Warfare has changed:

Research into performance and use of weapon systems and ammunition in Maritime Environment

NDIA Joint Armaments Conference (May 2010)
Outline

- Warfare has changed: operations in littoral areas
- Change in demands within RNLN: new ship classes
- Research topics
- Summary
Warfare has changed:
Transition from in the open
(‘Cold War role’) …

Hunting Warschaupact Subs

CIWS
Warfare has changed:
... to operations in littoral areas

Anti Piracy

Coast guard & security
As a result: a change in requirements to the fleet

Introduction of two new ship classes in RNLN

Off Shore Patrol Vessel
- 4 ship class
- low intensity conflicts
- asymmetric threat
  (2010 – 2012)

Joint Support Ship
- 1 ship class
- full violence spectrum with
  asymmetric component
  (2014)
As a result: a change in requirements to the fleet (II)

**OPV**: 1 * 30mm WS & 2 * .50 WS per ship
**JSS**: 2 * 30mm WS & 4 * .50 WS per ship

Requirements for RCWS

- Specific threat set
- 30 mm – preferable dual feed
- TV / IR / LRF
- Controls integrated in CMS

**Contract OPV** signed July 2008
- OTO Melara (It): 30mm MARLIN WS with Mk44
- Systems JSS as options
Joint Armaments Conference (May 2010)

Weapon system / Ammunition type

present

Task of platform

new

new

present
Research topics

1. Choice of Ammunition vs asymmetric threat

short term advice
- Advice on first buy operational ammo
  ✓ Off-the-shelf ammunition
  ✓ No system modifications
- Limited budget & Quick
  ✓ Use existing research data
  ✓ Expert judgement

long term advice
- Full operational potential
  ✓ Current & near future ammunition
  ✓ System modifications allowed
- Bigger budget
  ✓ Detailed study
  ✓ Use of international agreements for data exchange

2. Self Defence Capability vs asymmetric threat

Advice on:
- Tactical guidelines
- Control from CMS
- Optimal allocation of tasks
Initial choice of ammunition for Offshore Patrol Vessels

- Objective: ‘ranking’ of ammunition type performance for possible use in 0.50” and 30mm WS of OPV.

- Ranking based on:
  - SSPK (single shot probability of kill)
  - Burst (average # of rounds to achieve success)

- Restrictions / Freedoms of choice
  - Ammunition (Availability, no modification on gun configuration)
  - Target set & range: what when to expect what kind of kill !!!
    - mobility kill
    - catastrophic kill.

- Time schedule & budget
Quick scan methodology

- Build up of detailed target model(s)
  - Transformation in geometric models using Google Sketch-up
  - Introduction of critical components
- Build up of detailed ammunition model(s)
  - Direct translation into expected effect on component level (Pk/c)
- Computations with standard software
Sketch of quick scan methodology

Gun and ammunition dispersion determine the hit probability ($Ph,s$) of each critical component.

Ammunition type, $V_{impact}$, impact angle and target information result in perforation capacity and damaging effect.

Kill probability ($P_{k,s}$) is the sum of individual $Pk,h \times Ph,s$ for each component.

!No cumulative damaging effect is taken into account for burst calculations!
Results

SSPK for various ammo types

- Target 1 at long range
- Target 2 at short range
- Target 3

Burst effect
Long term solution

• Objective:
  selection of optimal ammunition type for 30 mm gun system

Normal methodology:
• build up of detailed target model(s)
• build up of detailed ammunition model(s)

PELE trial regarding incendiary effect and modelling

• numerous simulations with TARVAC software
Single PELE round on ‘short target’, simulated distance @ 1 km
• Single PELE Zr round on ‘short target’, simulated distance @ 2 km
• Burst of PELE rounds on ‘deep target’, simulated distance @ 1 km
Self defence capability of ship with RCWS against Asymmetric Threats

Advice on:
- Tactical guidelines
- Control from CMS
- Optimal allocation of tasks
Self defence capability
(Tactical guidelines)

Modelling ship (components), targets, interaction and scenario

Analysis based on computational Monte Carlo runs
Self defence capability (Allocation tasks)

ACE study:
Human in the Loop
Weapon system / Ammunition type

Task of platform

present

new

Non lethal solutions
Summary

- Warfare has changed: operations in littoral areas
- Change in demands within RNLN: new ship classes

Research topics
  - Choice of ammunition
    - Short term solution
    - Long term solution
    - Non lethal solution
  - Self Defence Capability of ship
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