



**NORTHROP GRUMMAN** DEFINING THE FUTURE

19 February 2004

# Tactical Stealth Visby as a Case Study

Naval Postgraduate School

**Dr. Philip A. Dur**

President

Northrop Grumman Ship Systems



# What are the Risks? Where Are the Risks?

## ■ In Combat, How Are Platforms at Risk?

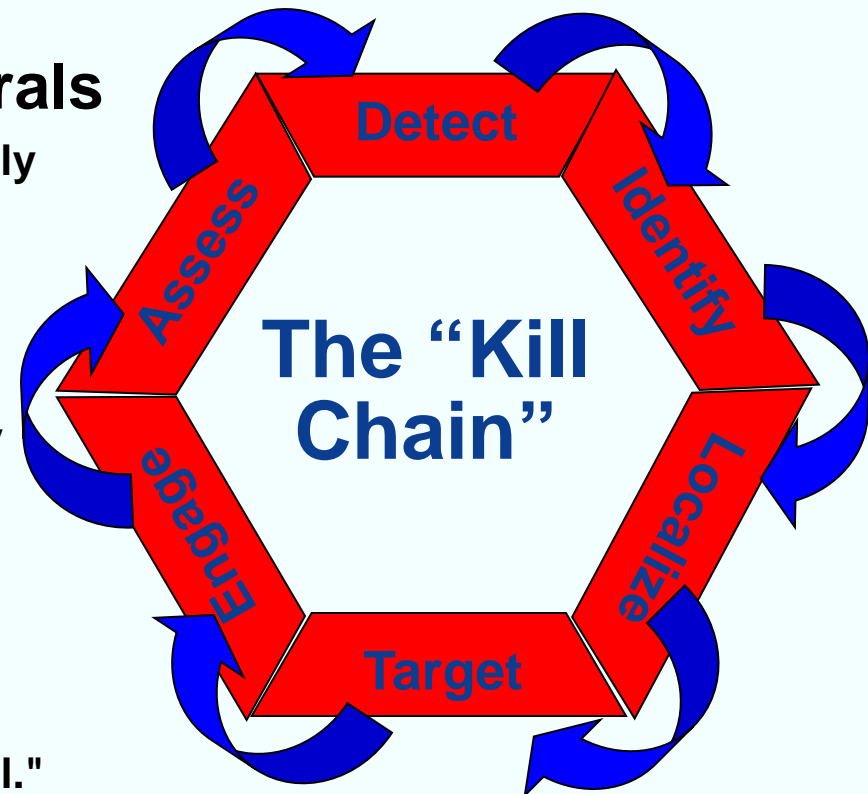
- What are the hallmarks of “harm’s way”?

## ■ 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**

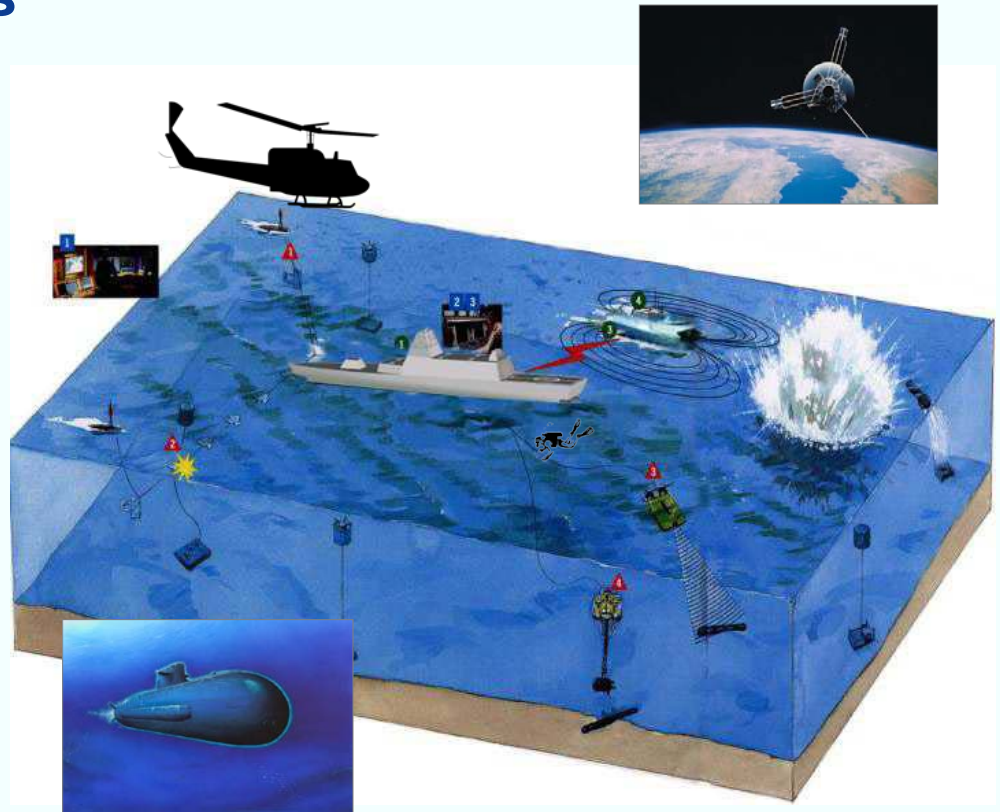




# The Littoral Challenge

## 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



DCN International: La Fayette



Vosper Thornycroft: Sea Wraith



DCN International: CCX 21



Kockums: Smyge





## **Greatest Progress to Date in a Small Combatant**

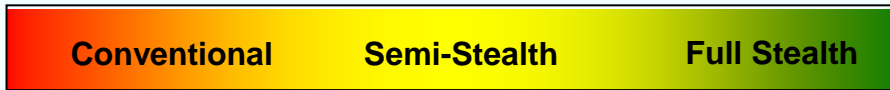
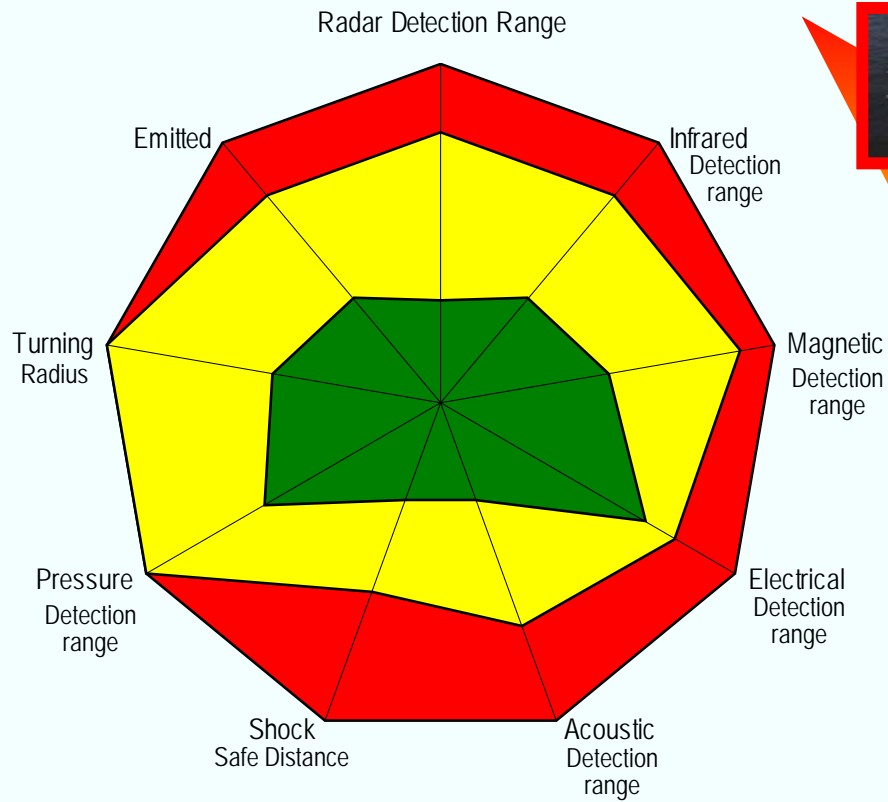
### **■ Swedish Visby Class**

- 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



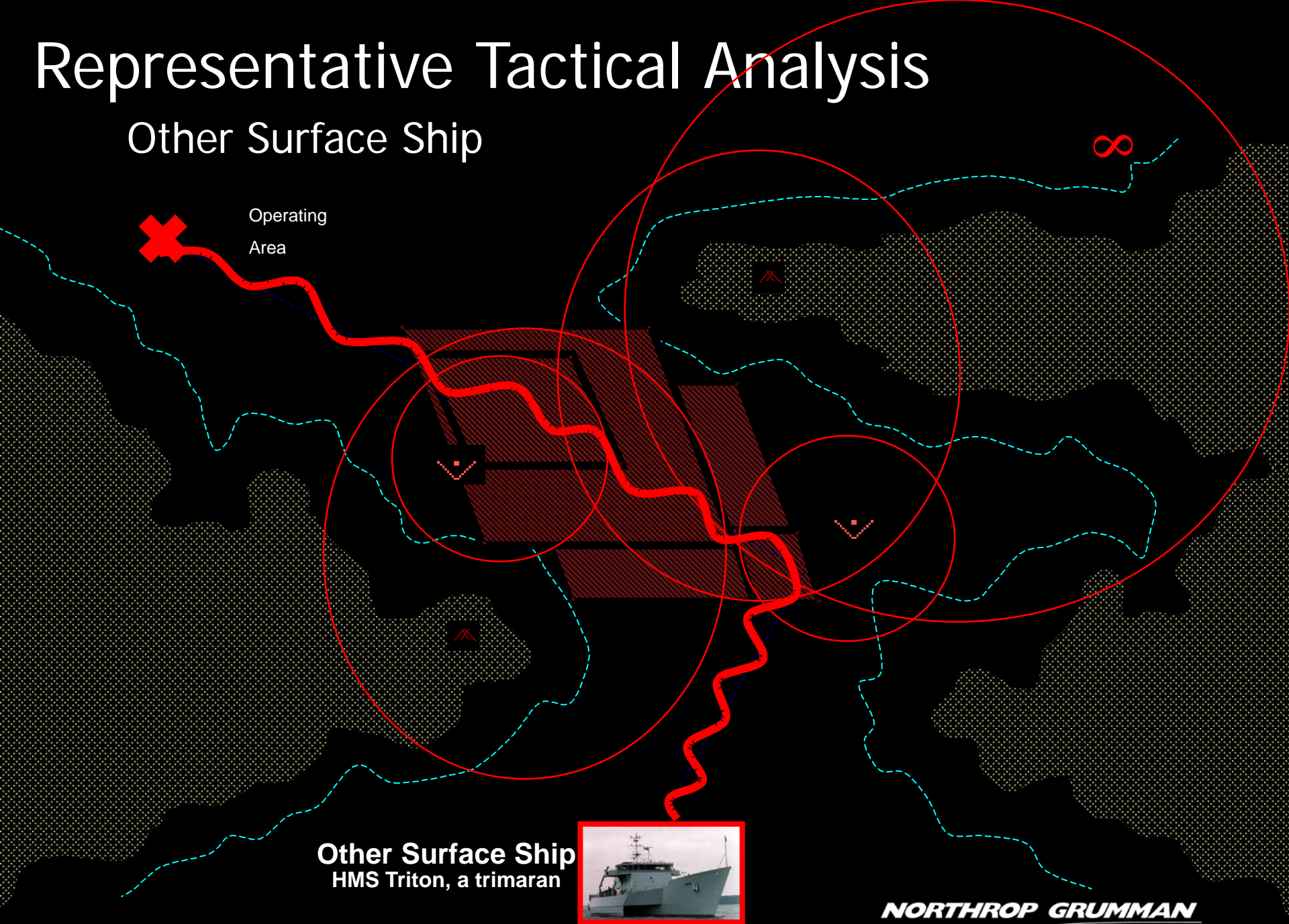


# Relative Tactical Superiority of RSN Visby



# Representative Tactical Analysis

Other Surface Ship



Other Surface Ship  
HMS Triton, a trimaran



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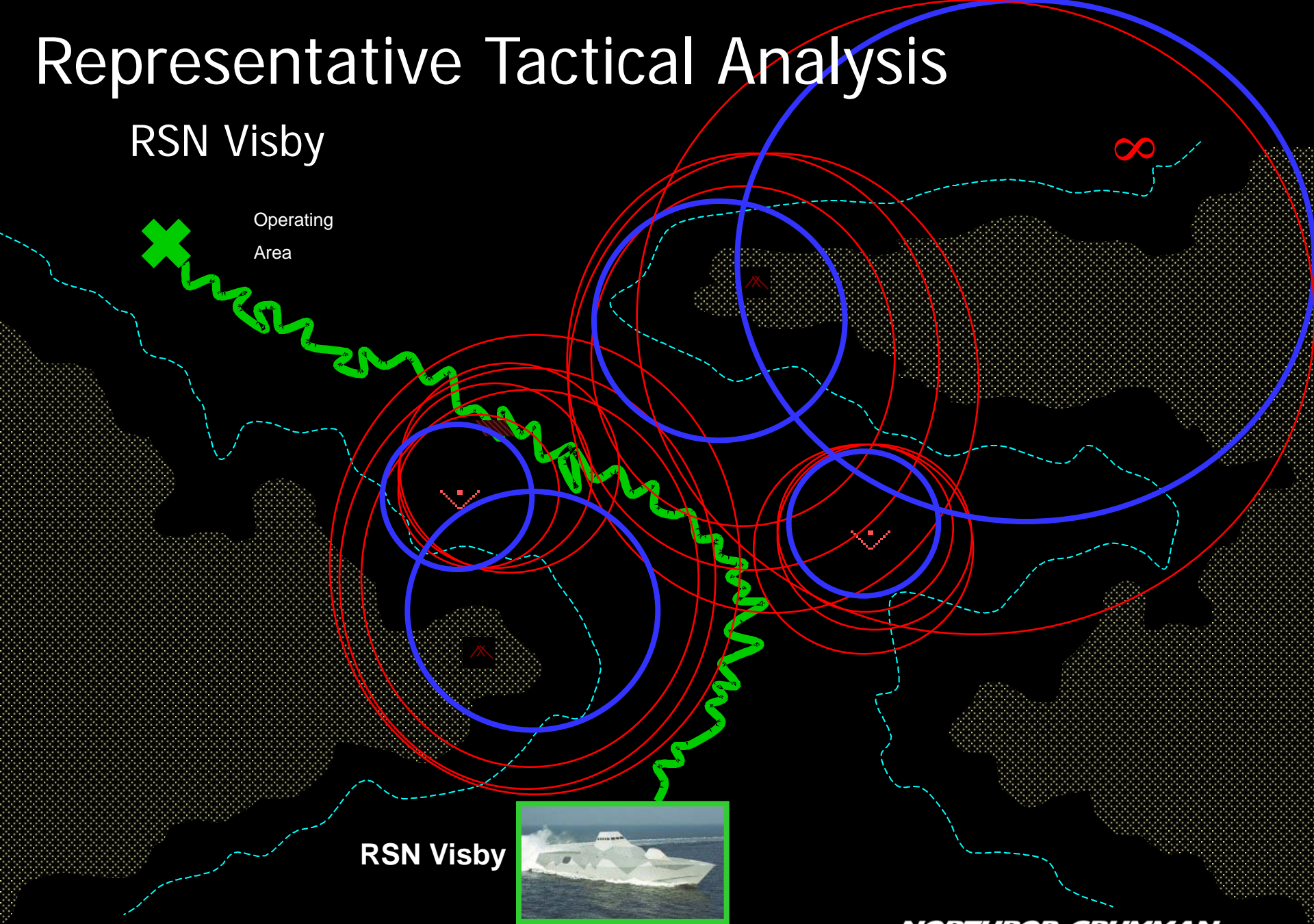
*Ship Systems*



# Representative Tactical Analysis

RSN Visby

Operating  
Area



RSN Visby

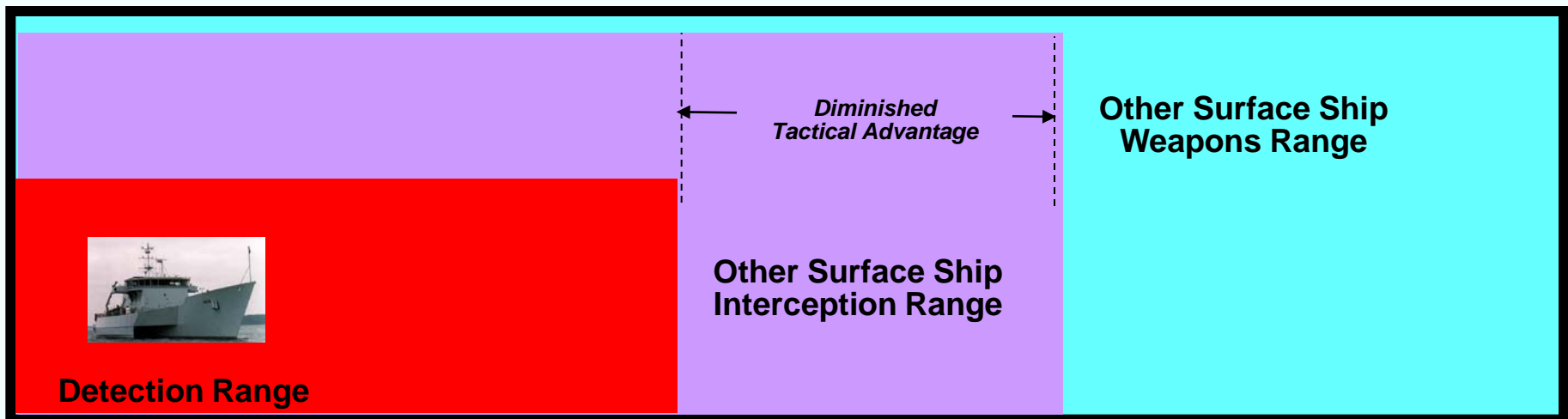
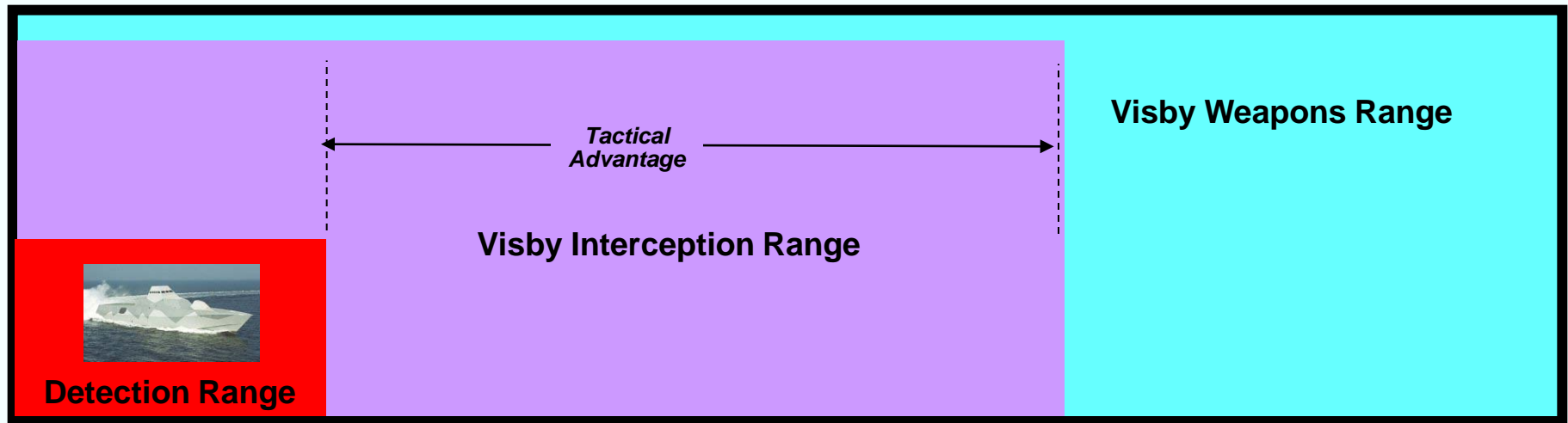


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# Representative Tactical Analysis





# 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 Radford, DD 968

### ■ 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



USS San Antonio, LPD 17



- 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

