Generating Adaptive Capability from Constraints:

Aligning Operational Dependency, Requirements, and Competitive Procurement to Sustain Advantage in Maritime Expeditionary Operations

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Panel #13 – From Demo to Deterrence: Accelerating Surge Capacity and Fleet Integration

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The Problem: We've Misunderstood the Operating Environment

Status Quo

- Strategy aligned to adversary capability & intent
- Assumes infrastructure & logistics will perform as expected
- Risk framed as external (enemy-driven)

Reality

- Operations depend on interdependent infrastructure systems
- Systems degrade under stress (even without adversary action)
- Constraint emerges from energy, throughput limitations, access, and interdependence

So what?

- This dependency "blindness" prevents the identification of vulnerabilities, which potentially increase risk

Constraint is not introduced by the adversary, it exists within the system and defines the fight

The Gap: Dependency Vulnerabilities are not Translated into Capability

Problem Statement

- Operational dependency is a constraining factor, but remains unmeasured and untranslated in planning and procurement.

Research Question

- How can operational dependency, often unmeasured in conventional planning but decisive under contested conditions, be systematically translated into prioritized capability requirements and fulfilled through adaptive, competitive procurement mechanisms?

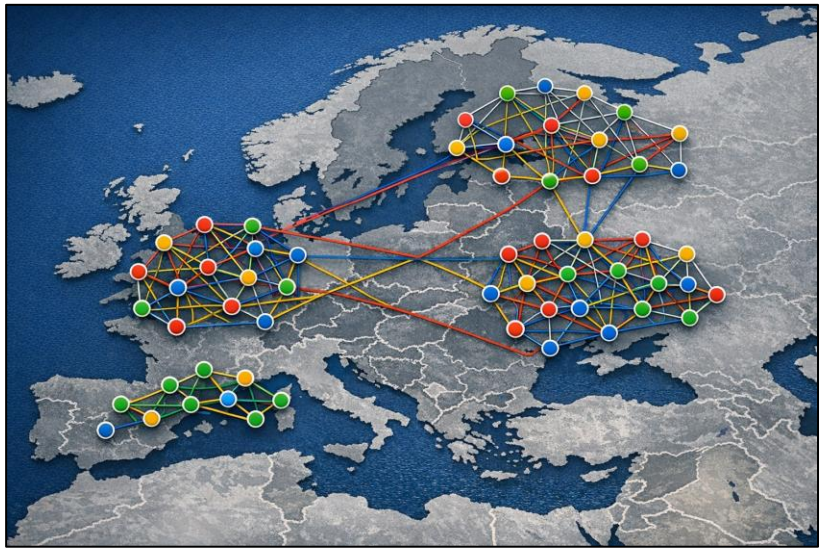
Scope

- Infrastructure-driven dependency:
  - Governance
  - Transportation
  - Energy
  - Sustainment
  - Digital systems
- Adaptive procurement of scalable, high-attrition enablers:
  - Distributed energy
  - Unmanned systems
  - Sensors
  - Sustainment assets
  - (NOT major defense acquisition programs)

Solution Framework: GEO-LENS → Requirements → VPC

Methodology: Step 1 – Identify Dependency

- Core Idea: If you can't measure dependency, you can't perceive vulnerabilities and the capabilities required for mitigation
- Geostrategic logistics evaluation & nodal selection (GEO-LENS) tool
  - Employs Operational Dependency Index (ODI) to compare nodes across:
    - Infrastructure (sea ports, airports, rail, roads, utilities)
    - Access
    - Energy
    - Threat
  - Key Outputs:
    - Constraint visibility
    - Demand signal origin (for capability requirements)
    - Prioritized nodal investment recommendations



Bottom line: GEO-LENS turns geography into decision advantage

Methodology: Step 2 & 3 – Satisfying Capability Requirements through Competitive Procurement

- Core Idea: Requirements are the bridge between Constraints and Procurement
- Well-designed Requirements:
  - Define what a capability "must do" **NOT** what it "must be"
  - This enables:
    - Modularity
    - Scalability
    - Competition
- Competitive Procurement via the variable, portfolio contract (VPC):
- Features:
  - Multi-vendor competition
  - Dynamic allocation (competing on C/S/P)
  - Built-in surge capacity
- Experimental Conditions:
  - 4 notional & competing firms
  - 4 weighting schemes:
    - Even
    - Cost-weighted
    - Schedule-weighted
    - Performance-weighted

Bottom line: Surge capacity is not planned – it is procured through contract structure

Experiment Results: Project GEODE & the GEO-LENS

Prioritization for European Infrastructure Investment (distributed energy generation)

Strategic Objective 1 (Pri 1) – "Preserve NATO Freedom of Action on the Eastern Flank":
1. Klaipėda Port
2. Riga Logistics Hub
3. Central Europe Transit Corridor

Strategic Objective 2 (Pri 2) – "Deny Russia Strategic Leverage over Arctic & High North Access":
1. Narvik Port Complex
2. Oulu Sustainment Center
3. Bodø Air & Multimodal Node

Strategic Objective 3 (Pri 3) – "Limit Russia's Ability to Sustain Protracted Conflict (Industrial/Energy)":
1. Central Europe Transit Corridor
2. Alexandroupoli Port
3. Klaipėda Port

Insights:

1. **Convergent infrastructure priorities**: GEO-LENS consistently identified Klaipėda Port and the Central Europe Transit Corridor as repeat selections across multiple strategic objectives, indicating they are theater-critical infrastructure nodes whose resilience and capacity directly enable NATO reinforcement of the Eastern Flank while simultaneously constraining Russia's ability to sustain protracted conflict.
2. **Regional infrastructure architecture**: The results reveal three complementary operational infrastructure clusters—Baltic/Eastern Flank (Klaipėda, Riga, Central Europe Corridor), High North/Arctic (Narvik, Oulu, Bodø), and Southern access (Alexandroupoli)—demonstrating that resilient campaigning requires coordinated investment across distributed multimodal nodes rather than reliance on single ports or bases.

Experiment Results: VPC for distributed energy generation & storage (DEGS)

CSP Weighting	Δ Unit Cost	Δ Contract Cost	Δ Performance
Even	-0.8899%	-1.1801%	+3.9386%
Cost	-0.8902%	-1.1874%	+3.9158%
Schedule	-0.4702%	-1.0453%	+4.1242%
Performance	-1.0367%	-1.2213%	+3.8910%

Weighting	Avg Unit Cost	Max Avg Contract	Min Avg Contract	Contract Spread
Even	$214,779	$18.25M	$11.17M	$7.08M
Cost	$208,327	$20.06M	$8.67M	$11.40M
Schedule	$209,032	$20.13M	$8.70M	$11.44M
Performance	$222,581	$15.76M	$13.40M	$2.36M

Insights:

1. **Performance outcomes**: Across all weighting models, the VPC consistently improved acquisition outcomes—reducing average unit cost by ~0.47–1.04%, lowering average contract cost by ~1.05–1.22%, and increasing performance ratings by ~3.89–4.12%, demonstrating that portfolio-based contracting can simultaneously improve cost efficiency and capability performance.
2. **Industrial investment signal**: Contract value distributions varied by weighting—cost and schedule weighting produced the lowest unit costs ($208–209K) but the widest contract ranges (~$8.7M–$20.1M), concentrating production with top performers, while performance weighting generated a tighter contract band (~$13.4M–$15.8M) that sustains multiple suppliers; in both cases, the minimum contract values remain sufficiently large to incentivize firms to invest in production tooling and capability development.

From Demo to Deterrence: What Must Change Now

Conclusion

- The research examined how infrastructure-driven operational dependency – often unmeasured in conventional planning but decisive in execution – can be translated into scalable capability through the alignment of dependency identification, requirements development, and procurement execution.

Recommended Actions

- Military:
  - Treat infrastructure as the pacing function for operations
  - Improve the GEO-LENS and use it in planning
- Acquisition/Procurement Community:
  - Pilot portfolio-based procurement
  - Shift to functional requirements (“must do” as opposed to “must be”)
- Industry:
  - Build scalable production models
  - Be prepared to compete across cost/schedule/performance