Cooperative engagement capability
Anti-ship missiles

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Introduction

- Based on current Swedish studies on cooperative engagement and anti-ship missiles
- Unclassified and general conclusions

Anti-ship missiles vs. ships in the littorals

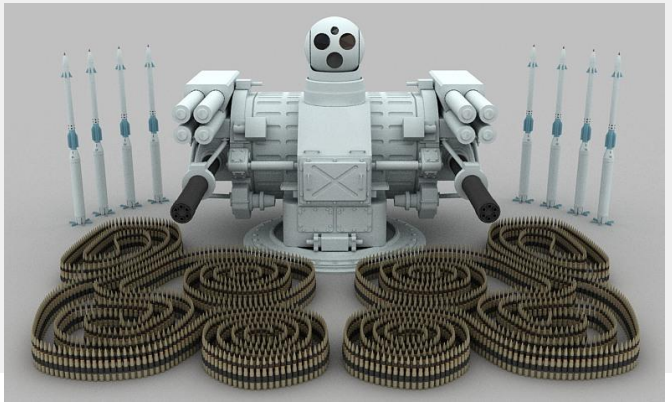
- Challenges
  - Finding the target amongst non-targets (islands, civilian ships…)
  - Overcoming electronic warfare
  - Overcoming air defence

Finding targets

- Finding and identifying targets at long range in a complex environment is a real challenge
- Combination of sensors is essential
  - Radar sensors (airborne for long range)
  - Signal/electronic intelligence for identification
  - Underwater sensors
  - Forward deployed sensors
- Missile seeker with high resolution

Ship air defence

- Combat ships have multi-layered air defence systems
  - Medium range surface-to-air missiles
    - Standard, ESSM, 9M96E
    - Vertical launch
  - Short range surface-to-air missiles
    - RAM, Sosna
  - Close-in weapon systems (CIWS)
    - Goalkeeper, Palma/Palash



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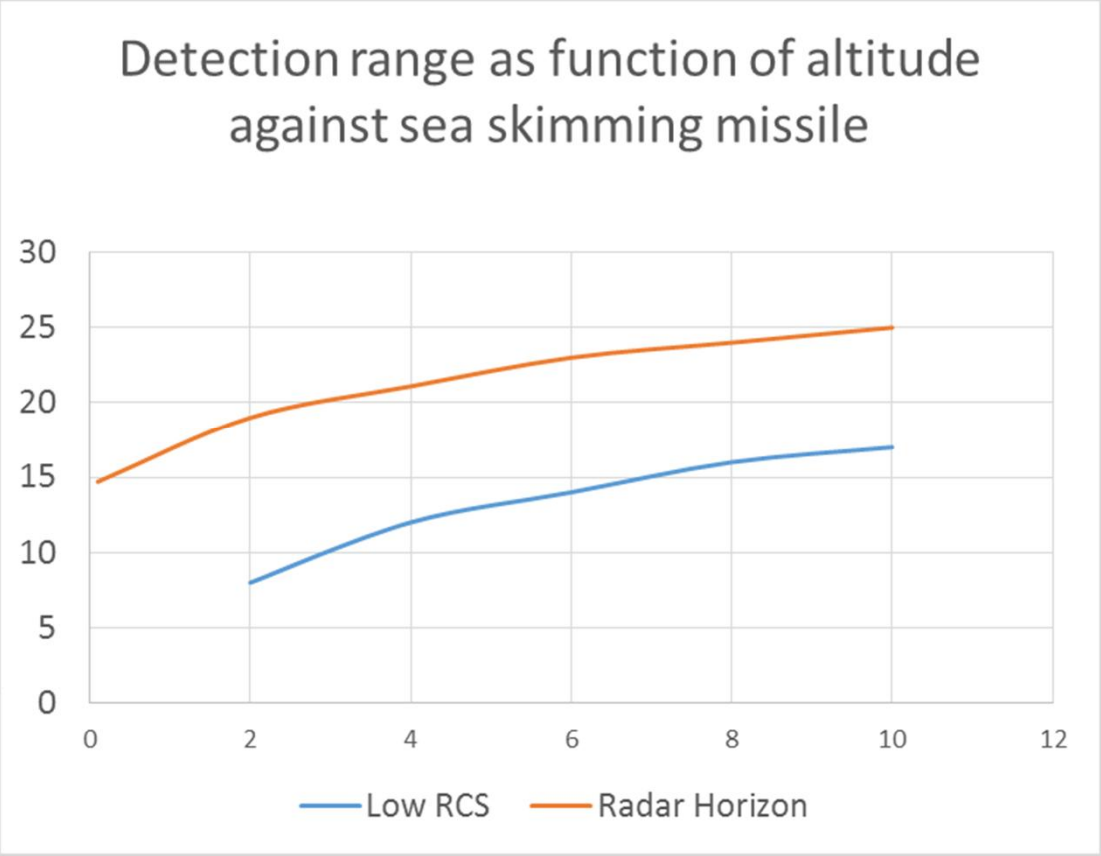
Overcoming air defence

- Medium range surface-to-air missiles
  - High capacity against simultaneous targets
  - Decreased performance against targets at extremely low altitude
  - Reaction time and inner launch zone limit can limit performance against targets with low RCS, high speed, low altitude

How to overcome SAMs

- Very low signature
- Low altitude (sea skimming)



Saturation: low RCS, low altitude and high speed

- Low altitude and very low RCS can give detection range less than 10 km
- This equals 30 seconds for subsonic ASM and 15 seconds for supersonic
- Saturation is achieved with
  - 1 supersonic anti-ship missile
  - A handful of subsonic anti-ship missiles

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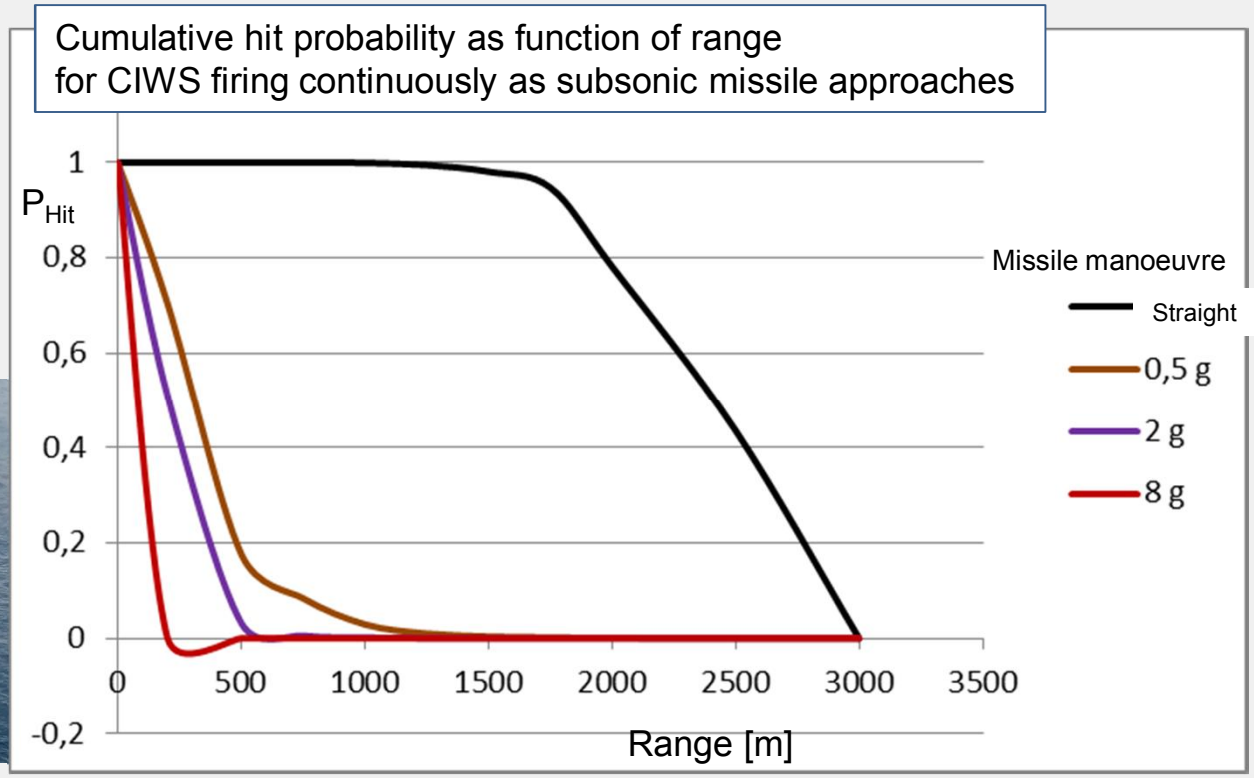
Cooperation

- Cooperative engagement useful to overcome air defence
  - Anti-ship missile flying low and silent requires target update from external sensor
  - Very close coordination of time-on-target against mobile ships requires target updates

Overcoming CIWS

- CIWS with close range guns are affected by evasive manoeuvres



Conclusion

- In order to be effective, anti-ship missiles need:
  - Find right target
    - External sensors giving target location
    - Target update via data link
    - Have seeker with high resolution
    - Discriminate electronic countermeasures
  - Fly very low
  - Have very low RCS and be silent
  - Be fast
  - Perform evasive terminal manoeuvres
  - All aspects need to be combined in a balanced concept

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