

Analysis for Non-Traditional Security Challenges: Methods & Tools

Military Operations Research Society (MORS) Workshop

WG 4 – “Deterrence” Report

WG 4 – “Deterrence”

**Strategic Deterrence Joint Operating Concept
Synopsis of the Central Idea**

Strategic Deterrence--The *prevention of adversary aggression or coercion that threatens vital interests* of the United States and/or our national survival. Strategic deterrence *convinces adversaries not to take grievous courses of action by means of decisive influence* over their decision making.

Ends:

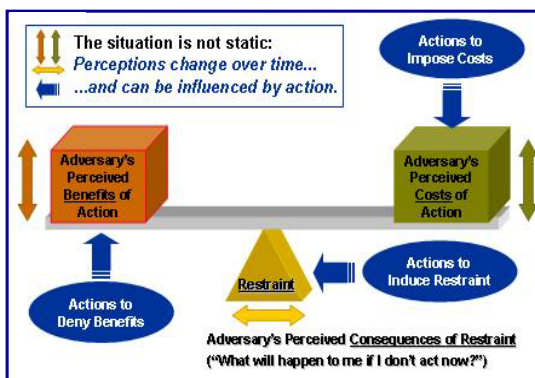
- Decisively Influence Decision-Making Calculus

Ways:

- Deny Benefits
- Impose Costs
- Induce Restraint

Means:

- Joint Force Capabilities (DoD)
- Elements of National Power (USG)



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WG-4 Focus Questions:

- ◆ How can analysts *characterize and measure uncertainty* concerning deterrence?
- ◆ How can deterrence analysts *determine and manage second- and third-order effects* in deterrence analysis?
- ◆ How can analysts *estimate the magnitude of an adversary’s response* to a proposed friendly deterrent action? Methods exist to determine the general response (e.g., favorable, unfavorable). This question concerns “How favorable?” or “How unfavorable?”

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WG-4 Structure

- Stage Setting:
 - DoD Strategic Deterrence Concept
 - Deterrence Assessment Framework
- Problem/Discussion:
 - Effects in the Cognitive Domain
 - Discussion: *Measuring Uncertainty*
 - Understanding Chinese Thinking
 - Gauging Adversary Response
 - Discussion: *Adversary Response*
 - Planning and Integrating Deterrence
 - Discussion: *2nd and 3rd Order Effects*
- Synthesis
 - Problem Description
 - Methods and Tool Availability
 - Recommendations

Defining Deterrence

• Scope of deterrence today

- ◆ Ends: Beyond the most dire threats
- ◆ Ways: Beyond coercion to include inducements
- ◆ Means: Beyond military to include non-military (inter-agency)

**Definitions
are important.**

• Specifying the problem(s)

- ◆ Coercion:
 - Basic, extended, intra-war, compellence
- ◆ Inducement:
 - Engagement (alliances, coalitions), cooperation (international organizations), assurance

• Inclusion of inducements expands *deterrence* into the realm of *influence*

- ◆ MOEs & analysis for each of these may differ
- ◆ Perception by others may be different (assume deterrence is coercion)

Government Stakeholders & Roles in Developing Deterrence Policy & Plans

• USG: NSC, Inter-Agency, IC, Congress

- ◆ **National Objectives:** National Security Strategy+
- ◆ Develop Policy
- ◆ Prioritization & Allocation of Resources

• DoD

- ◆ Military Objectives: National Military Strategy
- ◆ Develop Policy
- ◆ Issue Guidance: TSC Guidance, CPG, SPG
- ◆ Prioritization & Allocation of Resources

**Roles are
important.**

• STRATCOM

- ◆ Develop Global Deterrence Plan
- ◆ **Synchronize deterrence planning** in other plans

• Other COCOMs

- ◆ Regional Commands, including NORTHCOM: Develop Regional Deterrence plans
- ◆ SOCOM: Develop Transnational Deterrence plans

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Workshop Insights for the *Global Deterrence Concept*

- Definition
- Scope
- Cyber-Deterrence
- Non-State Actors
- Communication of Deterrence Actions
- Implementation and Planning
- Costs of Deterrence to US

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Attacking the Deterrence Analysis Problem

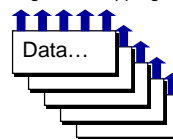
Dimensions/factors

- Players (incl. capabilities & limitations)
- Decisions/actions
- Competition/cooperation
- Deterministic/stochastic
- Goals/objectives (single v multiple, Political, econ, mil?)
- Payoffs (+/-, Costs, Benefits) reduce prob of achieve, reduce benefits/increase costs, preference ordering
- Stages/phases
- Strategies (risk averse, mini-max, maxi-min)
- Interactions/Influences (2nd, 3rd order effects)
- Others.....

Match with ...

OR Methodologies (Suite)

- Dynamic Programming (stochastic or deterministic)
- Game Theory – (> 2 person), (non 0-sum), (multi-stage)
- Experimental Gaming
- Influence Diagrams
- Cost-benefits Analyses
- Risk Analysis (p[event] * consequence)
- Decision Trees / Decision Analysis (Value, Utility)
- Cognitive Mapping



Difference Today:

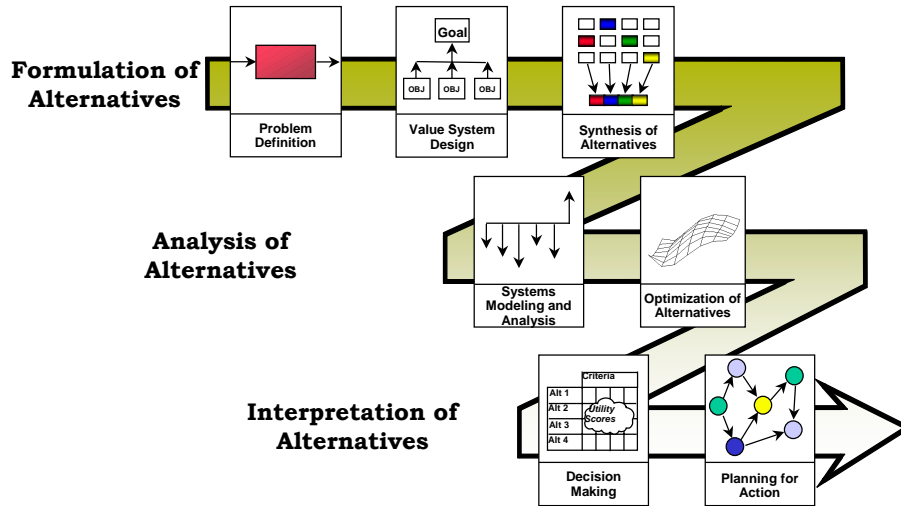
- Who
- What
- How
- Context

Application of Methodology depends on the dimensions AND the question being asked or the decision to be made!

Appropriate ? : Do certain actions contribute (detract from) deterrence or stability?
 Bad ? : What is the probability that action X will deter actor Y from doing Z?

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Systems Engineering Design Process

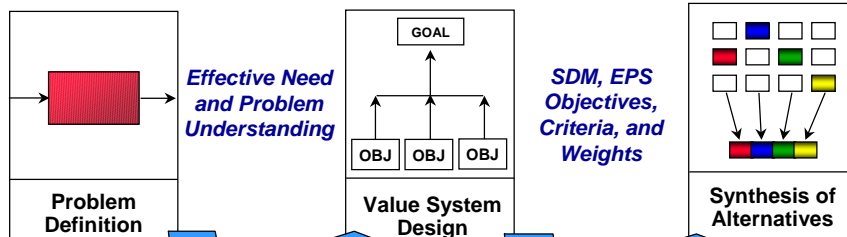
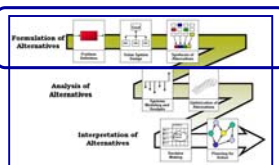


Source: USMA Department of Systems Engineering

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Formulation of Alternatives

Must both Scope and Bound the problem!



- Needs Analysis
- Stakeholder Analysis
- I/O Modeling
- Pareto Analysis
- Interaction Matrices
- Causal Loop Diagrams
- Affinity Diagrams
- Functional Decomposition
- Functional Flow Diagramming

- Value Models (Qual & Quant)
- Gold, Silver, & Platinum Standards
- Affinity Diagrams
- Local Weights
- Global Weights
- System Definition Matrix
- Engineering Problem Statement

- Brain Storming
- Brain Writing
- Dynamic Confrontation
- Zwicky's Morphological Box
- Feasibility Screening

Source: USMA Department of Systems Engineering

Method and Tool Availability

Different scenarios require different tools: Scenario A: strategic nation-state WMD problem. Scenario B: Non-state actor WMD problem.		Problem Definition				Direct Effects	2nd & 3rd Order Effects			Uncertainty		
		Scenario and Bounding (SOT) objective	Stakeholder Analysis	Needs Analysis	Identifying 2nd and 3rd order effects	Adversary Decision-Making Process (how does he decide?)	Assessing Adversary Response (how an effect?)	Measuring Magnitude of Adversary Response (how much of an effect?)	Geographic (state, regional, global)	Stability Effects	Temporal (future options)	Characterize
Methods	Example Tools											
Mathematical Programming	Dynamic (stochastic or deterministic)					X				X		X
Network Analysis	Nodal analysis, belief networks						X	?			X	
Risk Analysis	risk maps										X	X
Cost-benefits Analysis	cost-benefit ratio					X						
Influence Analysis	causal diagrams, agent-based models	X	X	X	X	X			X		X	X
Decision Analysis	decision trees, prospect approaches					X	X			X		X
Game Theory	> 2 person, non 0-sum, multi-stage						X					
Experimental Gaming	SME, Deterrence gaming, roleplaying				X		X	X	X	X	X	
Organizational Effectiveness	goals tree, cognitive mapping		X									
	functional decomposition	X		X	X							
	I/O modeling	X		X	X							
	basic research		X		X	X						
	brainstorming		X		X							

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Methods	Example Tools											
Mathematical Programming												X
Network Analysis											X	
Risk Analysis											X	X
Cost-benefits Analysis						X						
Influence Analysis		X	X	X	X	X			X		X	X
Decision Analysis						X	X			X		X
Game Theory							X					
Experimental Gaming					X		X	X	X	X	X	
Organizational Effectiveness	goals tree, cognitive mapping		X									
	functional decomposition	X		X	X							
	I/O modeling	X		X	X							
	basic research		X		X	X						
	brainstorming		X		X							

- ◆ Significant Gaps in determining the impacts of second and third order effects, and measuring the magnitude of adversary responses.
- ◆ Data availability eliminates some models.
- ◆ Timely methods required to inform decisions.
- ◆ Human-in-the-loop methods often best choice.

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Additional Points to Consider

- **Problem Definition**
 - ◆ The problem is well scoped; work needed to bound the problem (all deterrence, or just strategic deterrence? All forms of influence?)
 - ◆ How do we account for the dynamic (“wicked”) nature of the problem?
- **Metrics**
 - ◆ Are we asking the right questions to guide metrics development? (Instead of trying to respond to the question “What are the metrics?”)
 - ◆ What are those questions?
 - ◆ What decisions will be informed by the metrics?
- **Methods**
 - ◆ Allow for competitive analysis; not all redundancy is bad.
 - ◆ There is value in outsourcing analysis; can help avoid single points of failure
 - ◆ Consider the impact of expert opinion as data source
 - ◆ Most analyses require inter-disciplinary team (incl. IA, multi-national)
 - ◆ Develop methods to validate analysis
 - ◆ Develop methods to address the role of ambiguity in deterrence
 - ◆ Methods must be usable/understandable, extendable, and replicable

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● Recommendations

- ◆ To DoD/Service Sponsors:
 - Carefully define scope and roles concerning deterrence.
 - Drive development of deterrence policy, analysis and planning across USG, not just within DoD.
 - Sponsor focused (and integrated?) research in difficult areas (including through competition).
- ◆ To MORS:
 - Provide a mentor to each WG (a la Rist mentors).
 - Adjust MORS to accommodate/encourage greater IA participation.
 - Hold MORS Workshop on Influence Operations.
 - Will help define boundaries
 - Sponsor MORS competition for thorny problems.

Backup Slides

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Deterrence Concept Insights 1

- **Definition – reconsider classic definition**
 - ◆ Classic deterrence primarily considers cost/benefit of action
 - ◆ Also consider - Cost/benefit of inaction (SD JOC – *induce restraint*)
 - Not a classic definition of deterrence, but practical
 - Includes inducement for inaction or alternative
 - Deterrence is necessary, but not sufficient for stability
 - Desire cost/benefit of inaction is greater than the cost/benefit of action
 - Achieve stability within deterrence – dynamic state to ensure that changes do upset the balance $c/b \text{ inaction} \gg c/b \text{ action}$ (for both adversary and US)
- **Current scope of JOC is *Strategic Deterrence***
 - ◆ Expand discussion that concept may be applied at a strategic, operational, or tactical level to achieve a strategic effect

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Deterrence Concept Insights 2

- **Strategic concept can also be applied by operational and tactical level commanders to deter attack**
 - ◆ Requires some level of adversary analysis
- **Discuss cyber-deterrence as another deterrence objective?**
- **Manage expectations of deterrence**
 - ◆ Can't deter all attacks → credibility will suffer
 - ◆ If the attack is not catastrophic, then we mitigate effects and drive on
 - ◆ Attacks will happen in a long war
 - ◆ Broad policy statements are potentially difficult in application
- **Expand the discussion of immediate versus general deterrence**
 - ◆ Consider effects of immediate deterrence actions on general deterrence
- **Examine the efficacy of clarity of intent (backed up demonstrated capability) – declaratory policy**

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Deterrence Concept Insights 3 (Communications)

- **Focus on the “how” of communication as well as the “what”**
- **Communication with adversary – learn how to effectively communicate**
 - ◆ Delivery Methods – What sources does adversary pay attention? What sources does adversary trust?
 - ◆ Format of the message
 - ◆ Learn to effectively communicate with adversary
 - ◆ of intent (backed up demonstrated capability) – declaratory policy
- **Need to examine how messages will be manipulated by both blue and red**
- **Is there a modeling that can help demonstrate how communication of a message occurs**
 - ◆ Primary effect on adversary
 - ◆ Secondary effect on other parties, domestic audience
 - ◆ Is there a bio-model that applies?
 - ◆ Can we inoculate certain societies against misinformation?

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Deterrence Concept Insights 4 (Non-State Actors)

- **Examine the efficacy of deterring terrorists**
 - ◆ May not be able to expend the necessary resources and time to effectively deter
 - ◆ US may be morally restrained from imposing costs (or providing benefits)
 - ◆ Benefit denial may be of increasing importance w/terrorists
- **Difficult to identify (and thus understand) the actor to deter**
- **Not interested in stability – cost of inaction too high**
- **Want to upset the status quo – for purpose of changing the system**
- **Can we deter those committed to dying for a cause? (only option may be defeat?)**
- **Costs of deterring extremists may be too high**
- **Deterrence may likely be unsuccessful, but much can be gained in terms of denying benefit of attack – may cause pause (enough time to destroy actor)**
- **Need to determine how to influence/deter a networked actor (model network)**

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Deterrence Concept Insights 5 (Implementation/Planning)

- **Need ability to characterize uncertainty in decision models**
 - ◆ Uncertainty rises from a lack of understanding of adversary decision making
 - ◆ Ability to model uncertainty would be very helpful to decision makers
 - ◆ Determine how to design strategy and plans around a range of uncertainty
 - ◆ Eliminate unlikely cases, incorporate cases with dramatic impact
- **Need ability to model non-DoD means that affect deterrence**
- **Need model to show deterrent effects caused by proposed changes in force posture/basing**
- **Need a model deterrent impact of nuclear weapons on deterrence (more than a mathematical model of damage)**
- **Need a tool to help show 2nd order effects of deterrent actions**
 - ◆ Effect on who you are targeting?
 - ◆ Effect on other adversaries, allies, friends, neutrals (3rd party)?
- **Need model to gain insight into various methods to deter non-state actors**