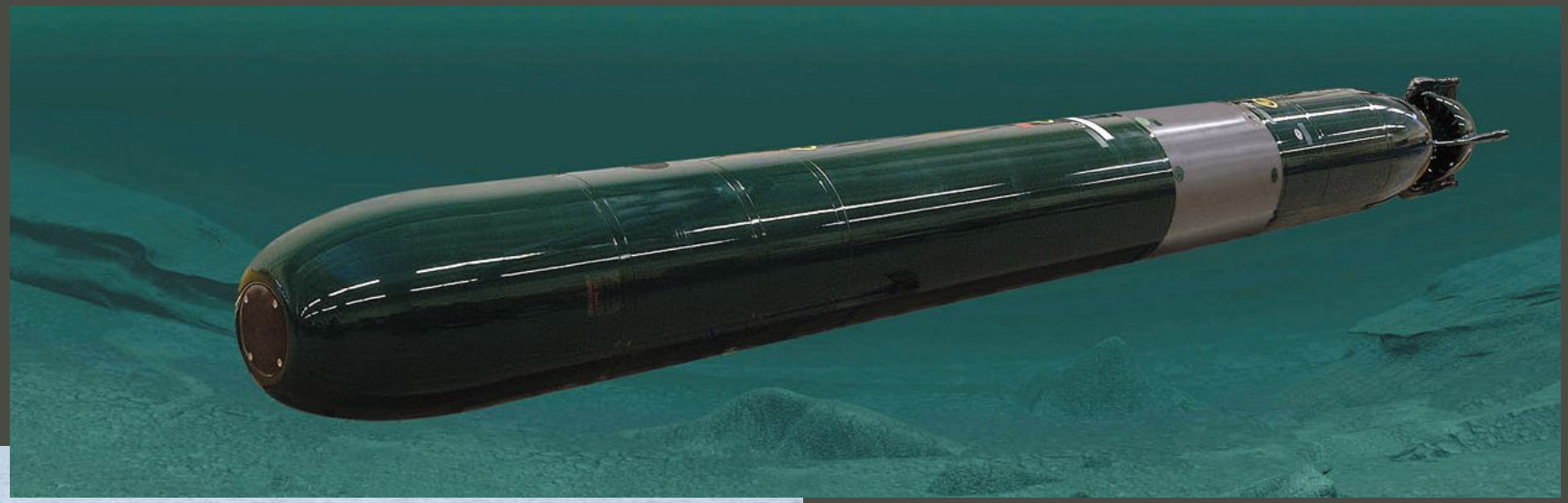
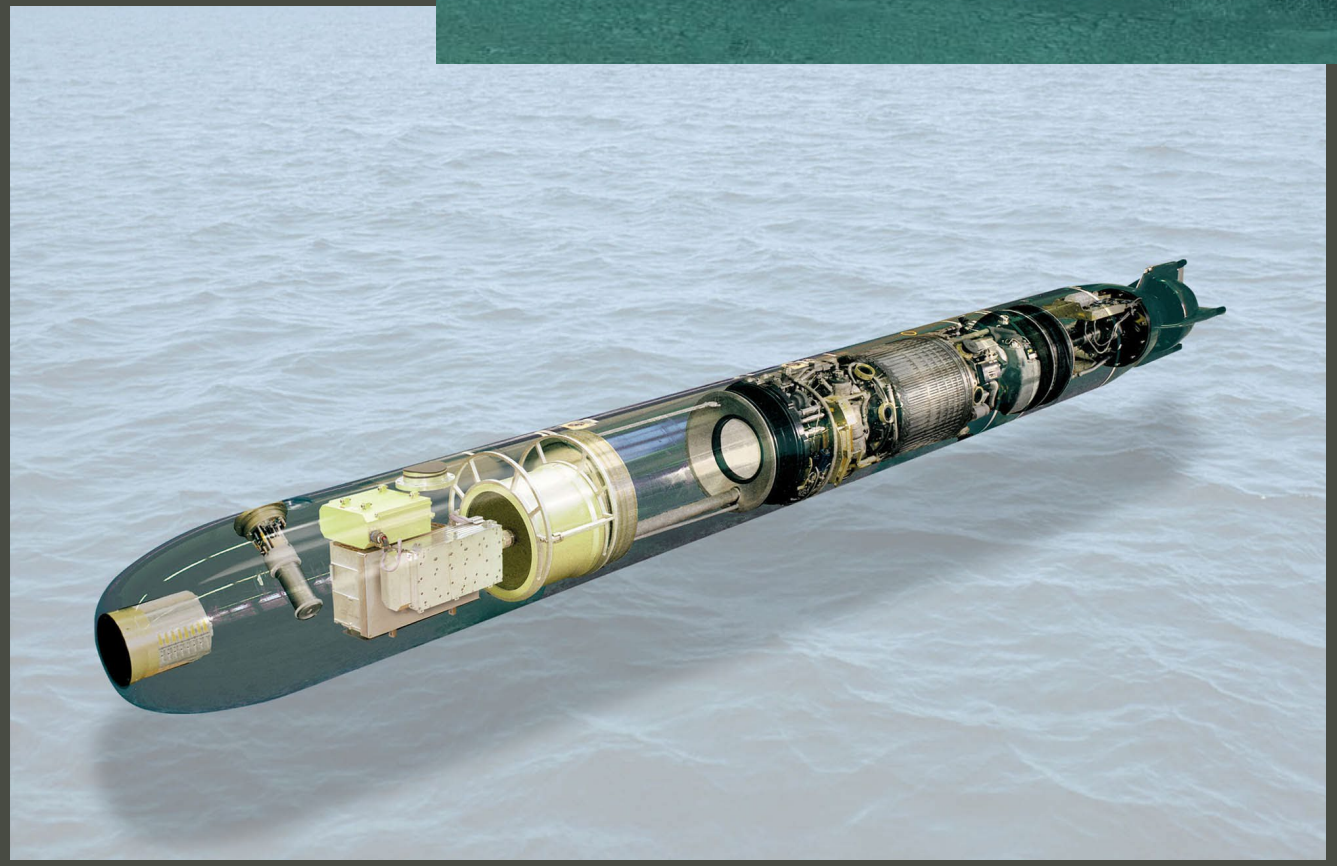
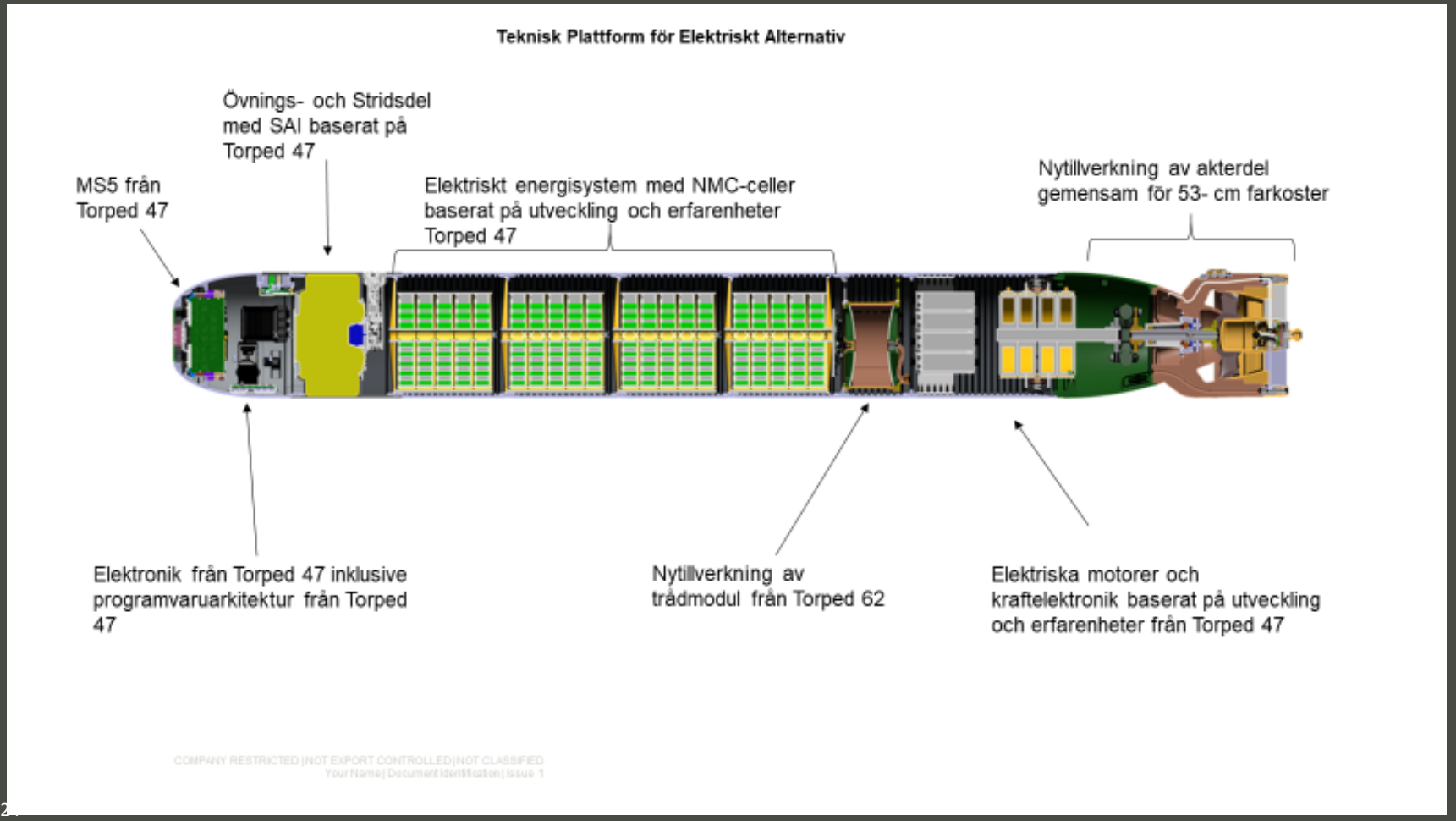
Torped 62





Torped 63


Teknisk Plattform för Elektriskt Alternativ
Övnings- och Stridsdel med SAI baserat på Torped 47
MS5 från Torped 47
Elektriskt energisystem med NMC-celler baserat på utveckling och erfarenheter Torped 47
Nytillverkning av akterdel gemensam för 53- cm farkoster
Elektronik från Torped 47 inklusive programvaruarkitektur från Torped 47
Nytillverkning av trådmodul från Torped 62
Elektriska motorer och kraftelektronik baserat på utveckling och erfarenheter från Torped 47
COMPANY RESTRICTED | NOT EXPORT CONTROLLED | NOT CLASSIFIED
Your Name | Document Identification | Issue 1

Road Map Heavy Weight Torpedo Capability

2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040 2041 2042

Original Plan (alt 1)

- LTF Torpedo 62 Phase 1
- Torpedo 621
- Prototype — Torp 622
- Torpedo 622
- Prototype — LTF Torpedo 62
- Torpedo 623
- Torpedo 64
- Torpedo 64 ~2070
- Torpedo 64 new platform

Based on Torped 47 technical platform, upgraded thermal propulsion system

New Plan (alt 2)

- LTF Torpedo 62 phase 1
- Torpedo 621
- Prototype — Torp 622
- Torpedo 622
- Submarine Integration
- Propulsion + Signature
- Fibre Comms (Star Link? ☺)
- Target Head
- Prototype — PDF + Tech Dev — Torpedo 63
- -> Prototyp 63
- Torpedo 63 ~ 2060

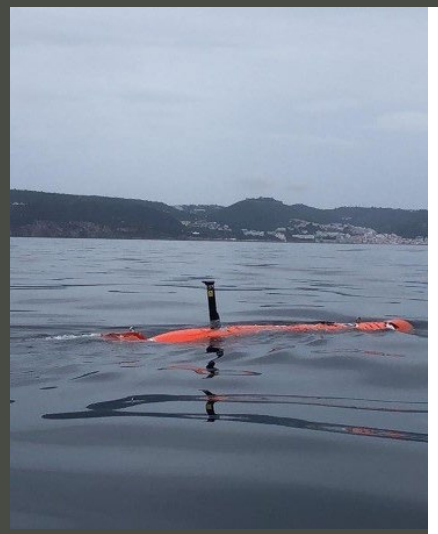
Torpedo 621 with upgraded thermal propulsion system

Torpedo 63 based on Torpedo 47 technical platform

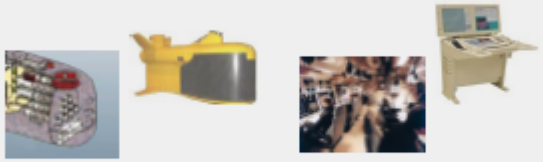
Concept phase | Production | Development | Operational

Capability Growth Heavy Weight Torpedoes

- Torped 63 development gives:
- Electric Propulsion initially NMC technology
- Fibre Wire Guidance
  - Increased Coms Range nearing 100 km (TBD)?
  - Increased data rate, collaborating torpedoes
- Target Head based on TORP 47
- Torpedo Computer based on TORP 47
- War Head based on TORP 47
- Software based on TORP 47
- Increased counter measure resillience
- Much increased combat ranges
- Surveillance/Recon Torpedoes
- Wake Homing

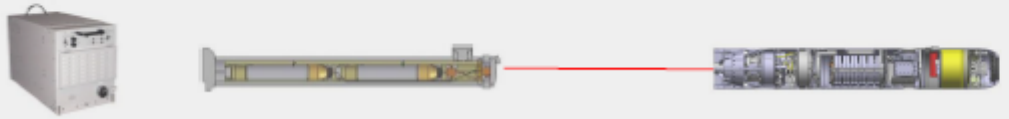


Torpedo Weapon System

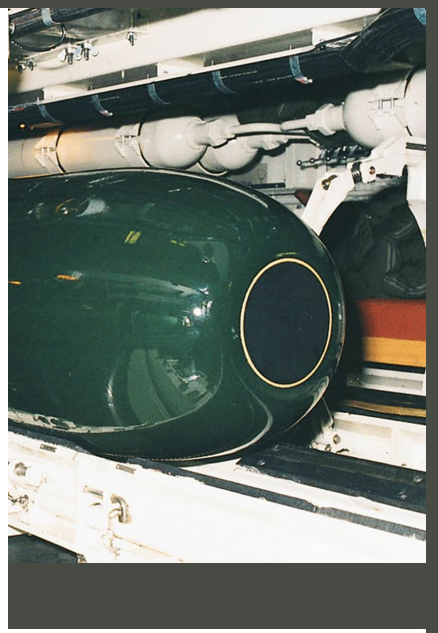


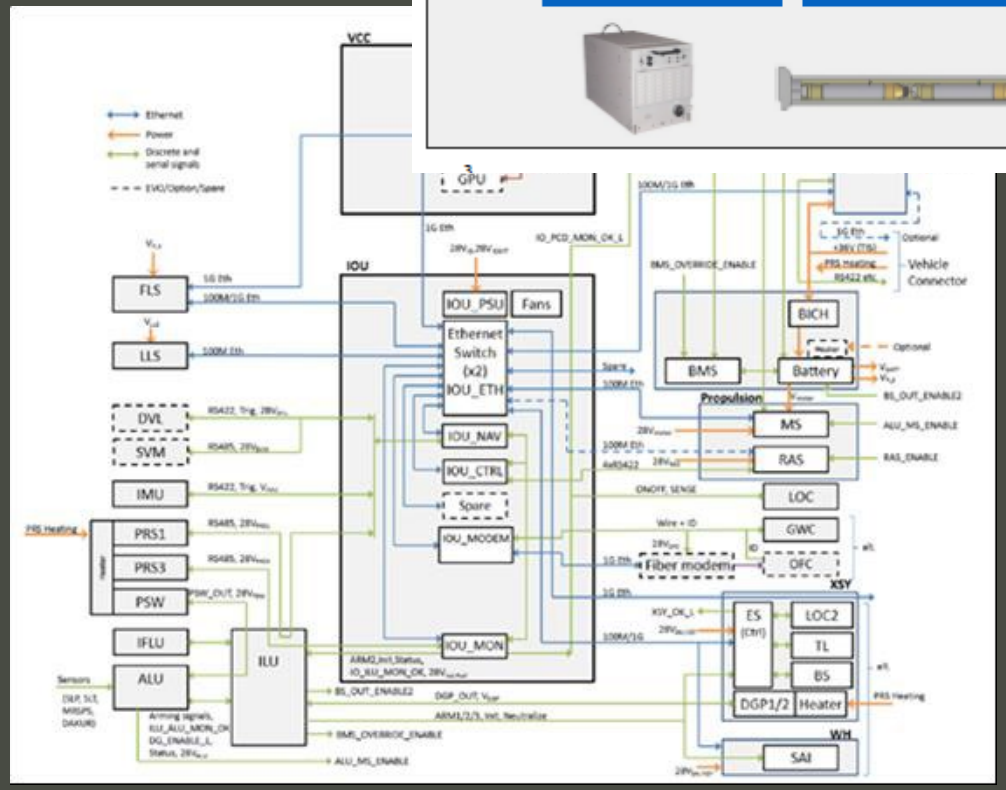
Sonar | Combat Management System | Torpedo System

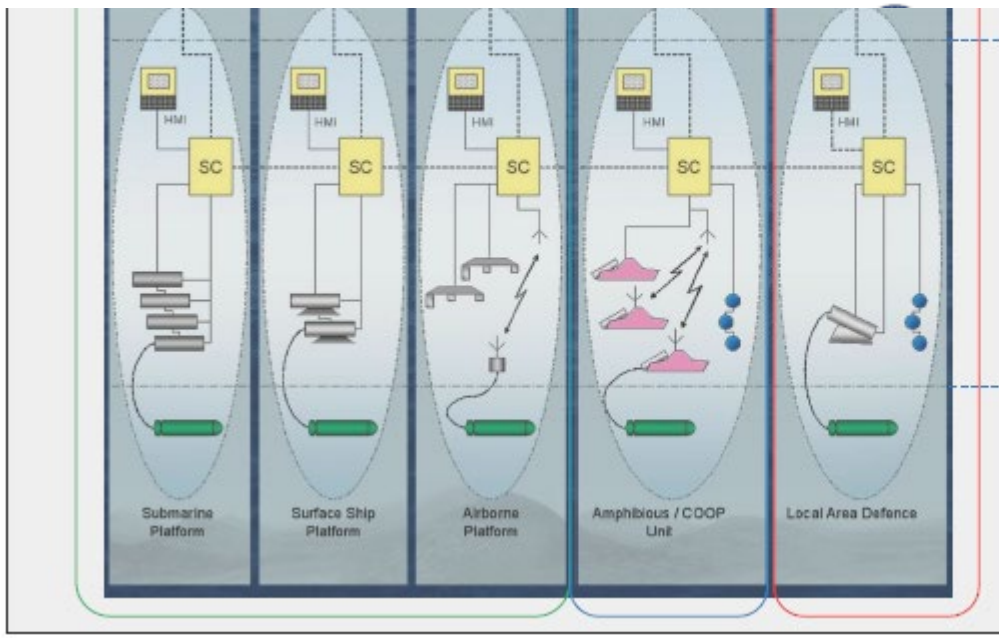
Torpedo Interface System | Torpedo Tube | Communication System | Torpedo



- Tactics
- ROE
- Documentation
- Training
- Experience
- System-Safety
- Logistics







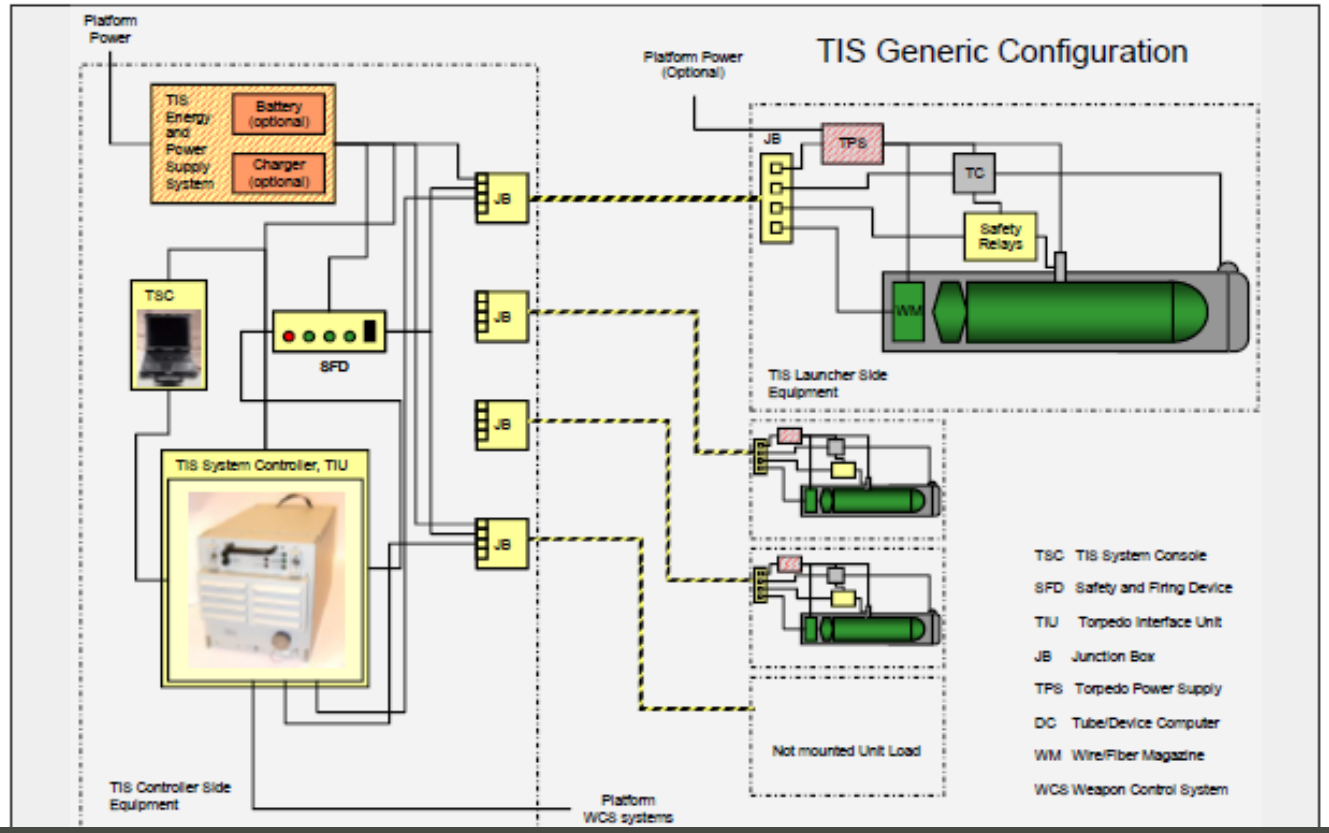
Platform/ NCW Layer

Controller Layer

SC = System Controller (TIU)

Vehicle Layer

Torpedo Interface System (TIS) Architecture



Technical Plattform - Desires and Requirements

Desires

- Rapid industrial reaction times
- Quickly from need to delivery
- Threat Adaption During Life Cycle
- EOL Management
- Security of Supply
- Cost Efficiency

Requires

- Competence Sustainment
- Continuity
- Life Cycle Planning
- Perception of Future Technologies
- Threat Development Perception
- Investments

"The technical platform is more than hardware, software and logistics support. It comes from knowledge, skills and capacity"

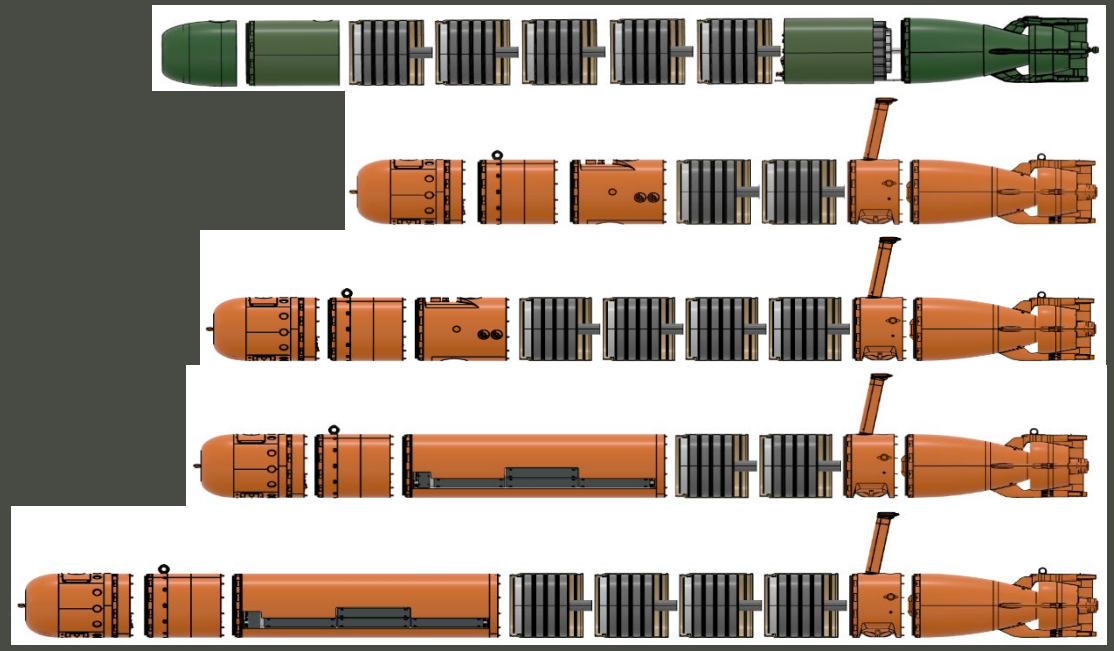
Technology know how needed

- **Systems Engineering**
- Environmental Know How
- Doctrin
- Energy Systems, battery systems, fuel cells, metal burning
- Hydrodynamics, propulsion, docking
- Signatures, acoustics, magnetic, electric potential, chemical sniffing
- Sensor Systems, target heads, AUV-sensors
- Communications, wire, fiber optics, UW-Coms, RF
- Navigation
- Autonomy, ”AI”, Machine Learning
- Plattform integration, ”systems of systems”
- Threat environment development prediction

Technical plattform, ”Energy Module”

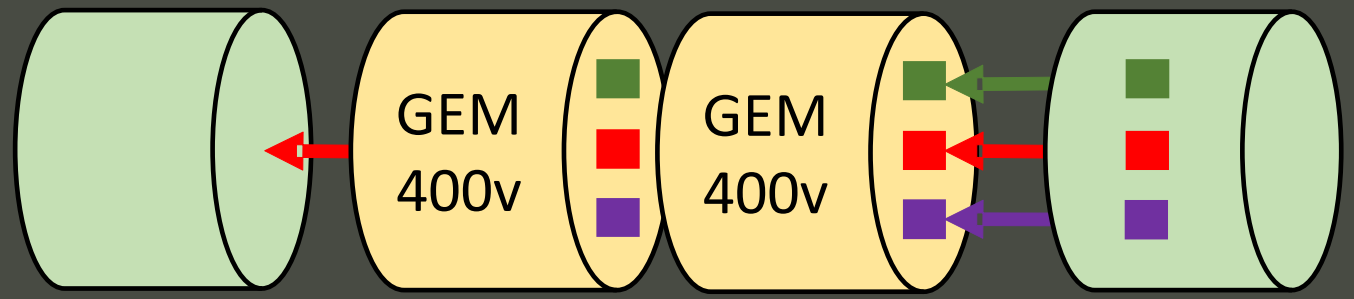
- Common Energy Module (GEM53):
  - Torpedo 63
  - AUV62-MR
  - AUV62-AT
  - Self Propelled Mine

- New development
  - Based on know/how from Torpedo 47
  - New chemistry NMC

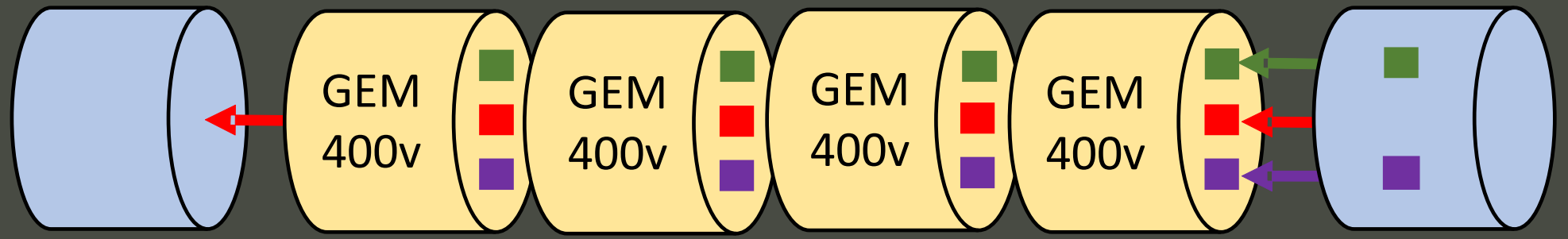


Common Energy System, Design concept

AUV62
- 2 parallell
- 400 V
- 42 kWh



Tung Torped
- 2 parallell, 2 serie
- 800 V
- 84 kWh



Kontroll/Data Charge/Discharge Battery Management/Safety Management

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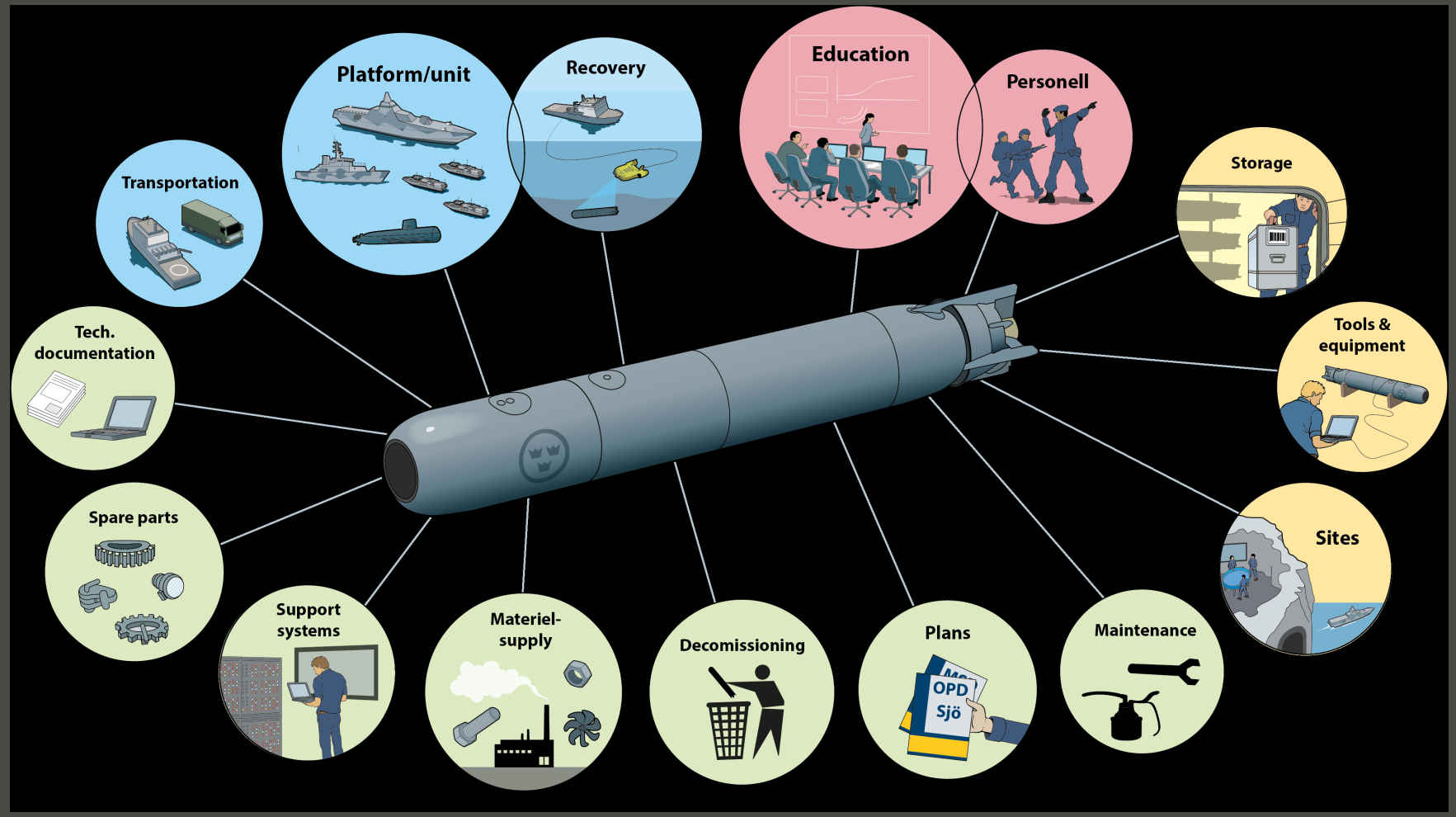
Re-using , sharing earlier work – through coordination



Q & A