

Saab Kockums Composite Products and Technologies

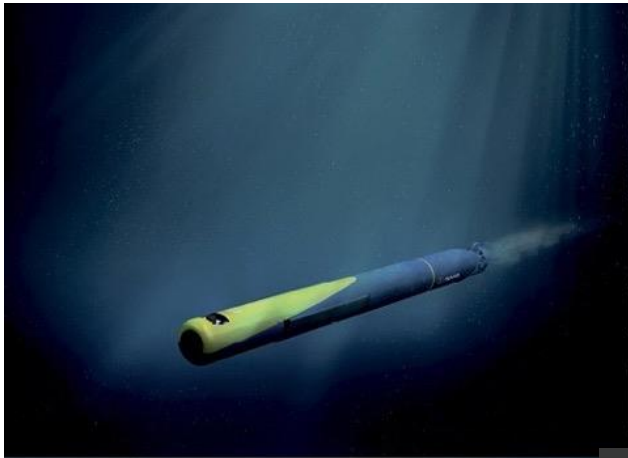
2020-03-12

Dr. Roger Berg

Director Technology Management

Saab Kockums

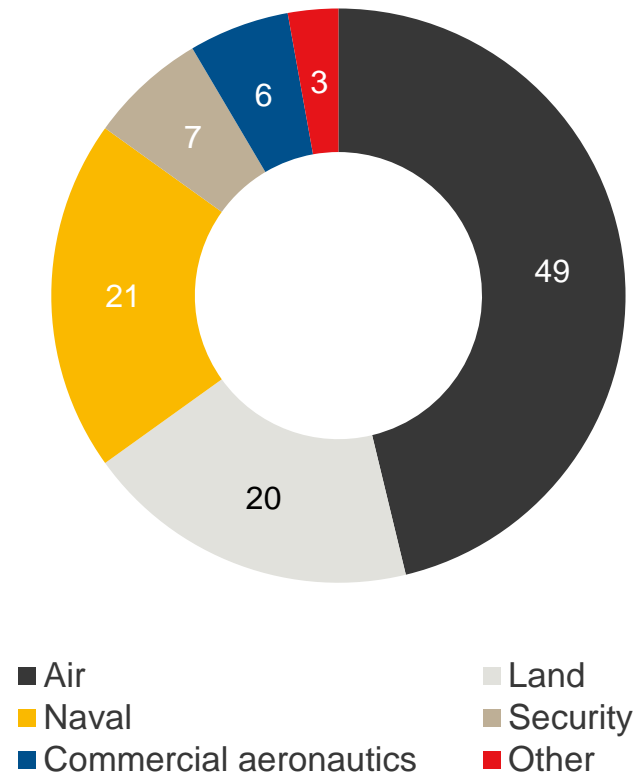
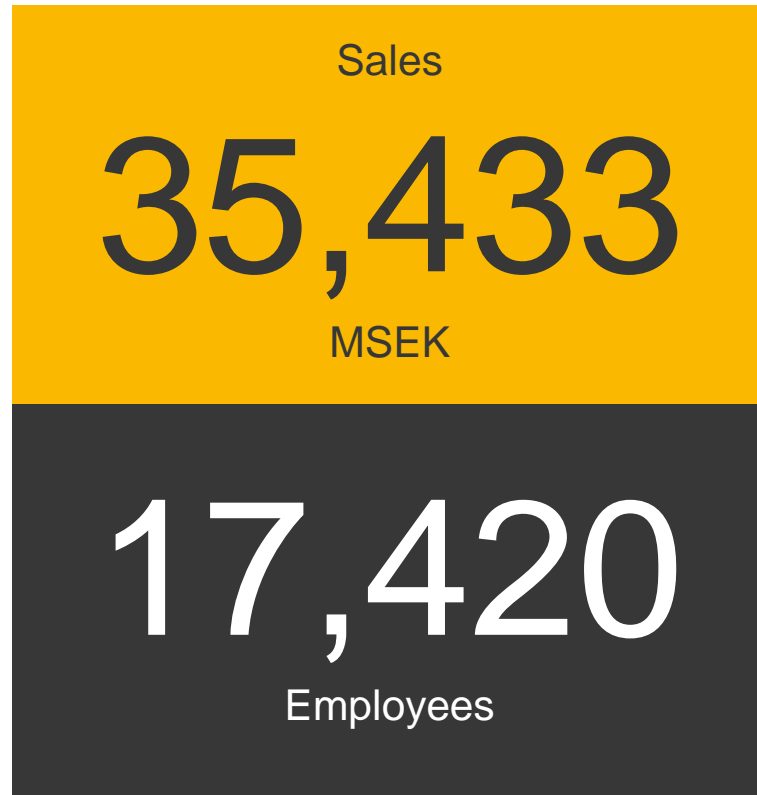




Our broad offering



Saab Group Overview – 2019



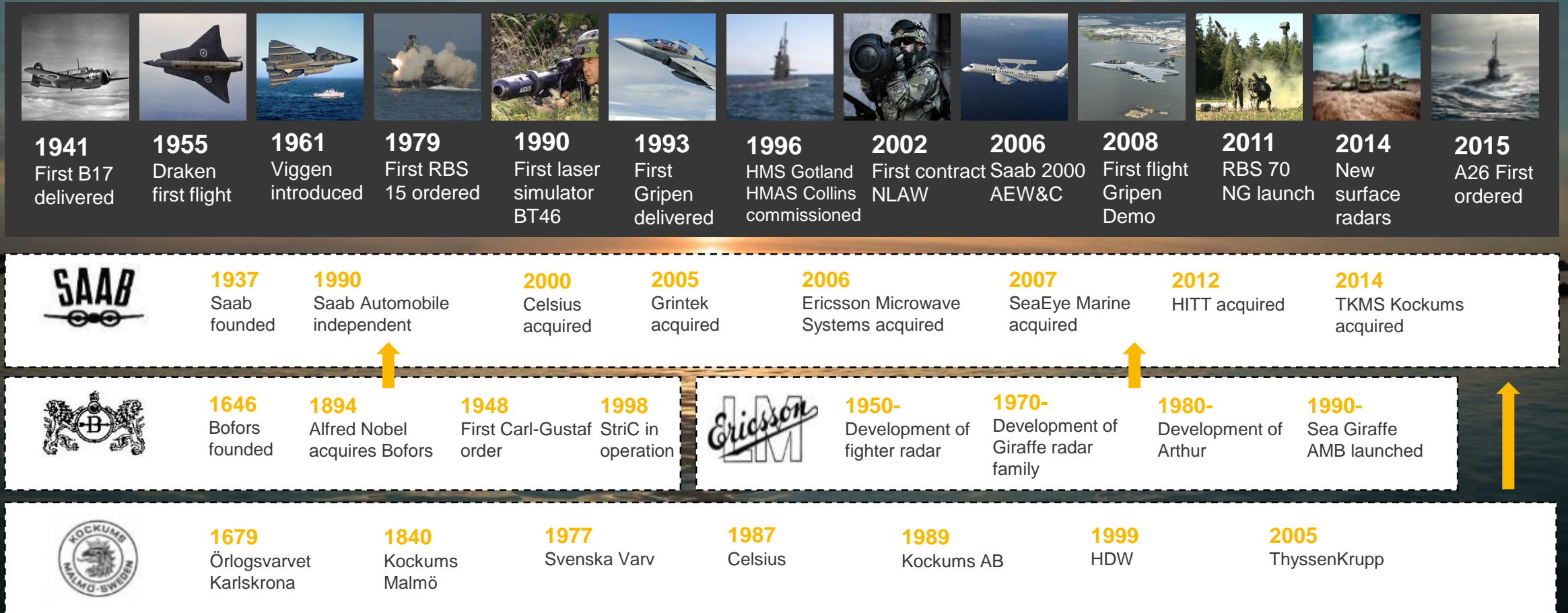
How we are organised



COMPANY RESTRICTED | NOT EXPORT CONTROLLED | NOT CLASSIFIED
Your Name | Document Name | Issue 1



At the forefront of change



Saab Kockums - Sites and facilities



Locations

Malmö and Helsingborg

- Design and research
- Stirling AIP

Karlskrona

- Design and research
- Construction Shipyard
- Maintenance and repairs

Docksta

- Design and research
- Construction Shipyard
- Maintenance and repairs

Muskö

- Support, maintenance and repairs

Singapore

- Support, maintenance and repairs

1600 PEOPLE*



* Including FT Consultants

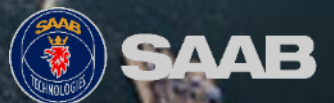


Baltic Sea

City of Karlskrona

Saab Kockums

Naval Base



Product portfolio



Submarines

World leading submarines based on generations of evolution and proven design



Stealth ships

Design and construction of surface vessels and systems based on holistic stealth approach



MCMV

World leading supplier in vessels and systems for mine counter measures, manned and unmanned



Patrol and Combat Crafts

More than 250 vessels delivered world-wide, based on the legacy of Docksta



Technology

Stirling AIP
Material technology
Autonomous systems
Underwater technology



Through Life Support

Configuration management, maintenance, repairs and international missions

Combat Boat 90 –CB90 - Fast Assault Craft

Technical data

Length, OA:	14.90 m
Beam:	3.85 m
Displacement:	18 tons
Engine power:	2 x 600 kW
Speed:	45 knots

EUROPEAN DEFENCE FUND



EUROPEAN
DEFENCE
AGENCY



€35 million

Research Window

Development of future key capabilities at TRL 5-7.
"Open" proposal procedure

Research

EDA Pilot
€1,4 million

EU PADR
Total €90 million for 3 years

EU Defence Research Programme (EDRP)
€500 million per year

2016

2017

2018

2019

2020

2021

2022

2023

2024

2025

2026

2027

Pilot/ EDIDP1:
Total €500 million

EU Industrial Development Programme (EDIDP)
Total €1 000 million per year

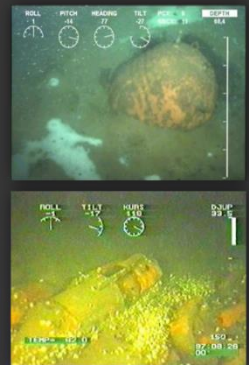
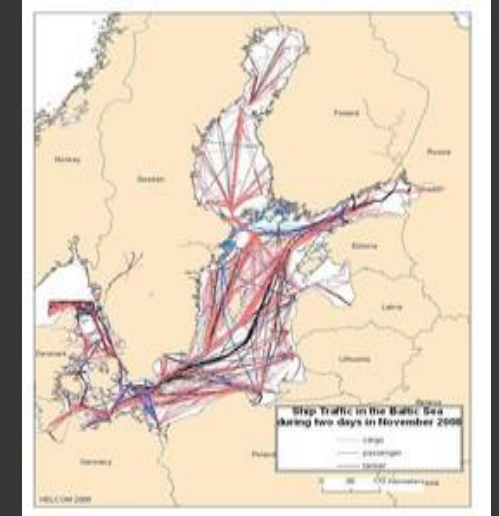
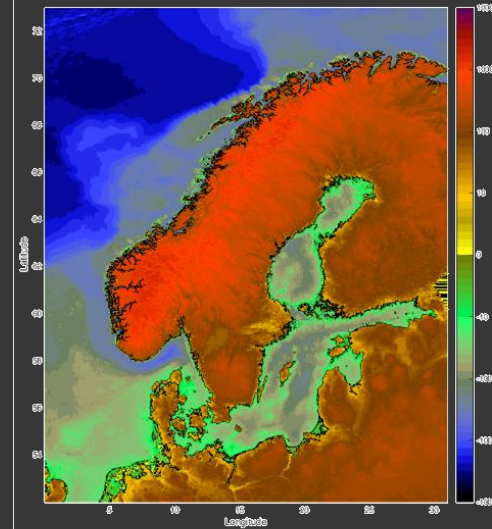
Capability Window

Projects need at least 3 entities representing at least 2 Member States.
EU funds maximum 20% of development cost.

Development

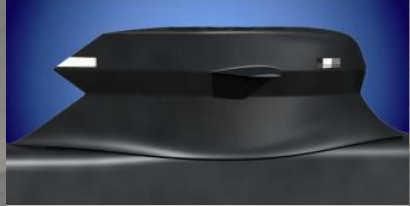
Operations in the Baltic Sea

- Very shallow (50 m in average) and low salinity (ca. 8 ppt)
- Complex hydroacoustic conditions
- Muddy water, organic material, poor visibility
- Complex archipelagos, heavy sea traffic
- Large number (>50 000) of unexploded mines and ordnances
- Congested - Several navies operate in the area – incidents and violations
- **Summary:** Very complex naval operation environment



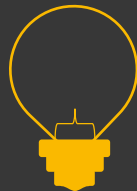
Blekinge Class - A26 submarine

- Next generation submarine for Royal Swedish Navy
- Designed for the littorals with ocean going capabilities
- Stealth
- Stirling AIP
- Shock resistant
- Advanced sensors
- Flexible payloads and modular design



Establishing methods, tools and facilities for future production

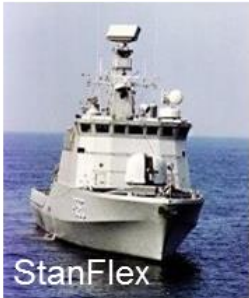
- Adding new capabilities and capacities
- Increased efficiency with digitalization
- Optimised workflow from steel cutting to verification
- Industrial robots to handle heavy and monotonous jobs
- Safe, clean and attractive environment improves quality



Taking the next step



From **Viksten** to **Visby** **40 years** of composite shipbuilding



Why composite ships?

- Swedish Navy in early 1970s
- Wooden minesweepers
 - Non-magnetic & shock resistant
 - But complicated construction
 - **And high maintenance**
- Requirements for new minesweepers
 - New but equivalent construction material
 - Less labour-intensive construction
 - Reduced maintenance



MCMV 47 Koster Class

- Low signatures
 - Non-magnetic, silent propulsion
- High shock resistance
 - Full scale tested
- Comprehensive MCM suite
- Excellent manoeuvrability
 - Voight propulsion
- Self protection
 - Surveillance radar
 - Fire control director
 - 40 mm Bofors gun



PVDS

Propelled Variable Depth Sonar
SAAB Double-Eagle Mk III

HMS

Hull Mounted Sonar
Atlas Elektronik 12M

Uw Pos

Underwater Positioning
Kongsberg HiPAP 501

ROV

Remote Operated Vehicle
SAAB Double-Eagle Mk II

MDV

Mine Disposal Vehicles
Atlas Elektronik SeaFox

Divers

Mine Identification /
Disposal

MCM C2

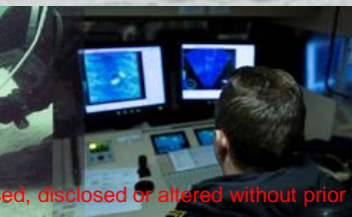
MCM Command & Control
Atlas Elektronik IMCMS

SAM

Unmanned Minesweeper
Saab Kockums SAM 3

Mine sweep

Towed sweep
Mechanical



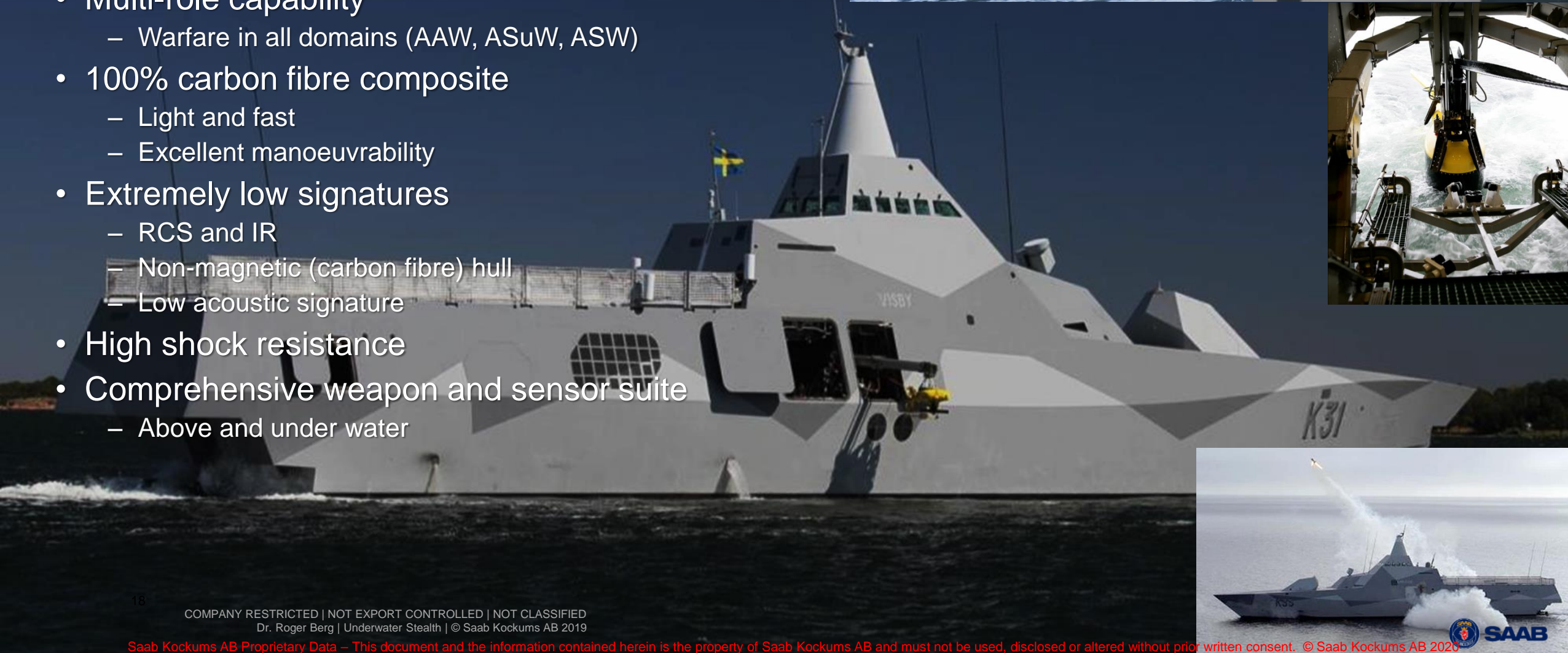
More **advantages**

- 30-50% structural weight reduction
 - Speed
 - Payload
 - Ship stability
- Stealth
 - Radar
 - Infrared
 - EMC/EMI (shielding)
- Life Cycle Cost (LCC)
 - 80% reduction hull maintenance (vs steel), 30% reduction LCC



Visby Class Stealth Corvette

- Multi-role capability
 - Warfare in all domains (AAW, ASuW, ASW)
- 100% carbon fibre composite
 - Light and fast
 - Excellent manoeuvrability
- Extremely low signatures
 - RCS and IR
 - Non-magnetic (carbon fibre) hull
 - Low acoustic signature
- High shock resistance
- Comprehensive weapon and sensor suite
 - Above and under water



Ship Stealth

- 100% carbon fibre
- Light, fast and maneuverable
- Extremely low RCS
- Non-magnetic
- Low IR signature
- Silent water-jet propulsion



Technology **Transfer** to Japan

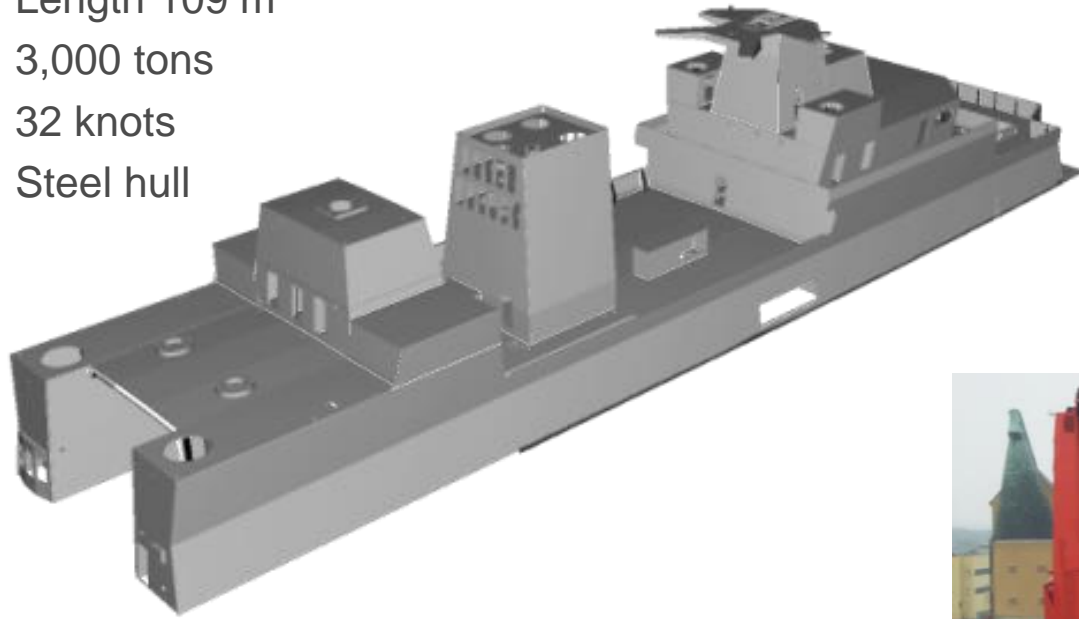
Delivery of the minesweeper “Enoshima” March 21st 2012 at Tsurumi Works Yokohama



Carbon-fibre Superstructure for **P28 Kamorta** Class corvette Indian Navy

Ship Specifications →

- Length 109 m
- 3,000 tons
- 32 knots
- Steel hull



Carbon-fibre Superstructure ↑

- Length 65 m
- 100 tons (abt 50% saving)
- Built and shipped in modules



Carbon-fibre Superstructure for **LMV Independence** class Singapore Navy

Specifications

- Length 80 m
- 1,200 tons
- 27+ knots
- **Steel hull / carbon-fibre superstructure**
- Diesel / CP propellers
- Mission containers
- Twin stern ramp
- Helicopter



Trend towards heavier Top-side Arrangements



Destroyer (US)



Support Ship (NL)



Destroyer (France)



LPD (NL)



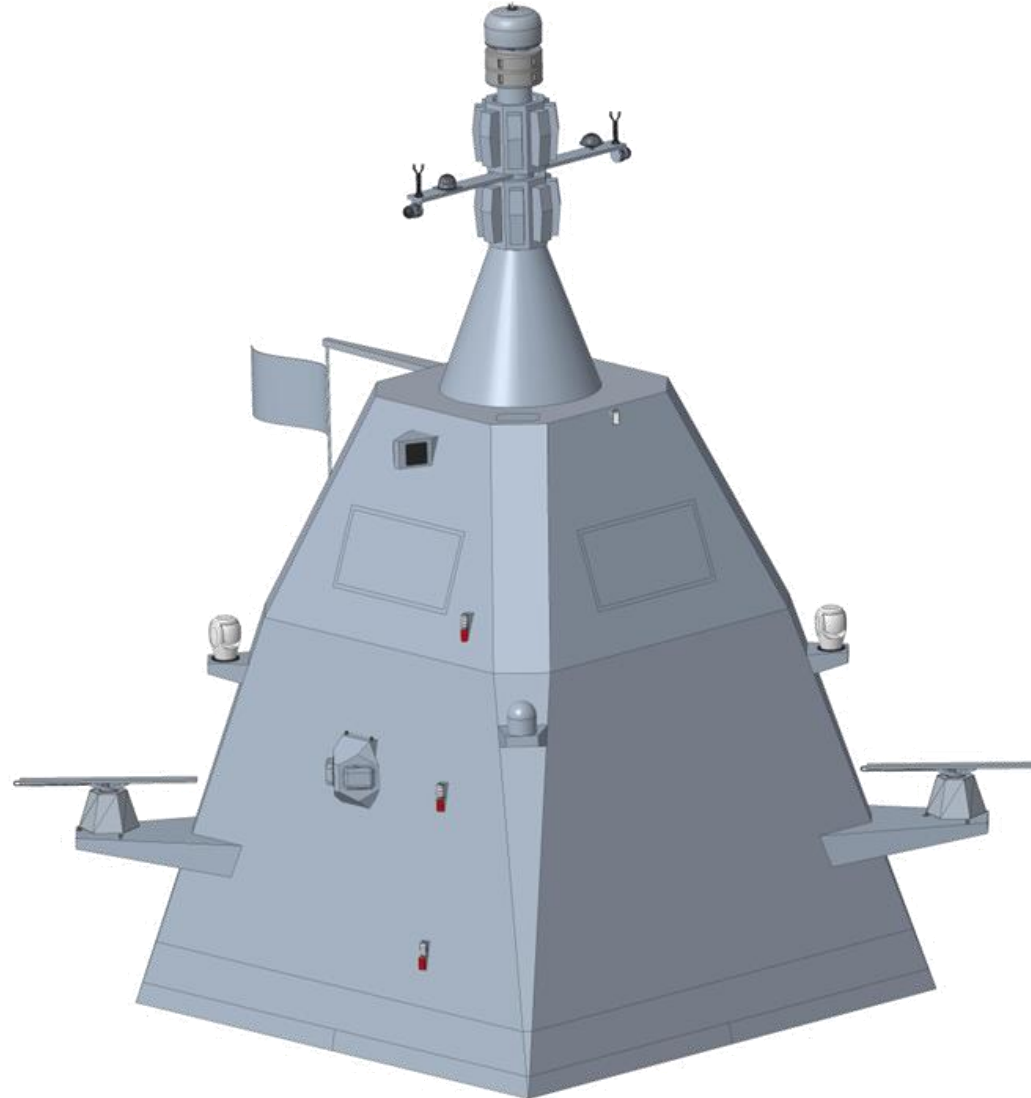
Destroyer (UK)



Frigate (Denmark)

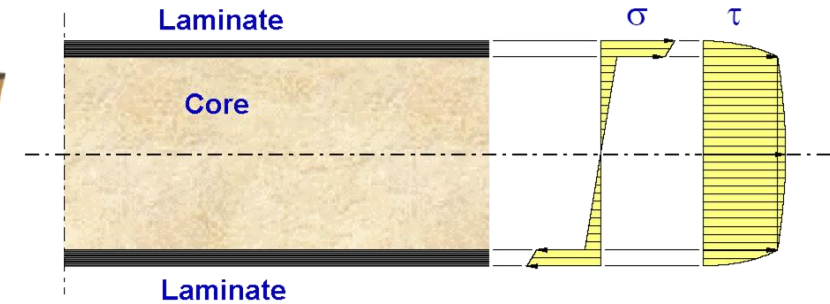
SLIM

Saab Lightweight Integrated Mast

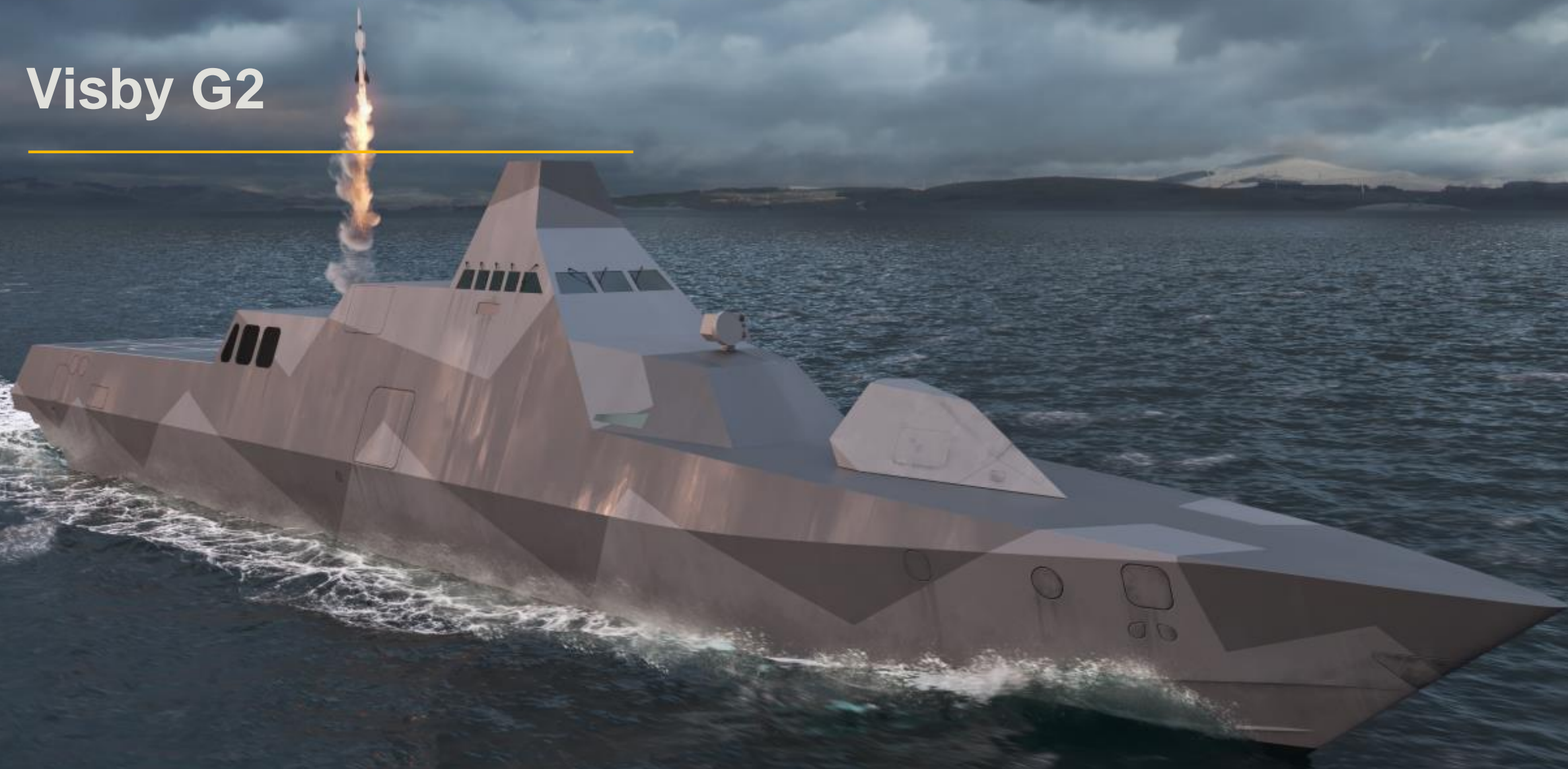


Sandwich construction

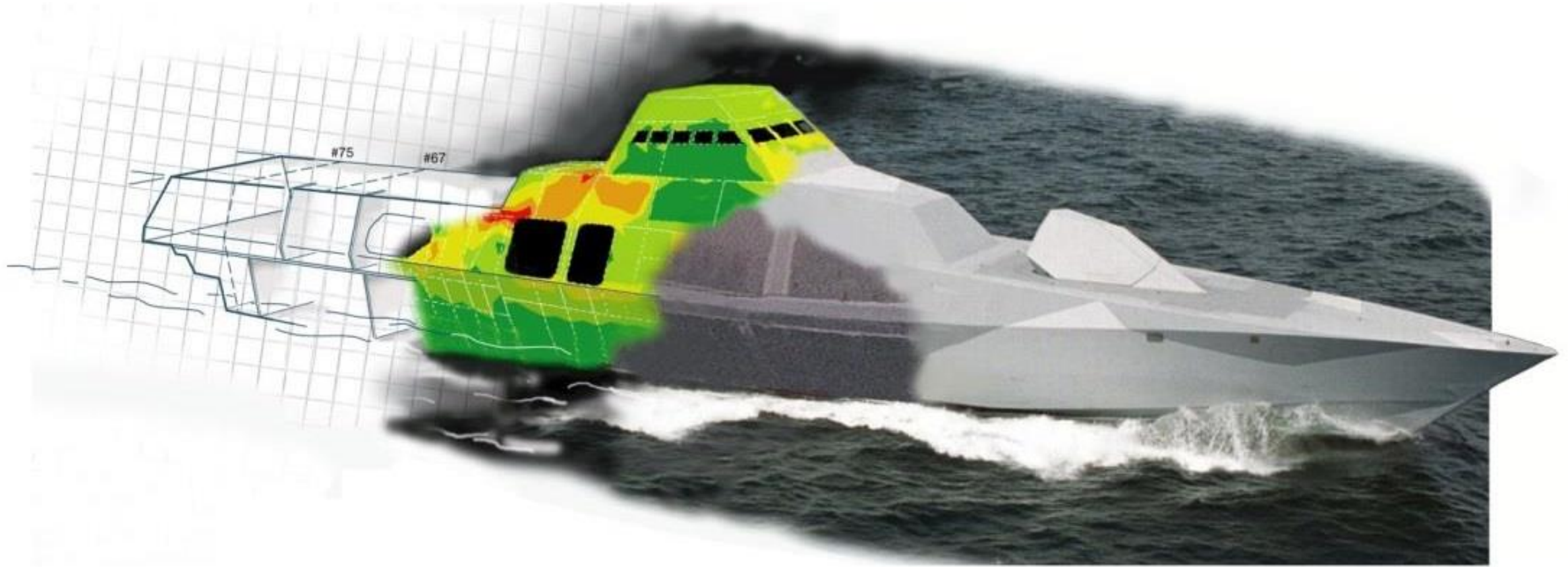
- Double-skin
 - Two load-bearing fibre skin **laminates**
 - Lightweight foam **core**
- Main result...
 - Increased stiffness
 - Reduced weight
 - Large panel fields
- In addition...
 - Built-in insulation
 - Easy to maintain



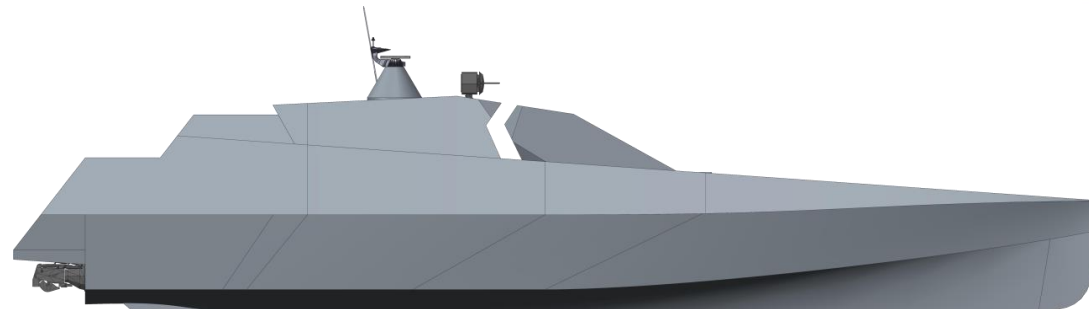
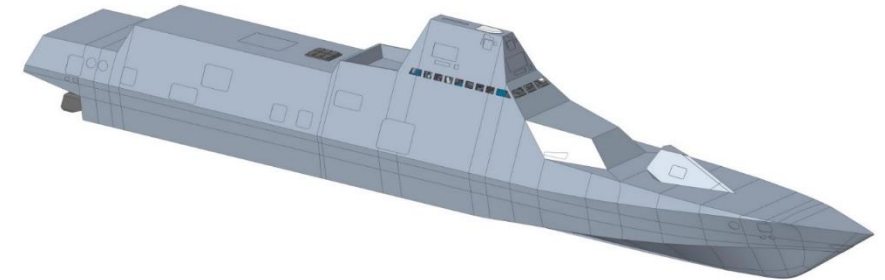
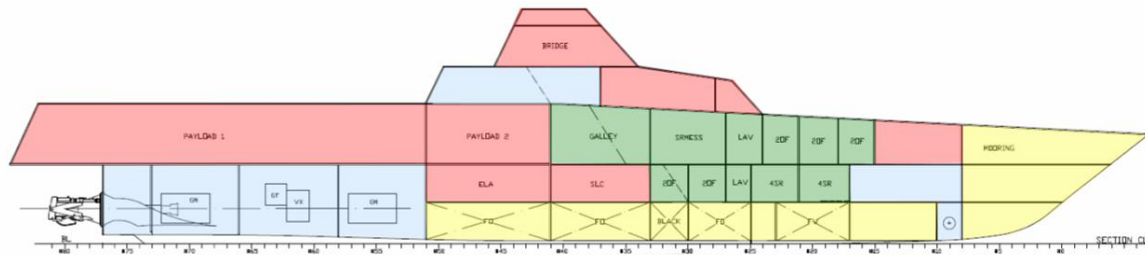
Visby G2



Composite Ship Design and Construction Challenges



Conceptual Design



Based on Proven Solutions

Mission Modules

(StanFlex)



Unmanned Vehicles

(SAM, Piraya)



Stern Launch & Recovery

(Swedish Coast Guard)



Steel / Hybrid Design

(P28 corvette)



Visby class corvettes

Stealth technologies, Multi-role, Composite Hull



FLEXPATROL Family

OPV, FAC, ASW, ASuW, MCM, Multi-role



Littoral Mission Vessel

Shock Resistance

(Koster, Styrso, Visby StanFlex, etc)



MCM Technologies

(Koster, Styrso, Visby, SAM etc)



ASuW Systems

(Stockholm, Gothenburg, Visby, Koster etc)



Stealth Technologies

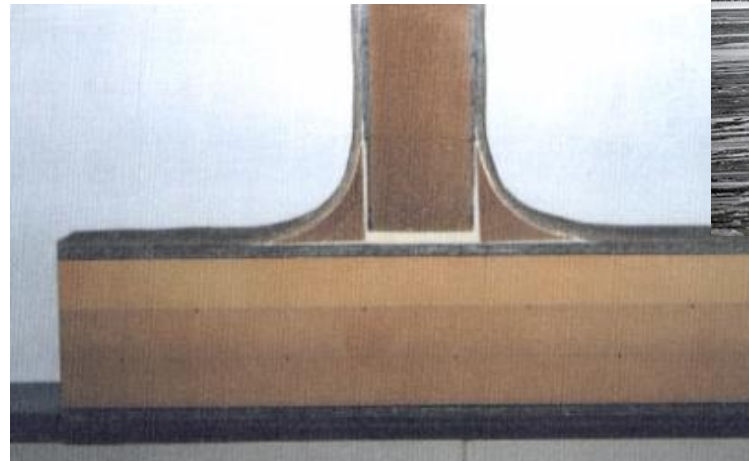
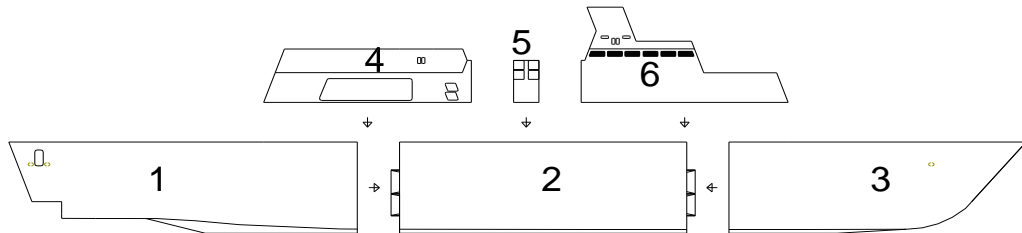
(Visby, Smyge, Koster, Gothenburg etc)



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Structural Design and Construction

- Static and dynamic loads
 - Shock, slamming, sea, ice
- Materials (fibres, resins, core)
- Weight/strength optimisation
- Panel (butt) joints and T-joints (deck-bulkhead)

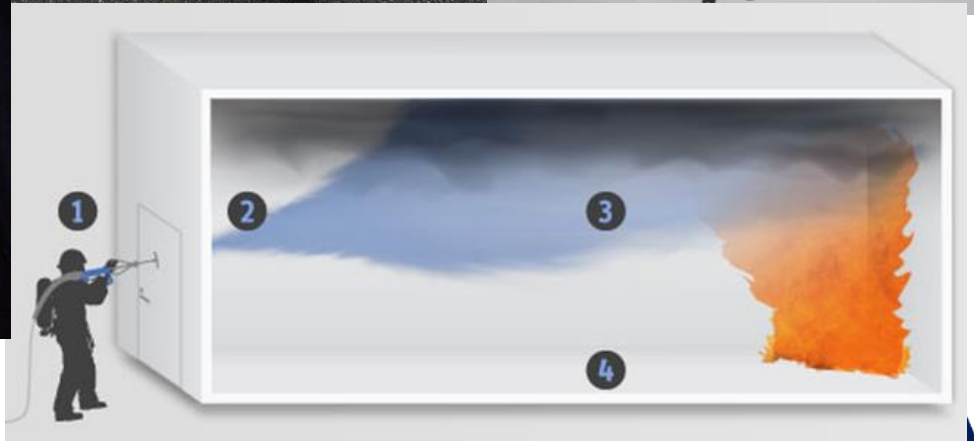
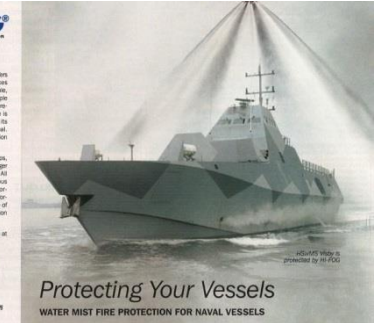


SHOCK RESISTANCE

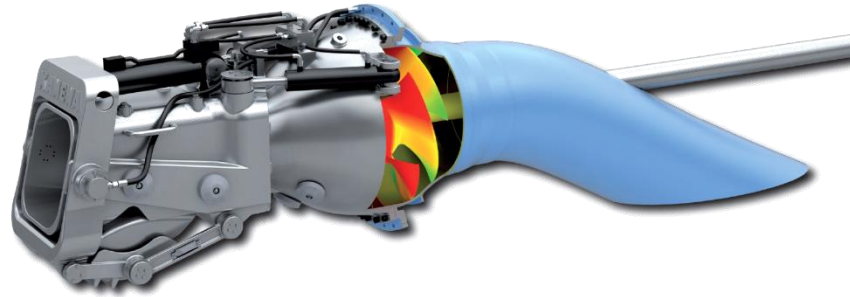
– SURFACE SHIP DEVELOPMENT



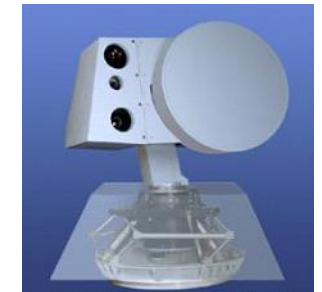
Fire Resistance and Protection



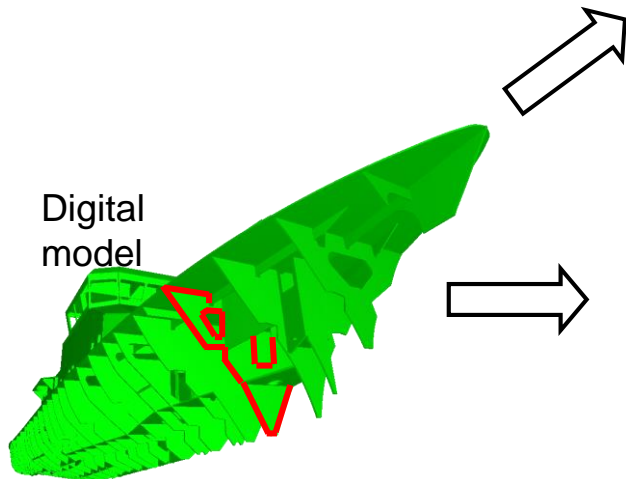
Ship Systems Integration



Combat System Integration



Production Development



Submarine Applications

