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

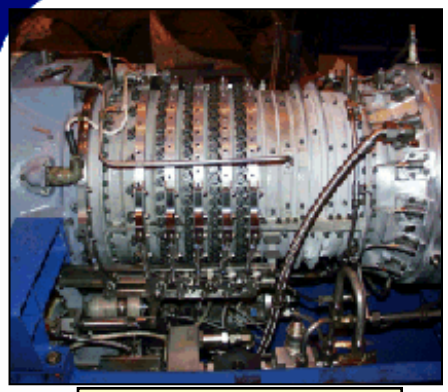
Skjold Class - Key Features

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

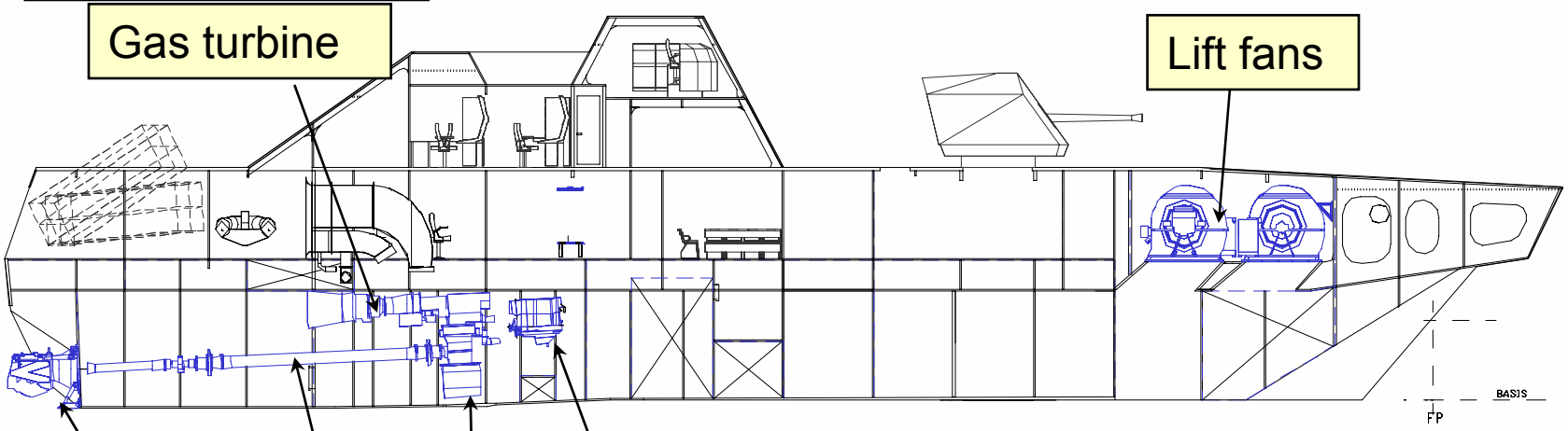
Propulsion:

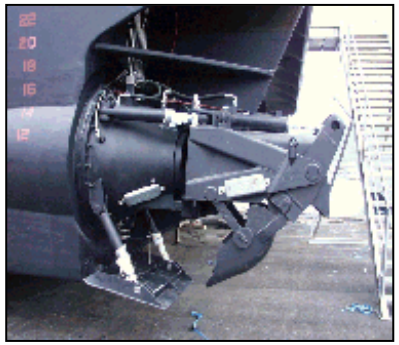
- 2 x 8000 hp Allison KF571 gas turbines
- 2 x 400 hp diesel engines for slow speed maneuvering
- 2 waterjets
- 2 x 930 hp 12 cycle MTU 183 for lift fans

Propulsion System



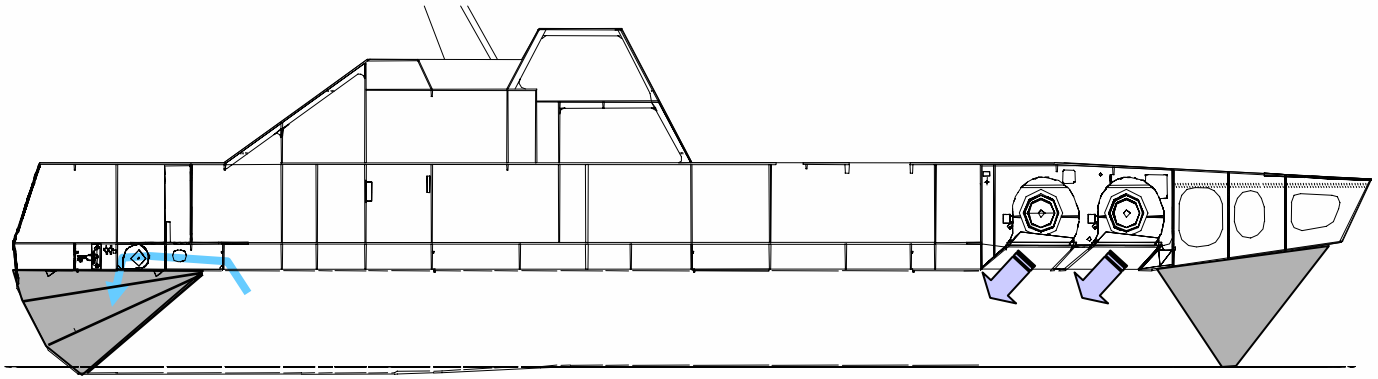
- Twin Hull Waterjet Drive System
- High Speed Operations
- Precision Maneuverability





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!

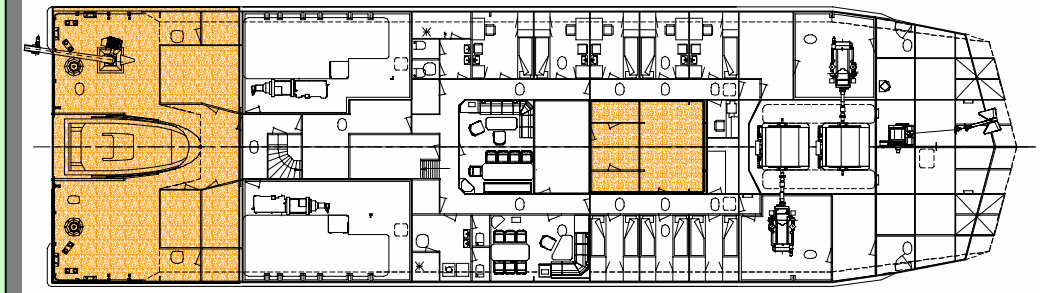
Norwegian FPB Requirements

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

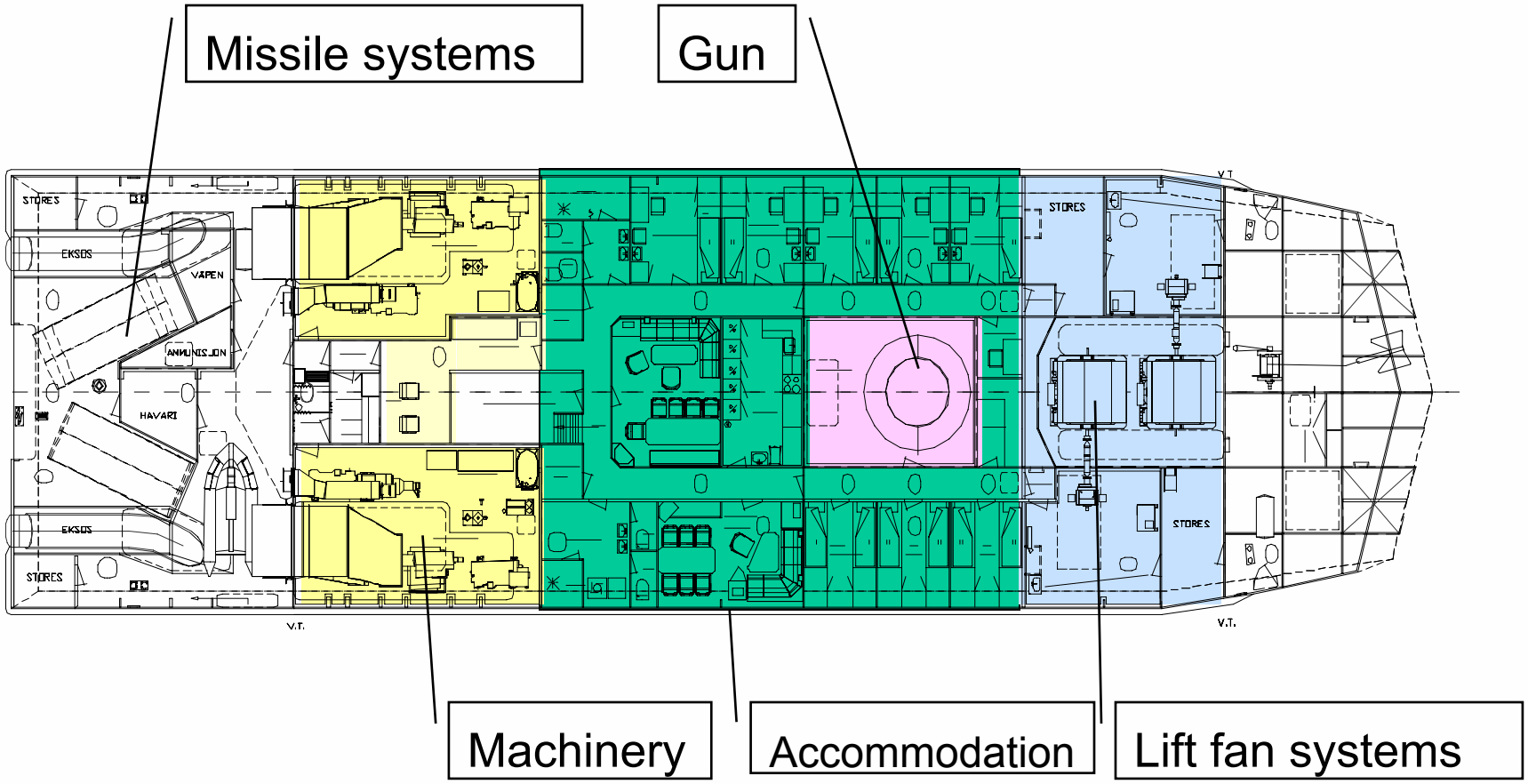
Weight Summary	
Lightship	200 tons
Fuel/Fluids	35-40 tons
Payload	30-35 tons
Fully Loaded	**270 tons***



- 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)

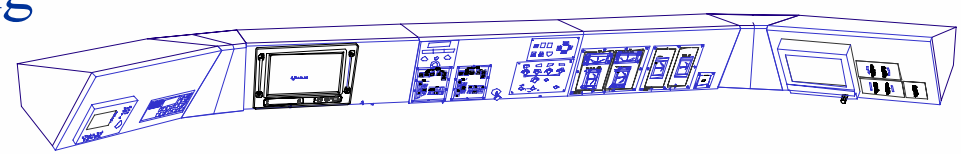
* Operated during OPEVAL at 300 tons in all range of sea states

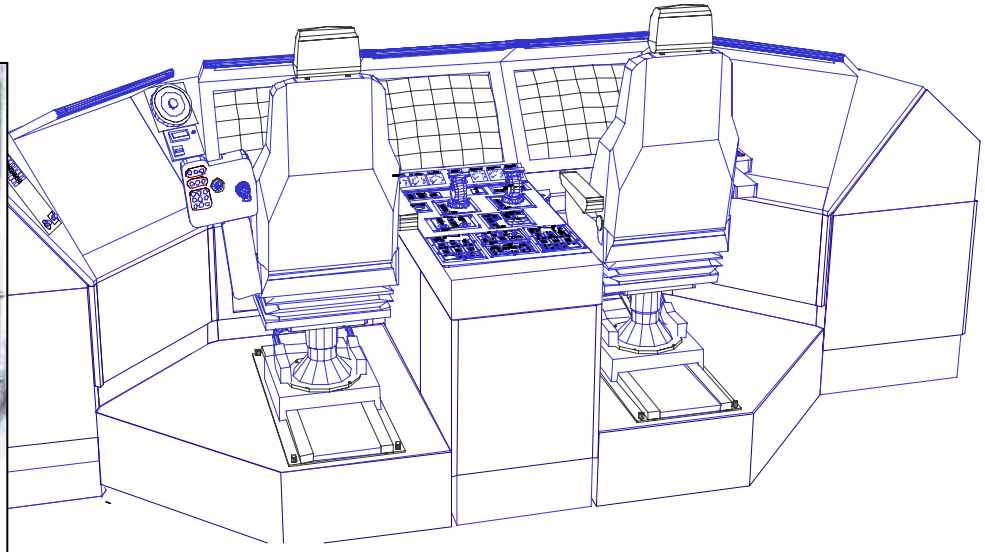
KNM Skjold - Interior Arrangement



Integrated Bridge

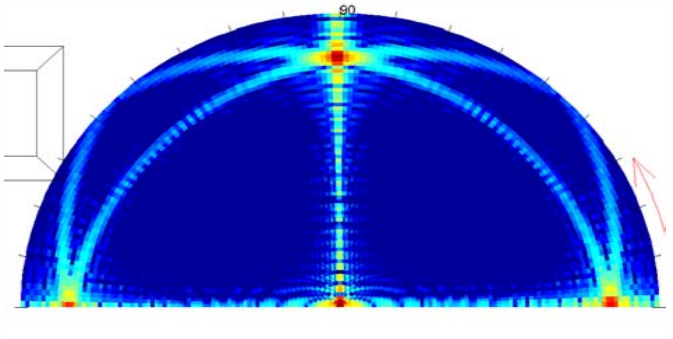
- Improved Command & Control Features
- Improved Ship Handling
- Reduced Manning





Low Radar Signature Achieved

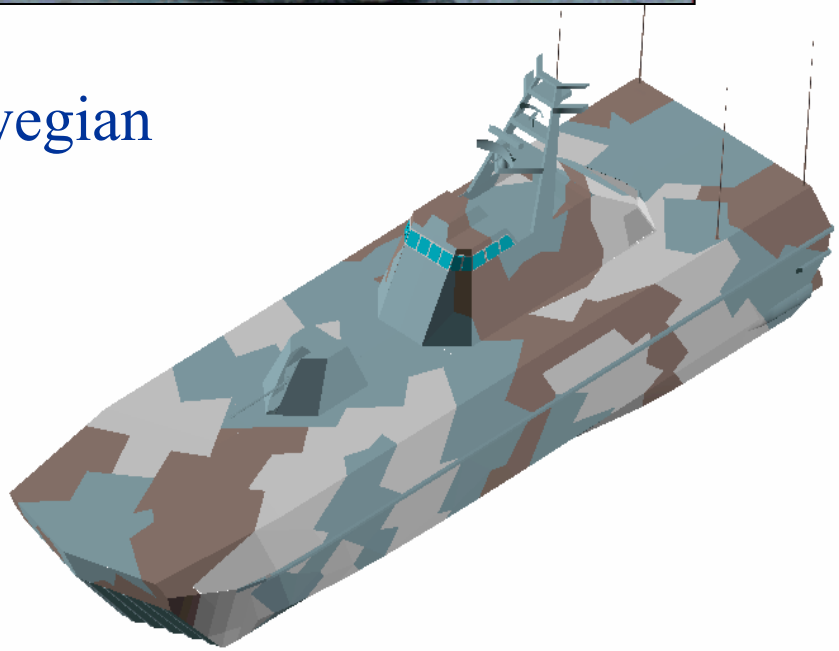
- **90-99% Reduction of RCS**
  Compared to Hauk Class FPB
- Radar Reflective and Radar Absorbent Materials Design
  - No 90 Degree Corners
  - Deck Outfitting Covered or Demountable
  - Flush Doors and Hatches
  - Air Intakes to Gas Turbines and Lift Fans Covered With Radar Absorbing Grid/Mesh
  - Flush, 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
• Small (<200 FT Length; < 46 FT Beam; 5FT Draft)	• 155 FT Long; 44 FT Beam; 3 FT Draft On Cushion
• Stealthy	• Low RADAR/IR/Optical/Acoustic/ & Magnetic Signatures
• High Speed	• Speed > 55 KTS @ Low Sea State
• Agile	• Highly Maneuverable Twin Jets
• Highly Automated (<20 Crew)	• Crew Size 10-15
• Reconfigurable	• Large Gun/Missile/Equipment Bays - Customer Dependent Load Outs
• Long Loiter Capability (>21 Days)	• On Station Time Dependent on Speed/Mission/Aux Fuel Load
• Chem/Bio/Radiation Protection	• 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*****