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Optimal Munitions Mix for USMC Mobile Anti-Ship Missiles Launcher

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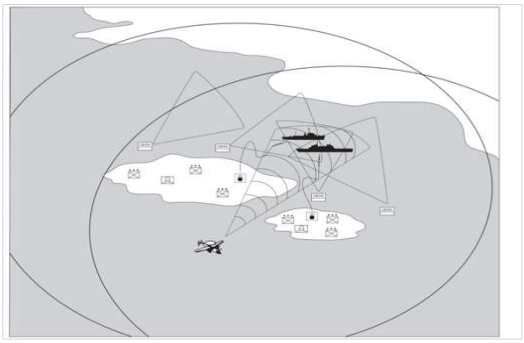
Evaluating USMC Ground Based Anti-Ship Missiles Units

Naval Postgraduate School

Background

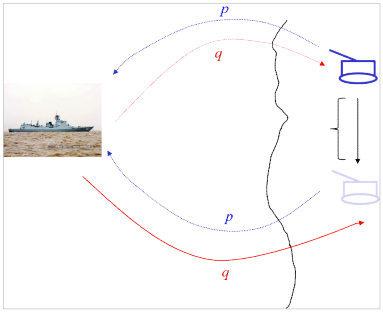
- USMC is focusing on Expeditionary Advanced Based Operations (EABO), which seeks to place a persistent Marine Corps presence inside the enemy's weapon engagement zone to secure objectives necessary to the conduct of a naval campaign.
- Central to EABO is the development of a Ground Based Anti-Ship (GBASM) capability.
- This project evaluates the force structure of GBASM units.



GBASM systems are placed on islands inside weapon engagement zone to perform sea-control and sea-denial missions.

Model

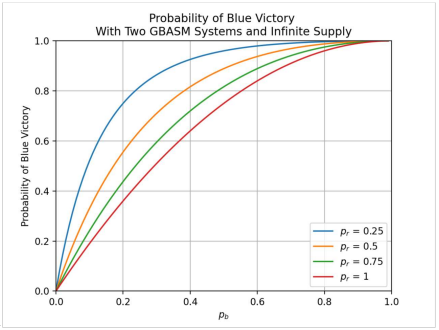
- Duel between Blue and Red modeled as a Discrete Time Markov Chain.
- Blue uses Shoot-and-Scoot tactics to reduce effectiveness of Red counterfire.
- Blue has K GBASM systems, each of which can fire N missiles.
- Red countermeasures: defensive interceptors against incoming Blue missiles and offensive missiles to target Blue GBASM systems.



Blue fires on Red and scores a kill with probability p. Red counterfires and kills Blue with probability q. Blue moves to a new position quickly after firing, so often q is smaller than p.

Results

- Shoot-and-scoot provides a significant advantage as Blue is able to "fire first"
- Most important factor is the overall kill probability of a Blue salvo aggregated across all GBASM systems.
- Marginal impact of having more GBASMs is greater when Red is more lethal with counterfire.
- Having more GBASMs firing fewer missiles is better than having few GBASMs firing many missiles, but the difference is usually minor.
- If Red can only effectively counterfire at a small number of GBASMs, the importance of Blue having many GBASMs increases.



Probability of Blue Victory vs. the probability one GBASM kills Red in one salvo. Each line corresponds to a different probability Red kills one GBASM. K = 2 GBASMs.

Conclusion

- Fire effectively first.
- Having many GBASMs increases survivability but may not be cost effective.
- Larger salvos have added benefits of overwhelming Red defenses.

Future Work

- Incorporate multiple Red targets.
- Analyze GBASM logistics.
- Determine location to place GBASM units to maximize mission effectiveness (e.g., sea denial).

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