



The Skjold Class Fast Reaction Craft

Skjold Background

- Lead Boat of Class Completed in April 99
 - SES Technology Based on Successful MCMV Program
 - 9 MCMVs Built & Deployed
- Successfully Tested in Norwegian and Arctic Waters
 - Norwegian Navy OPEVAL Completed in 2000
 - 1000 Hours of Operation in Rigorous Sea States (1-6)
 - All Performance Requirements Achieved
- World Class, State-of-the-Art Fast Reaction Craft



SES Concept Proven by MCMV Deployment

- SES Technology Matured by MCMV Class
- Royal Norwegian Navy Verified:
 - Low Shock Load Vulnerability
 - Seakeeping Stability
 - Magnetic Signature
 - Maneuvering Capability
- Skjold OPEVAL Validated Extremely Low Fluid Drag
 - Significantly reduced wave resistance at high speed gives high speed at low power settings



Skjold Class - Key Features

Length	155 feet
Beam	44 feet
Displacement	270 tons
Speed at Seastate 3	45 knots
Draft (on cushion)	3 feet
Range (fully loaded)	800 nm
Crew	15

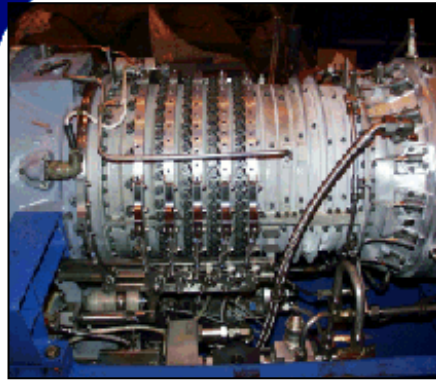
Propulsion:

- 2 x 8000 hp Allison KF571 gas turbines
- 2 x 400 hp diesel engines for slow speed maneuvering
- 2 waterjets
- 2 x 930 hp 12 cycle MTU 183 for lift fans

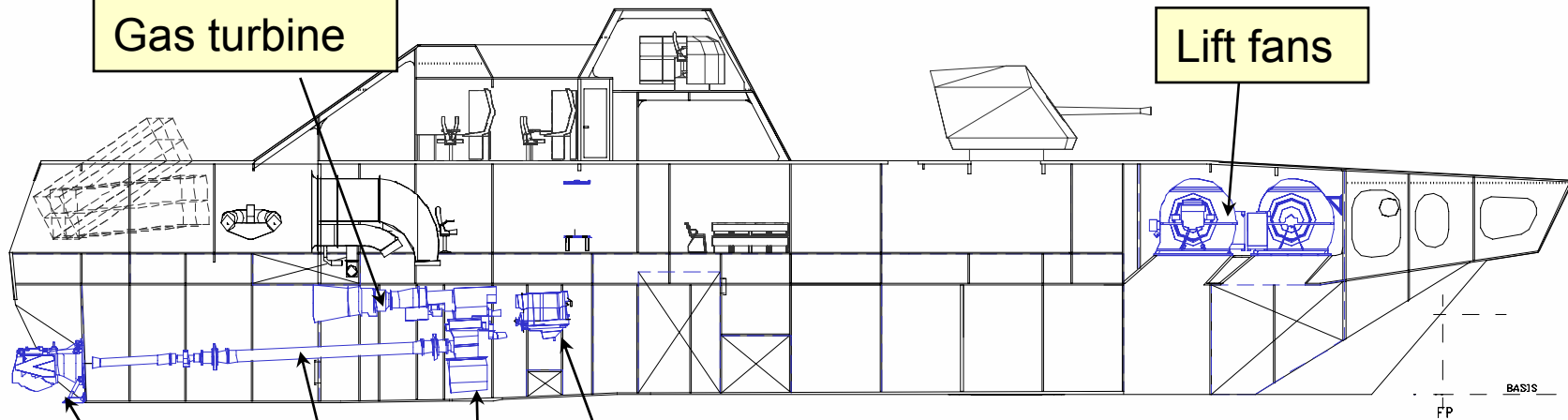


Propulsion System

- Twin Hull Waterjet Drive System
- High Speed Operations
- Precision Maneuverability



Gas turbine



Lift fans

Diesel engine

Gear box

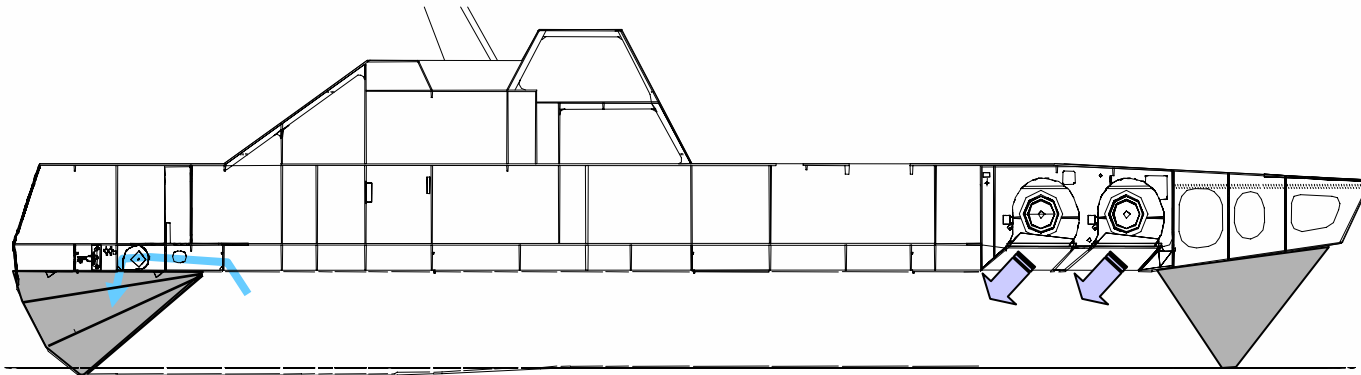
Waterjet

Composite shaft



Surface Effect Ship Design Principles

- Catamaran Hull (Twin Hulls)
- Fans Blow Air Into the *Air Cushion* Between the Hulls
- Rubber Seals Close the Air-leakage
 - Bow Finger Seals
 - Stern Bag Seal
 - Ride Control System Improves Seakeeping and Comfort



Fire Safety

- Fire Safety Significantly Improved By Norway's Fire Resistant Composite Development Program
- Lightweight Composite Ship Structures Have Better or Equal Fire Safety Compared to Steel Structures
- Smoke/Heat/Toxicity Well Within A 60/ISO 5660 Standards

A 60 Requirements

- Test Time > 60 min
- Backside Temp < 140°C
- Max Deflection < 97 mm

Actual Test results

- Test Time: 61 min
- Temp Increase: 27 °C
- Deflection: 3.5 mm

Exceeds A60 Standard By Wide Margin!

Norwegian FPB Requirements

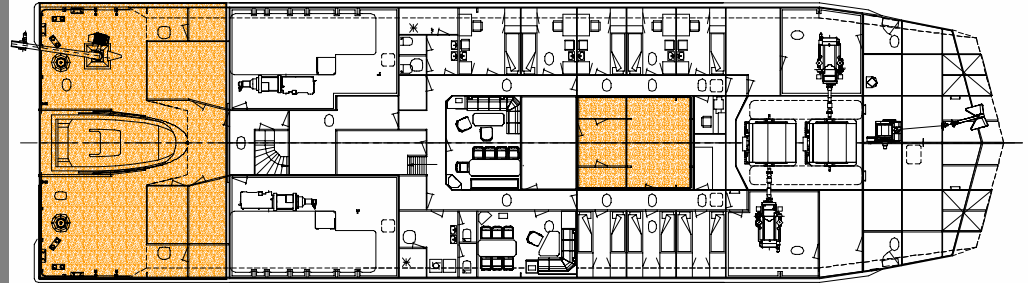
Requirement	Required	Verified
Payload capacity	◀	◀
Mission efficiency	◀	◀
Speed		
Calm water: >45 knots	◀	◀
Seastate 3: 45 knots	◀	◀
Seastate 5: >25 knots	◀	◀
Seakeeping performance		
100 % operability in SS4	◀	◀
100 % operability in SS5		◀
Maneuverability	◀	◀
Range 800 nm	◀	◀
Radar Cross Section	◀	◀
IR-signature	◀	◀
Optical signature	◀	◀

All Norwegian FPB Requirements Met or Exceeded

Payload Capacity

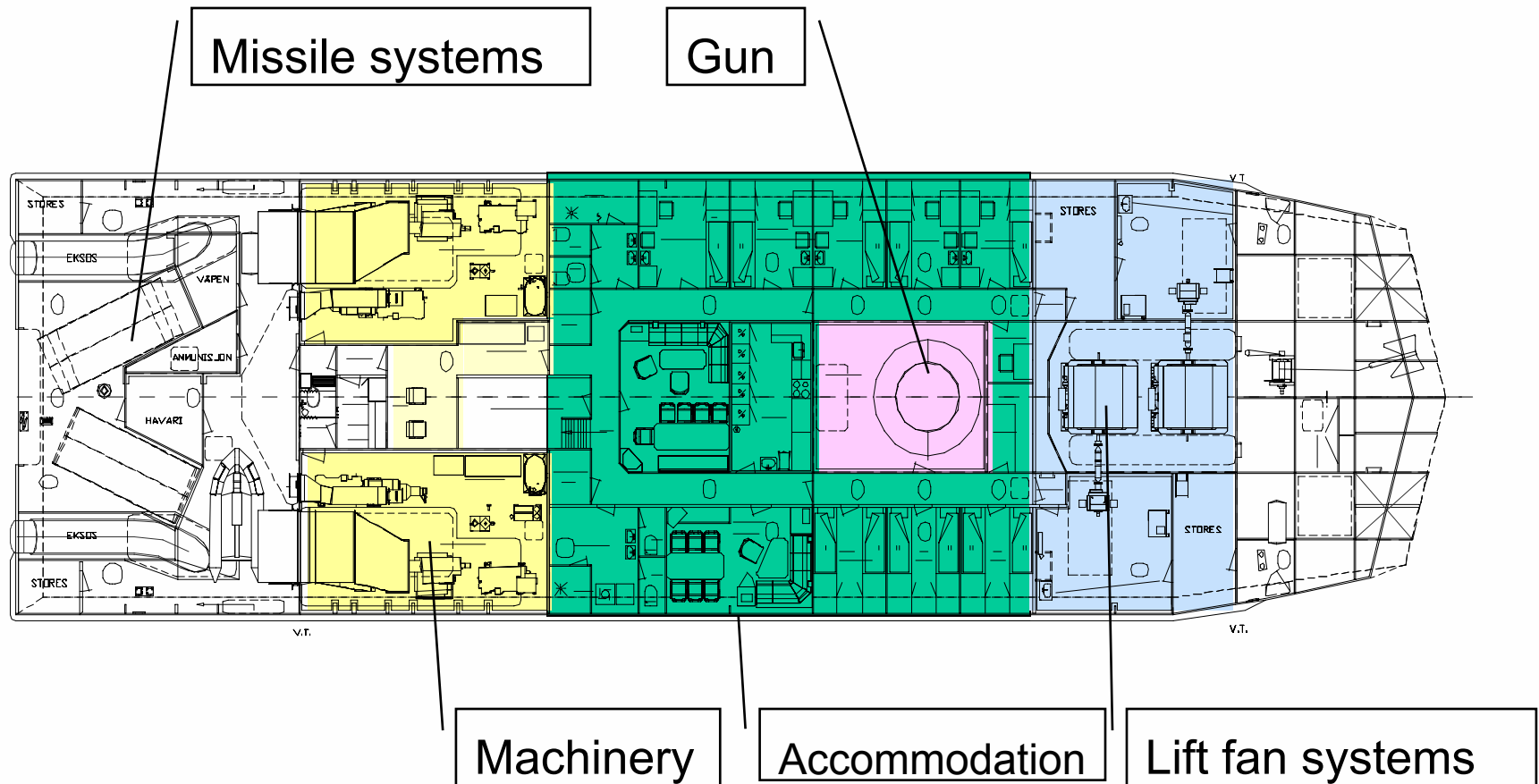
Weight Summary

Lightship	200 tons
Fuel/Fluids	35-40 tons
Payload	30-35 tons
<u>Fully Loaded</u>	<u>270 tons*</u>



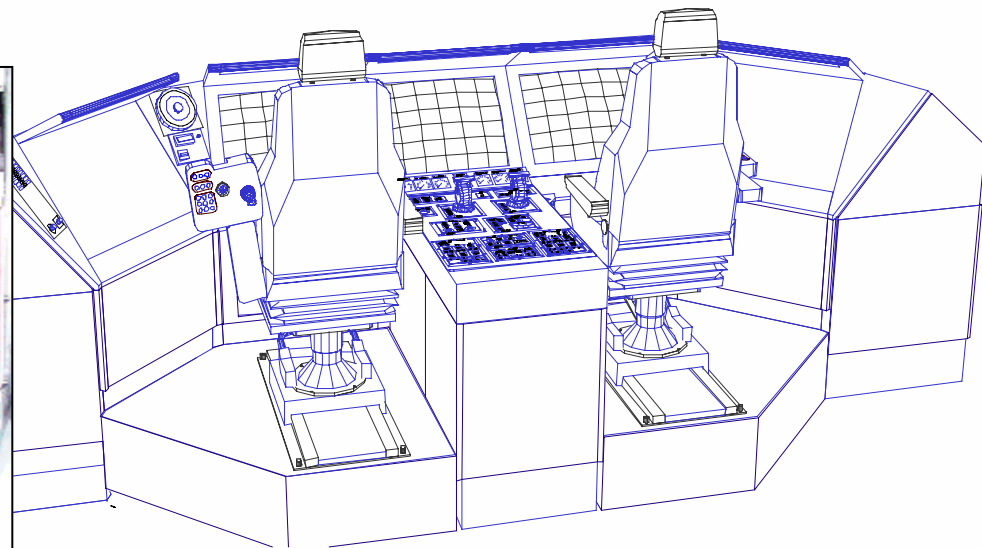
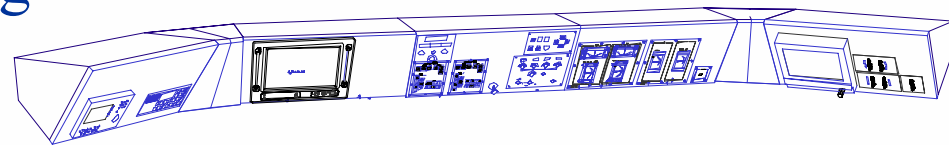
- Low Lightship Weight Allows for Modular Payload Alternatives and Range Tradeoffs
 - Alternative Modularized Sensor/Weapon Systems
 - Extended Range with Aux Fuel
 - Large Bays and Deck Spaces for Modular Mission Flexibility (i.e. Aft Bay can hold 8 Harpoons or 102 Troops or 153 Pax)
- * Operated during OPEVAL at 300 tons in all range of sea states

KNM Skjold - Interior Arrangement



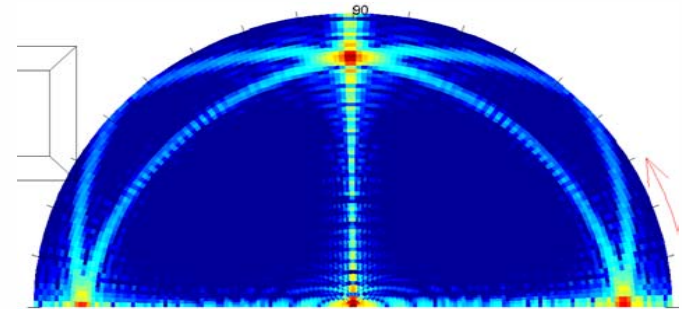
Integrated Bridge

- Improved Command & Control Features
- Improved Ship Handling
- Reduced Manning



Low Radar Signature Achieved

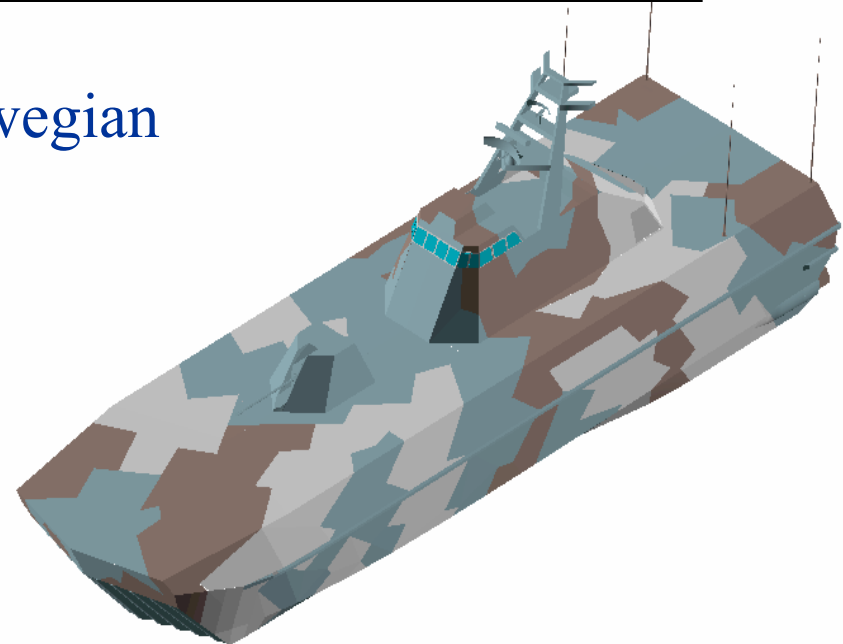
- **90-99% Reduction of RCS**
Compared to Hawk Class FPB
- Radar Reflective and Radar Absorbent Materials Design
 - No 90 Degree Corners
 - Deck Outfitting Covered or Demountable
 - Flush Doors and Hatches
 - Air Intakes to Gas Turbines and Lift Fans Covered With Radar Absorbing Grid/Mesh
 - Flush, Radar Reflective Window Screens
- Constructed With Large Areas of Load Bearing, Radar Absorbing Structures (RAS)
- NATO Exercise Validated LO Performance
 - All Other FPB Units Detected
 - Skjolds Not Detected & Not Attacked



Low Optical Signature



- Paint Scheme Tailored to Norwegian Coastal Background



Demonstrated "High Operational Effectiveness"

- **Large Engagement Zones & Suppression Area**
 - Multiple Coordinated Operations With Shared Sensors
 - High Sustained Speed
- **High Sustained Seaworthiness**
 - Full Operational Capabilities Without Degrading Crew's Performance Up To and Including Sea State 5
- **High Stealth Capability**
 - Low Radar Signature
 - Low IR Signature
 - Low Optical Signature
 - Low Acoustic Signature
 - Low Magnetic Signature



Demonstrated "High Overall Effectiveness"

- **Flexible Payload Configurations**

- High Payload Ratio
- Spacious Crew & Payload Arrangement
- Excellent Potential for Modular Payloads



- **High Operational Management Capability**

- Coordinated Operations
- Command & Control
- Information Collection & Analysis
- Effective NBCD
- Gas Citadel With Cleansing & Sluicing Facilities



Mission Configurable Options

- Flexible Operations
 - Command & Control
 - Seal Delivery/Extraction
 - Combat SAR
 - SAR/Disaster Relief
 - Law Enforcement
 - Gunfire Support
 - Counterinsurgency
 - Anti-Terrorist Operations
 - OOTW Missions
- Warfare Areas
 - ASUW
 - Missiles/Guns/UAV Ops
 - ASW
 - VDS/LFS/Torpedoes
 - AAW
 - Lightweight SAM/CIWS
 - MCM
 - Towed Sensors/UUV Ops
 - AEW
 - Sensors/Jammers/Chaff

Notional U.S. Littoral Requirements

Requirement

Skjold

<ul style="list-style-type: none"> • Small (<200 FT Length; < 46 FT Beam; 5FT Draft) 	<ul style="list-style-type: none"> • 155 FT Long; 44 FT Beam; 3 FT Draft On Cushion
<ul style="list-style-type: none"> • Stealthy 	<ul style="list-style-type: none"> • Low RADAR/IR/Optical/Acoustic/ & Magnetic Signatures
<ul style="list-style-type: none"> • High Speed 	<ul style="list-style-type: none"> • Speed > 55 KTS @ Low Sea State
<ul style="list-style-type: none"> • Agile 	<ul style="list-style-type: none"> • Highly Maneuverable Twin Jets
<ul style="list-style-type: none"> • Highly Automated (<20 Crew) 	<ul style="list-style-type: none"> • Crew Size 10-15
<ul style="list-style-type: none"> • Reconfigurable 	<ul style="list-style-type: none"> • Large Gun/Missile/Equipment Bays - Customer Dependent Load Outs
<ul style="list-style-type: none"> • Long Loiter Capability (>21 Days) 	<ul style="list-style-type: none"> • On Station Time Dependent on Speed/Mission/Aux Fuel Load
<ul style="list-style-type: none"> • Chem/Bio/Radiation Protection 	<ul style="list-style-type: none"> • Effective NBCD Citadel with filters, airlocks and cleansing stations

Conclusions

- **Skjold Class FPB Provides Significant Tactical Advantages for Littoral Operations**
 - Extremely High Transit Speed/Maneuverability
 - Cost Effective Equipment and Structures
 - Lightweight, Robust, Firesafe Materials
 - Stealth at All Tactical Bandwidths
 - Flexible Payload Configuration
- **Skjold Offers Significant Improvement in Seakeeping and Operability Compared to Monohulls**
- **Skjold Is a State-of-Art Fast Reaction Craft**

*****Ready Now for Full Scale Production*****

