What are the Risks? Where Are the Risks?

- In Combat, How Are Platforms at Risk?
  - What are the hallmarks of “harm’s way”?

- Risk is Most Pressing in Littorals
  - "will be required to operate in the relatively shallow water of littoral regions where the threat posed by mines, patrol combatants, small boats, submarines armed with wake homing torpedoes, sea- and land-based aircraft (fixed and rotary wing), coastal defense sites (artillery, missile and possibly torpedo), and terrorist groups can be significant."

- Comments
  - "Integration of full spectrum signature reduction, active and passive self defense systems, and physical ship design is critical."
The Swedish Experience

Defense Posture

- Historical / Cultural Focus
  - 2,000 Miles of Coastline (3,218 Kms)
  - Historical Conflicts with Russia, France, Denmark, Prussia, Finland
  - Plus Contemporary Demands of Participation in European Politics
  - Coalition Forces, Joint Operations

Defense Objectives

- Defend Sweden against armed attack
- Maintain Swedish territorial integrity
- Contribute to peace and security in the world
- Assist Sweden in times of severe peacetime difficulty

Requires Swedish FMV to Procure Dual-Use Weapon Systems

- “Our aim should be to create capabilities that are suited for international tasks and national territorial defense tasks”
  GEN Håkan Syrén, Supreme Commander of Swedish Armed Forces, January 21, 2004

Equates to a Littoral Focus
The Littoral Challenge
The Spectrum of Signatures

- Radar cross-section (RCS)
- Infrared signature (IR)
- Acoustic signature (hydroacoustic and airborne noise)
- Magnetic signature
- Underwater electrical potential (UEP)
- Pressure signature
- Visual signature
- Transmitted signals
- Laser cross-section
Answering the Challenge

- Management of Radar Cross Section
  - Shaping, Composites, Concealed installation, Topside Integration, Embedded Antennas
  - Frequency Selective Surfaces (FSS)
  - Limited use of Radar Absorbent material (RAM)
  - RCS modeling

Vosper Thornycroft: Sea Wraith
DCN International: CCX 21
Kockums: Smyge
DCN International: La Fayette
Greatest Progress to Date in a Small Combatant

- **Swedish Visby Class**
  - Length 73 m / Beam 10.4 m / Displacement 600 m tons
  - Sandwich construction carbon fiber reinforced plastic (CFRP)
  - 4 x gas turbines + 2 x diesel engines / 2 x waterjet propulsors / >35 knots
Relative Tactical Superiority of RSN Visby

- Radar Detection Range
- Emitted
- Turning Radius
- Pressure Detection range
- Shock Safe Distance
- Acoustic Detection range
- Infrared Detection range
- Magnetic Detection range
- Electrical Detection range

Conventional  Semi-Stealth  Full Stealth
Representative Tactical Analysis

Other Surface Ship

HMS Triton, a trimaran
Representative Tactical Analysis

RSN Visby

Operating Area

RSN Visby

NORTHROP GRUMMAN
Ship Systems
Representative Tactical Analysis

- Detection Range
- Visby Interception Range
- Diminished Tactical Advantage
- Visby Weapons Range
- Other Surface Ship Interception Range
- Other Surface Ship Weapons Range
Challenge to Systems Engineers

- Responding to Operational Requirements
- Conducting Conceptual Analysis of Alternatives
- Allocation of Top Level Requirements
- Conducting Specific Trade Off Studies
- Balancing Cost, Schedule & Performance
Tactical Stealth Through RCS Management
NGSS Contributions

- **USS Radford, DD 968**
  - Fitted with Advanced Enclosed Mast / Sensors (AEM/S), July 1997
  - ONR Funded Technology Demonstration Project

- **USS San Antonio, LPD 17**
  - Fitted with 2 x AEM/S
  - Rapid Transition from R&D to New Construction
  - USS San Antonio to be delivered to the fleet in November
• The Littorals are *harm’s way*

• Full Spectrum Signature Management Essential to War Fighter’s Success

• Systems Engineering is *the* Enabling Discipline

• Swedish Visby is Small Combatant Benchmark for Our Own US Navy