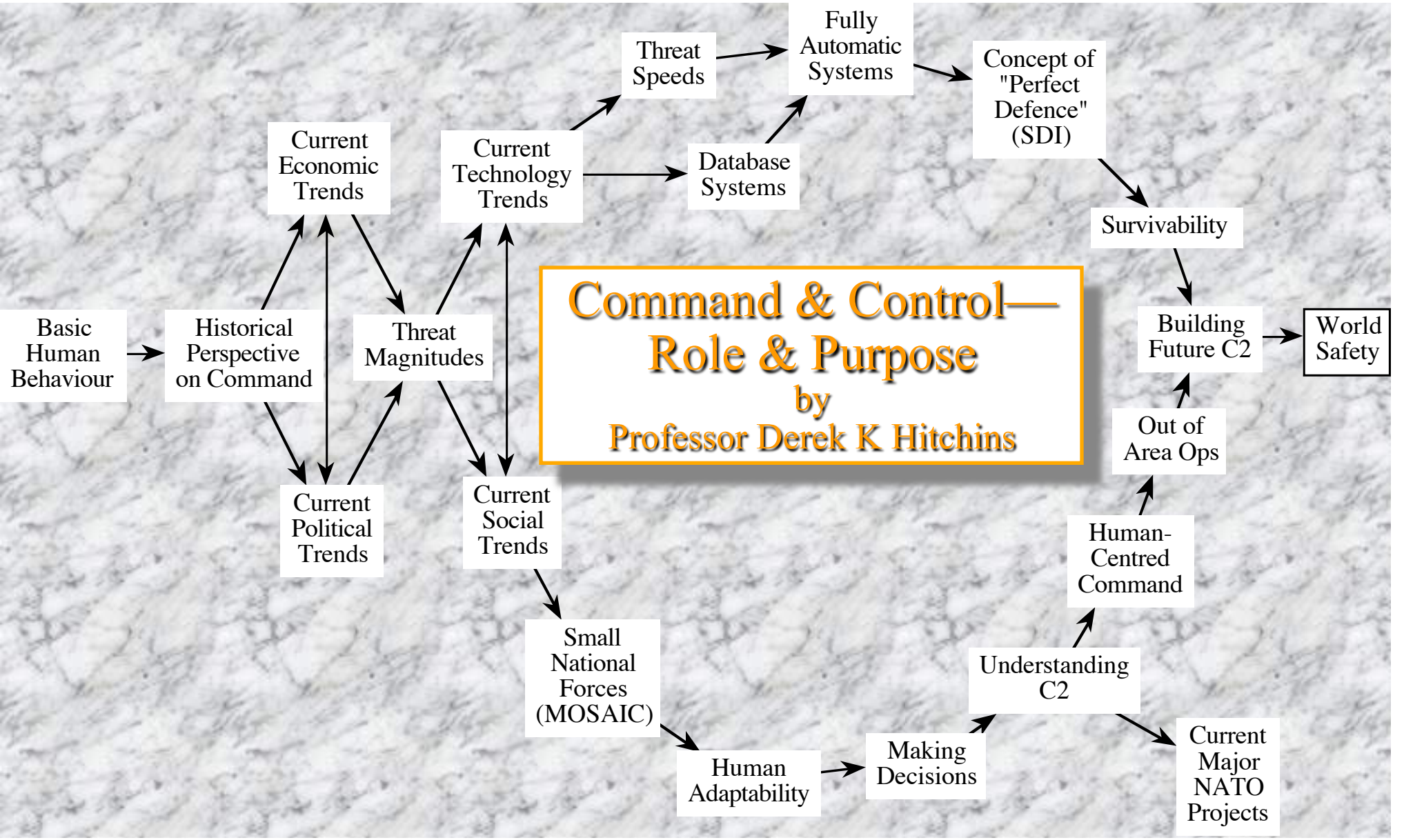
Command & Control—
Role & Purpose
by
Professor Derek K Hitchins
Basic Human Behaviour
Historical Perspective on Command
Current Economic Trends
Current Political Trends
Threat Magnitudes
Current Technology Trends
Current Social Trends
Threat Speeds
Database Systems
Fully Automatic Systems
Concept of "Perfect Defence" (SDI)
Survivability
Building Future C2
World Safety
Out of Area Ops
Human-Centred Command
Understanding C2
Current Major NATO Projects
Making Decisions
Human Adaptability
Small National Forces (MOSAIC)

Human Aggression

- Arboreal Herbivorous Primate:—
  - Male-dominated harems
  - Aggressive, but rarely to the point of killing
  - Aggression appeased by submission
- Plains-living Carnivorous Primate:—
  - Pair-bonding, no harems
  - Co-operative hunting
  - Subordinate males tolerated in male groups to aid hunting
  - Male-to-male aggression *suppressed*

Conclusion:—Killing is *not* innate

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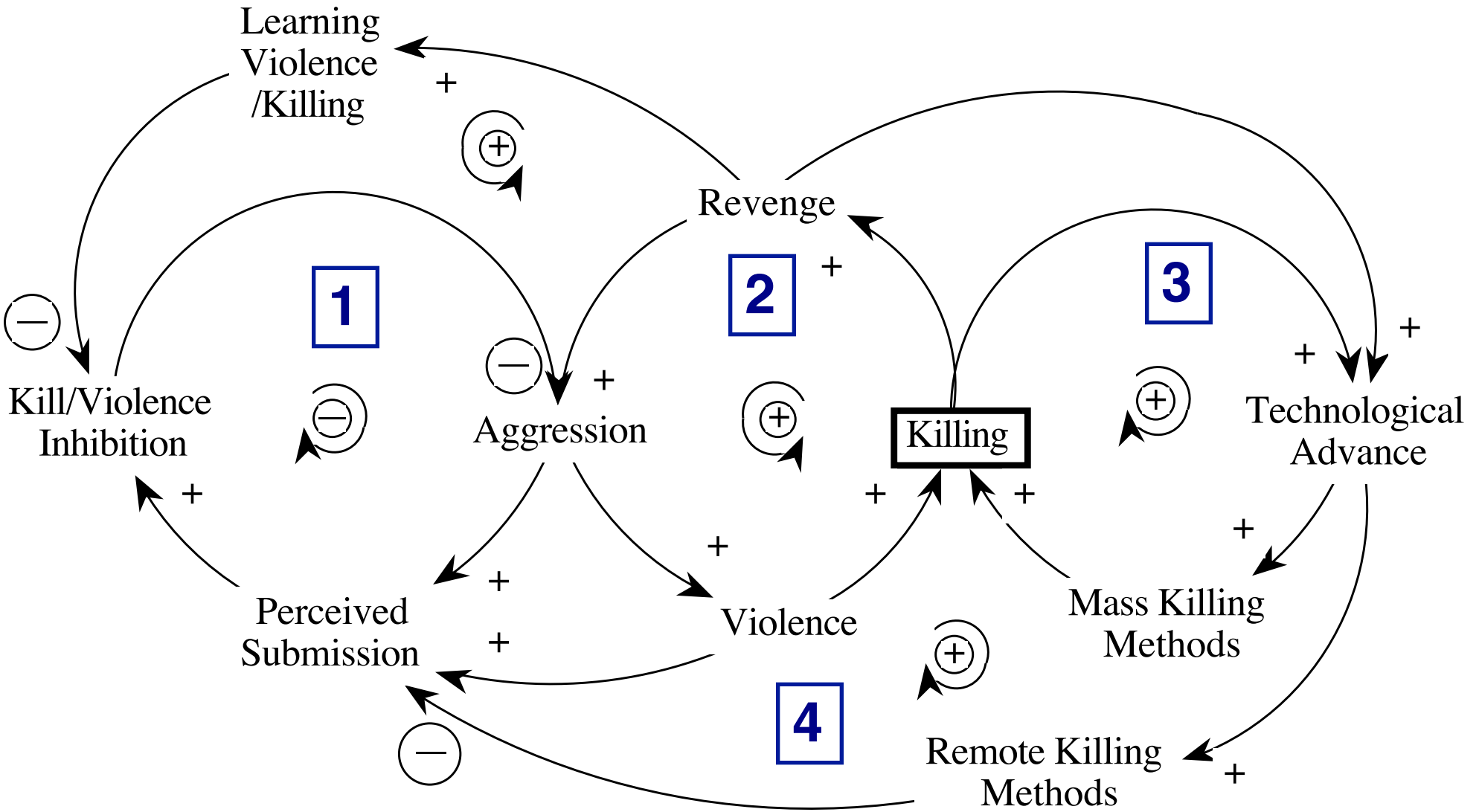
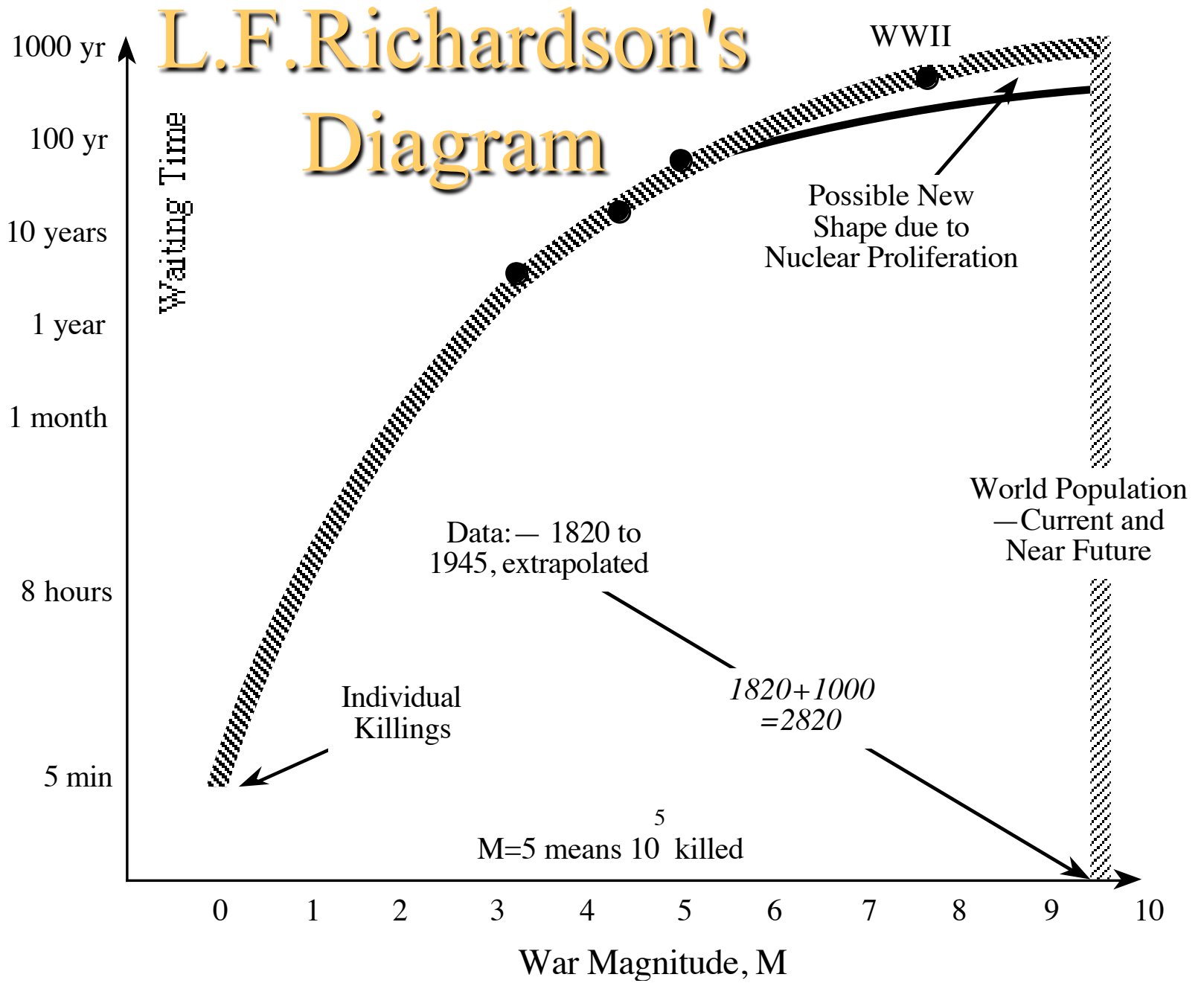
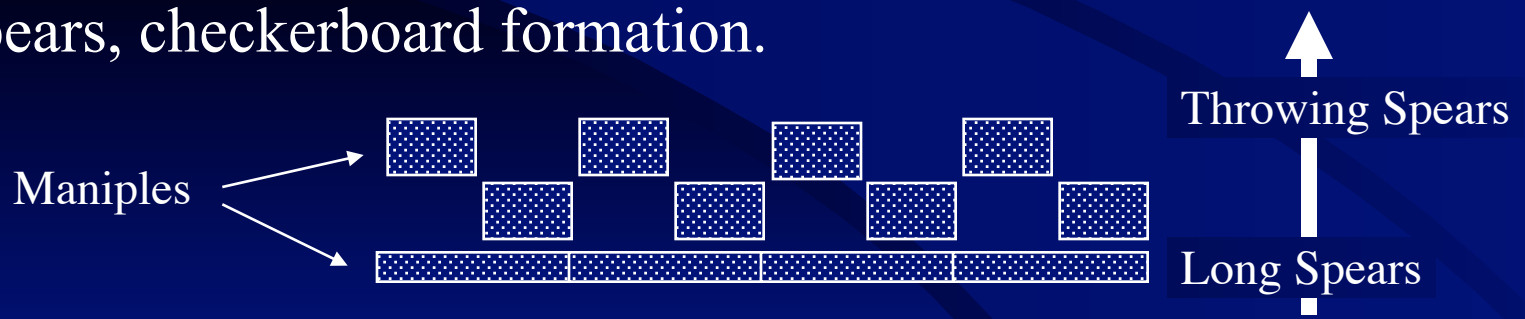
The Inevitable Cycle?




L.F.Richardson's Diagram
1000 yr
100 yr
10 years
1 year
1 month
8 hours
5 min
Waiting Time
WWII
Possible New Shape due to Nuclear Proliferation
World Population —Current and Near Future
Data:— 1820 to 1945, extrapolated
1820+1000 =2820
Individual Killings
M=5 means 10^5 killed
0
1
2
3
4
5
6
7
8
9
10
War Magnitude, M

Command in History—1

- Sumerian Phalanx. 4th millenium BC, 6-man deep, shields, pikes, battleaxes
- Egyptian Square. 2nd millenium BC, 100-man deep, copper battleaxes, bows, quivers for volley fire, wings and centre, flanking movements, recruit training, cadence step.
- Assyria, 9th Century BC, 120,000-man army, archers, mounted lancers. Archers mounted for mobility, fought on foot in pairs —one for bow, second for wicker shield. Engineer corps
- Greek Phalanx, 7th Century BC, 8-man deep files, 8-ft pikes, 2-foot swords, centre & wings, advanced to flute.
- Roman Legion, 4th Century BC, 120-man maniples, throwing spears, checkerboard formation.



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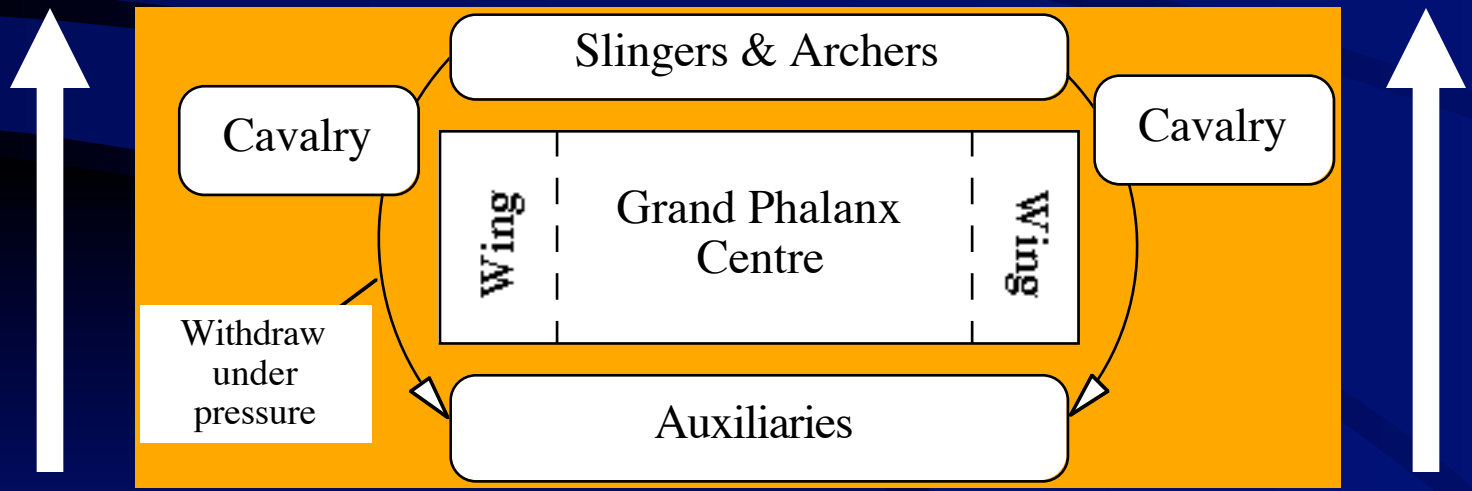
Alexander

Syntagma

16x16 men. Front five ranks held 21ft spears.
Remaining 11 ranks held spears vertically
or resting on shoulders of men in front

4 x Syntagma = Chiliarchia
4 x Chiliarchiae = Grand Phalanx



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Command in History—2

- **Muslims**, 7th Century AD, religious fanaticism—"The sword is the key to Heaven and Hell"—Koran. Mail and helmets, but no shields, brute force rather than tactics, sword, javelin, dagger, bow, scimitar, mounted lances. Employed Europeans as mercenaries for phalanx operations.
- **Mongols**, 13th Century, cavalry, 1 touman = 10,000 horsemen, 1 army = 3 toumans. Battle regulated by black and white flags—no oral or written orders. Cavalry in five lines. First two wore leather armour, used sabres and lances. Following 3 lines—bows and javelins, un-armoured.
- **Europe**, 14th Century, Crecy, long-bowmen vs French knights
  - *End of 1000 years of mobility-by-cavalry—sacrificed for firepower*
- **Swiss Phalanx**, Spanish Square—50-man front and per file.
- And so to Napoleon and modern times, infantry, tanks helicopter-cavalry...
- *Throughout this time, and today, command is limited by the abilities of the force to respond as much as by any C2 technology.*

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What Makes an Effective Fighting Force?

- The ability of Alexander to sense tentativeness or outright fear among the troops at a certain point in the enemy lines and to exploit it with a rapid thrust there.
- Caesar's care never to lose "control" of his legions so that, when a battle was going badly, he could disengage before tactical set-back turned into catastrophe
- Wellington's skill in anticipating the thrust of the enemy's attack and manoeuvring laterally in time to avoid it

Johnson & Levis, *Science of Command & Control*

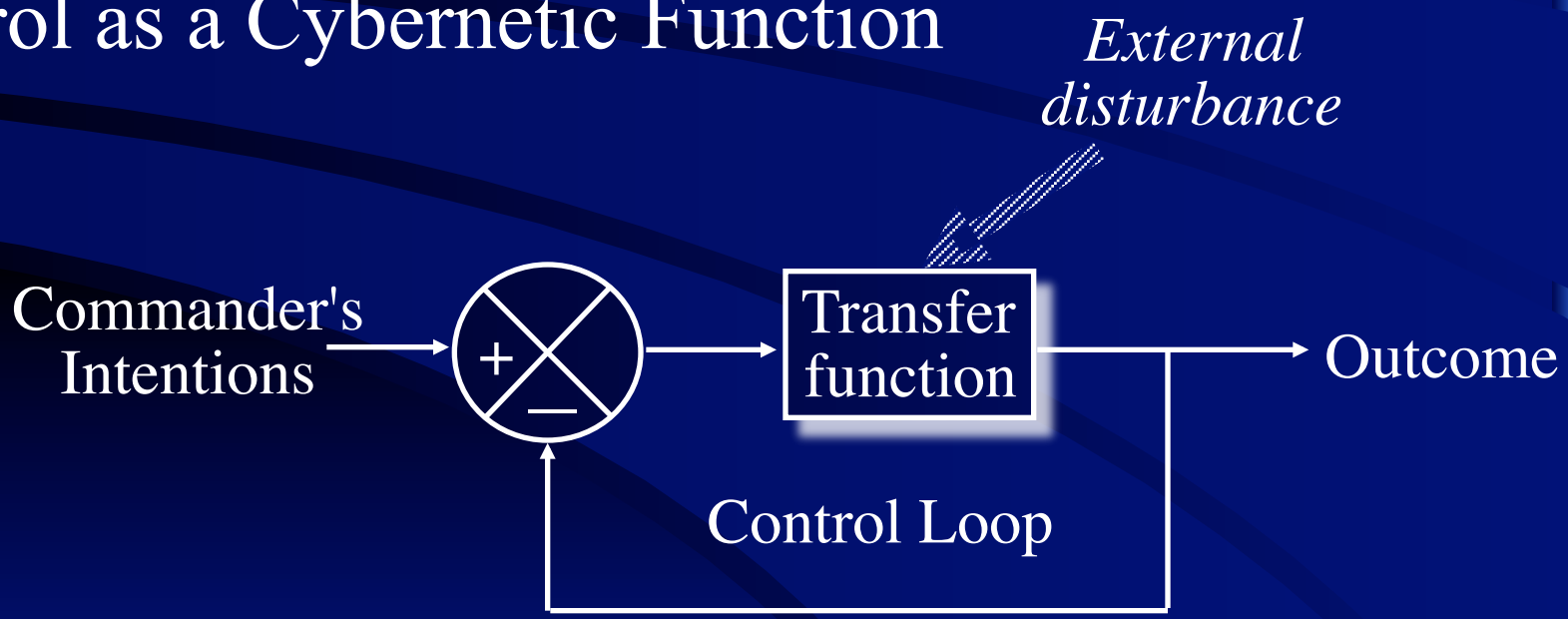
What is Command?

- Command the authority
- Command the responsibility
- Command the Chess-player
- Command the Isotope Manipulator
- Command the Orchestra Conductor

"Orchestrated? You start to play and then some son-of-a bitch climbs out of the orchestra pit and chases you all round the stage with a bayonet"

What is Control?

- Control as Synergy—co-ordination of 'internal' organization to produce overall external effect.
- Control as the Issuing of Missions
- Directive Control
- Control as a Cybernetic Function



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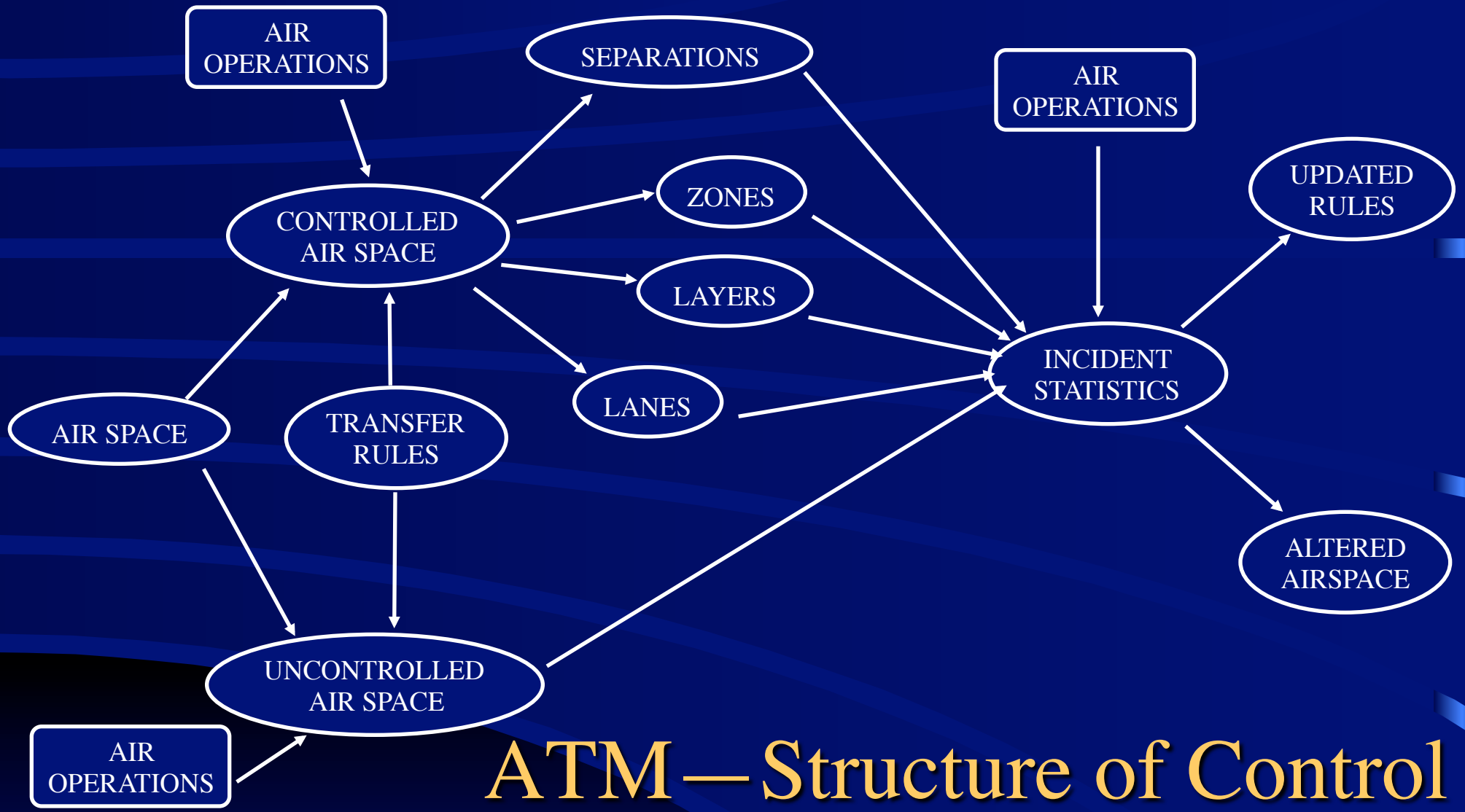
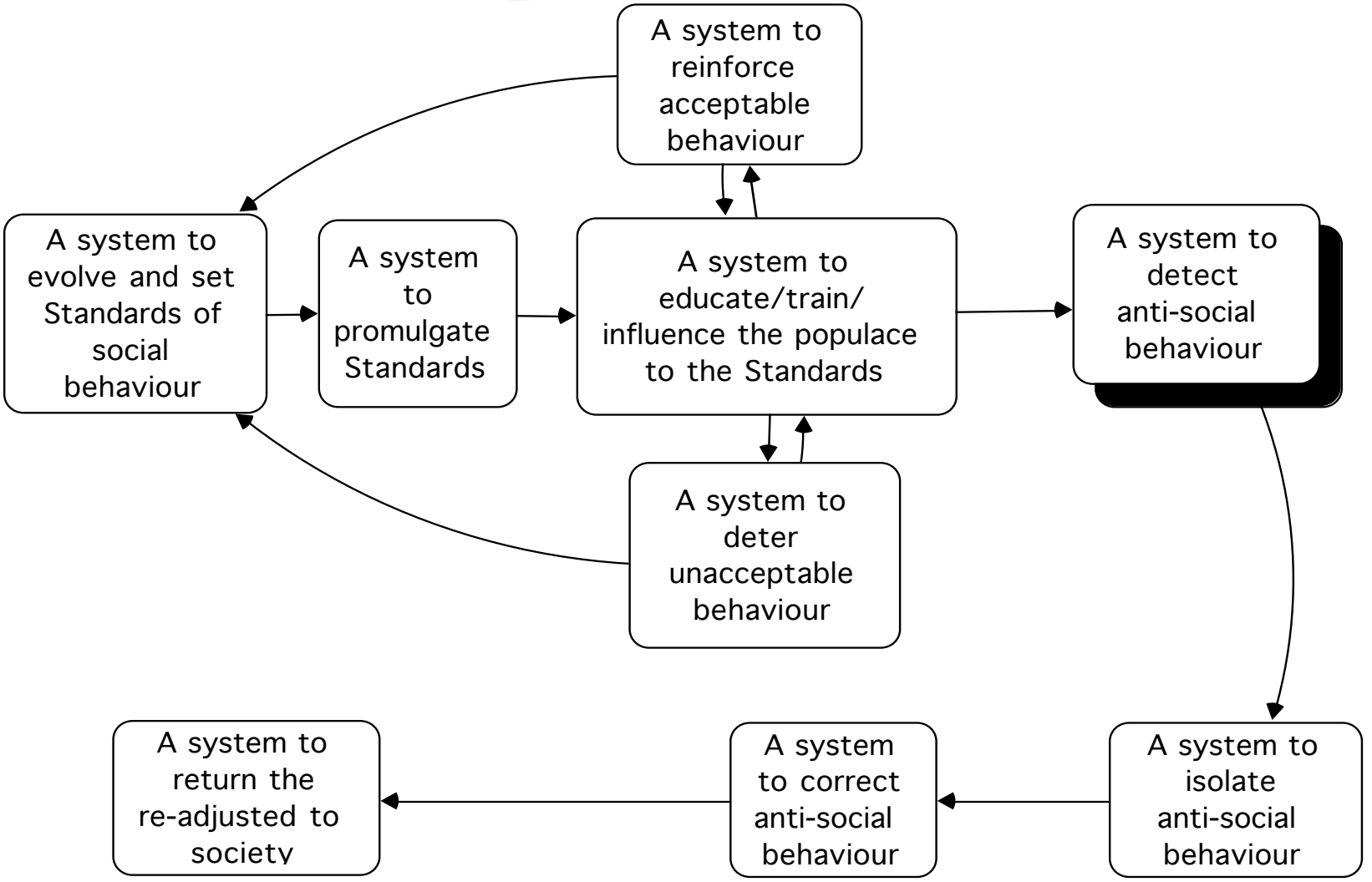


ATM—Structure of Control

Note: 1. separation concepts

2. slow external control (rules)

Police—Open-Loop Control?



- Contemporary peace-making, -keeping more like policing

Expectations of Command & Control

- Force Commander. Intelligence, Decision Support; Execution Management; Deployment Management
- Out-of-Area Commander. Focus for Command Information; Centre for Control
- Political Master. Political Situation Control
- National MOD. Application of National MOD Influence
- Procurement Financier. Force Multiplier to reduce overall defence costs
- Lateral Force Commander. Intelligence Source; Coordinating Agent; Resource source; synergy management
- Subordinate Commander. Control and Reporting (C&R) Authority; Mission Source; Resource Source.
- Journalist. Source of up-to-the-minute information for public consumption

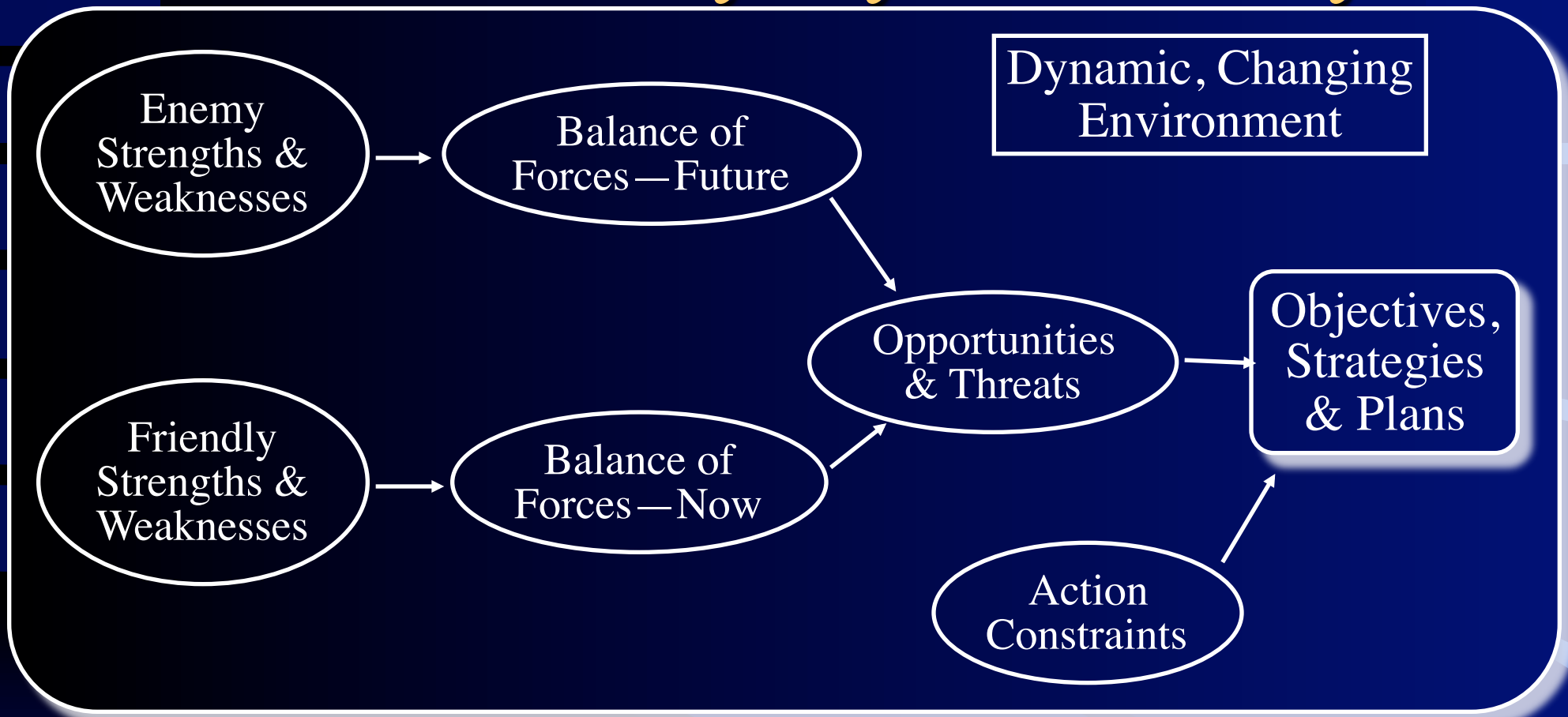
A View of the Defensive C2 Task

- Deter • Counter aggression • Face a changing Threat Direction • Counter Diverse Threat Elements • Protect own Latent Offensive Forces • Distinguish Friend from Foe, esp. own Returning Offensive Forces
- Survive • Avoid Detection • Prevent Interception / Exploitation • Defend Defensive Assets • Defend own C2 • Tolerate Damage—redundancy, reconfiguration
- Be available • Reliable • Dependable • Maintainable • Transportable • Mobile
- Win the Cost-Exchange Ratio Battle—cost of Defence should not cost more than the Assets so saved, in the long term

Role of Command & Control?

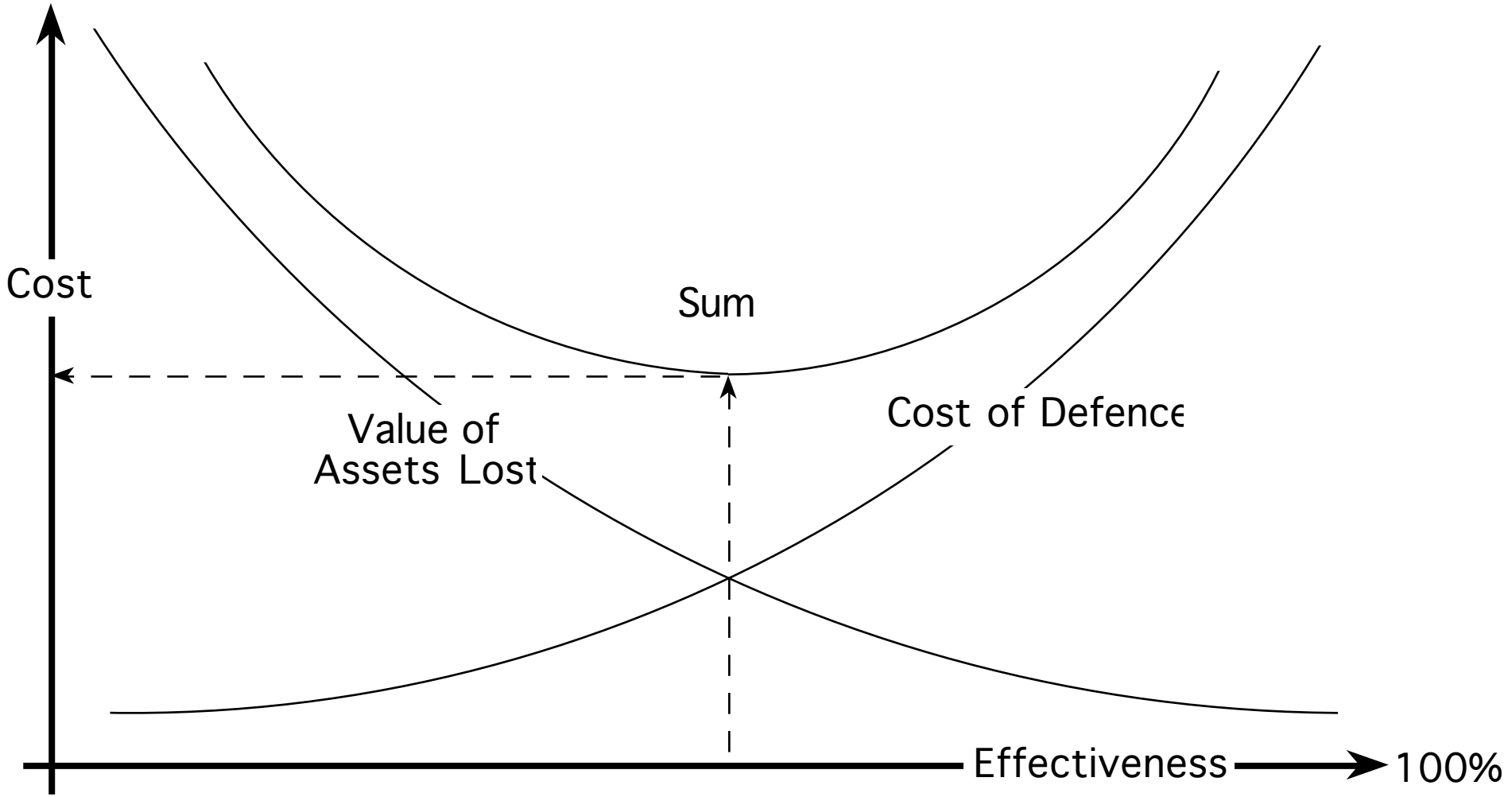
- Force Multiplier Effect (FME)
  - more bangs per buck, more firing than fired-at,
  - exploitation of enemy weakness— concealment of own ,
  - concentration of force, economy of effort, unity of effort,
  - etc, etc, etc.
- Executive Decision Support
  - gather and analyse all data to enable commanders to formulate sound decisions
- Focus for Operations Management
  - coordinate and monitor the progress of operations.

FME—Military Myth or Reality?



V.difficult to unravel Cause and Effect—
FME real but unquantifiable?

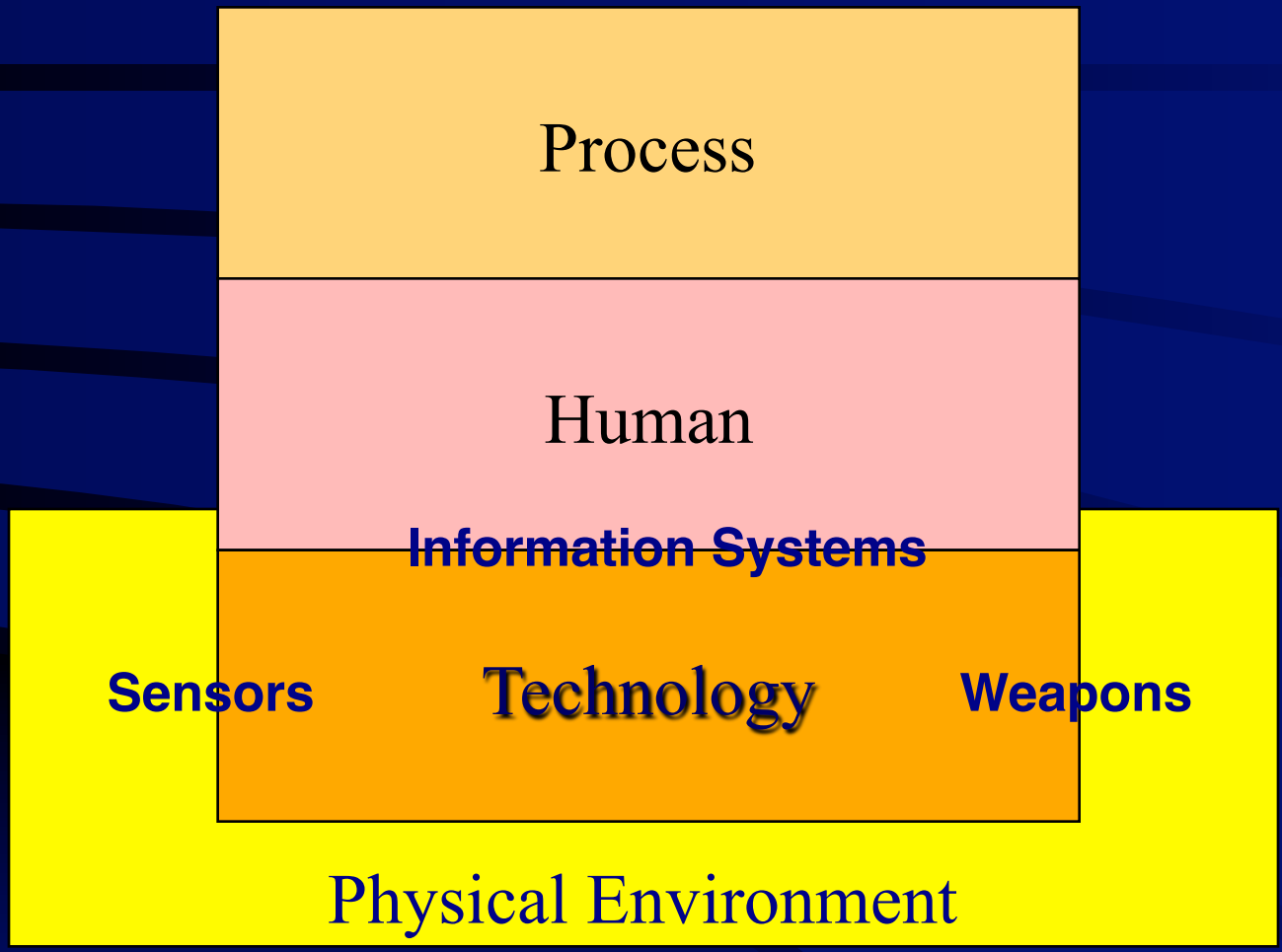
The Economic Viewpoint

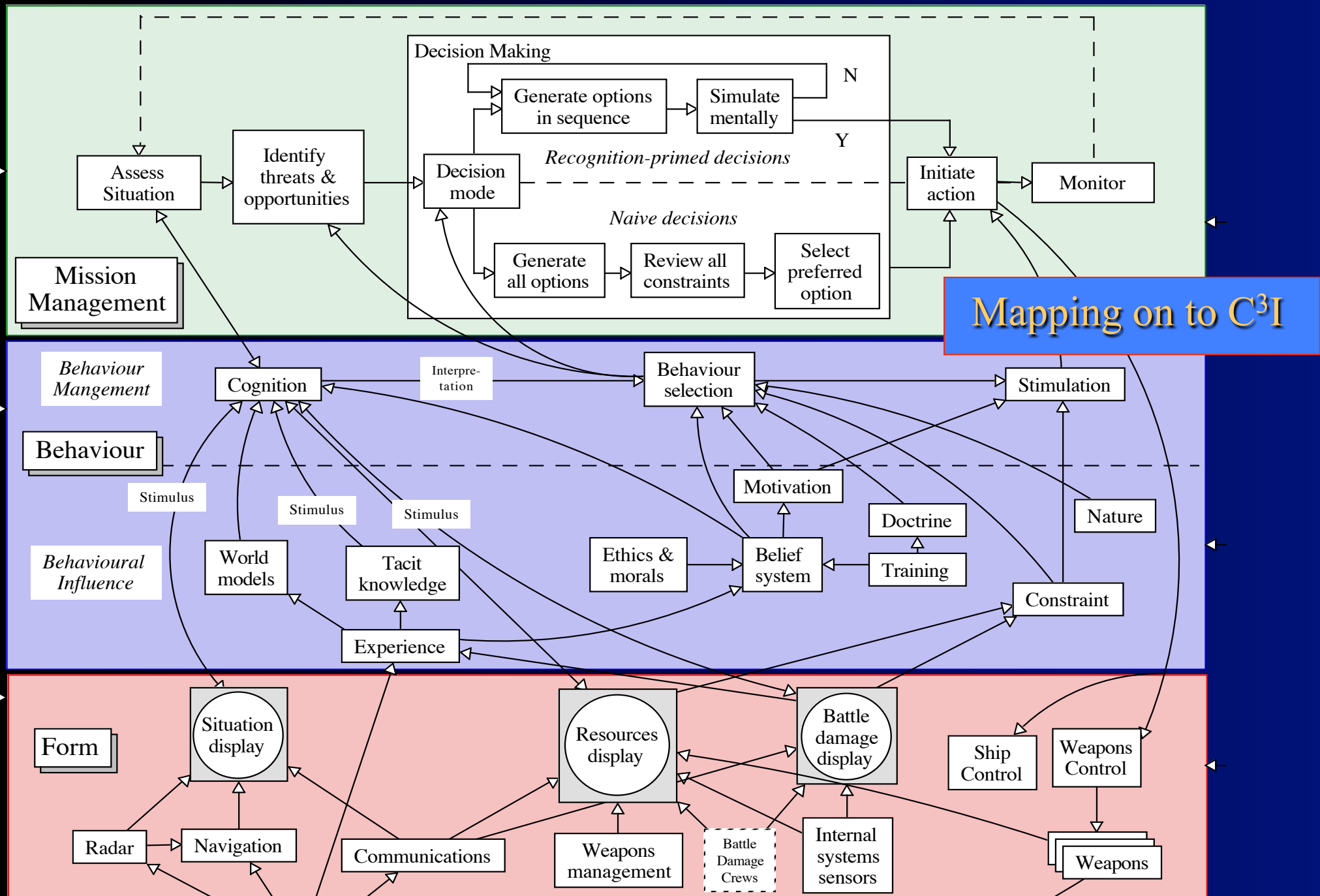


Preparation

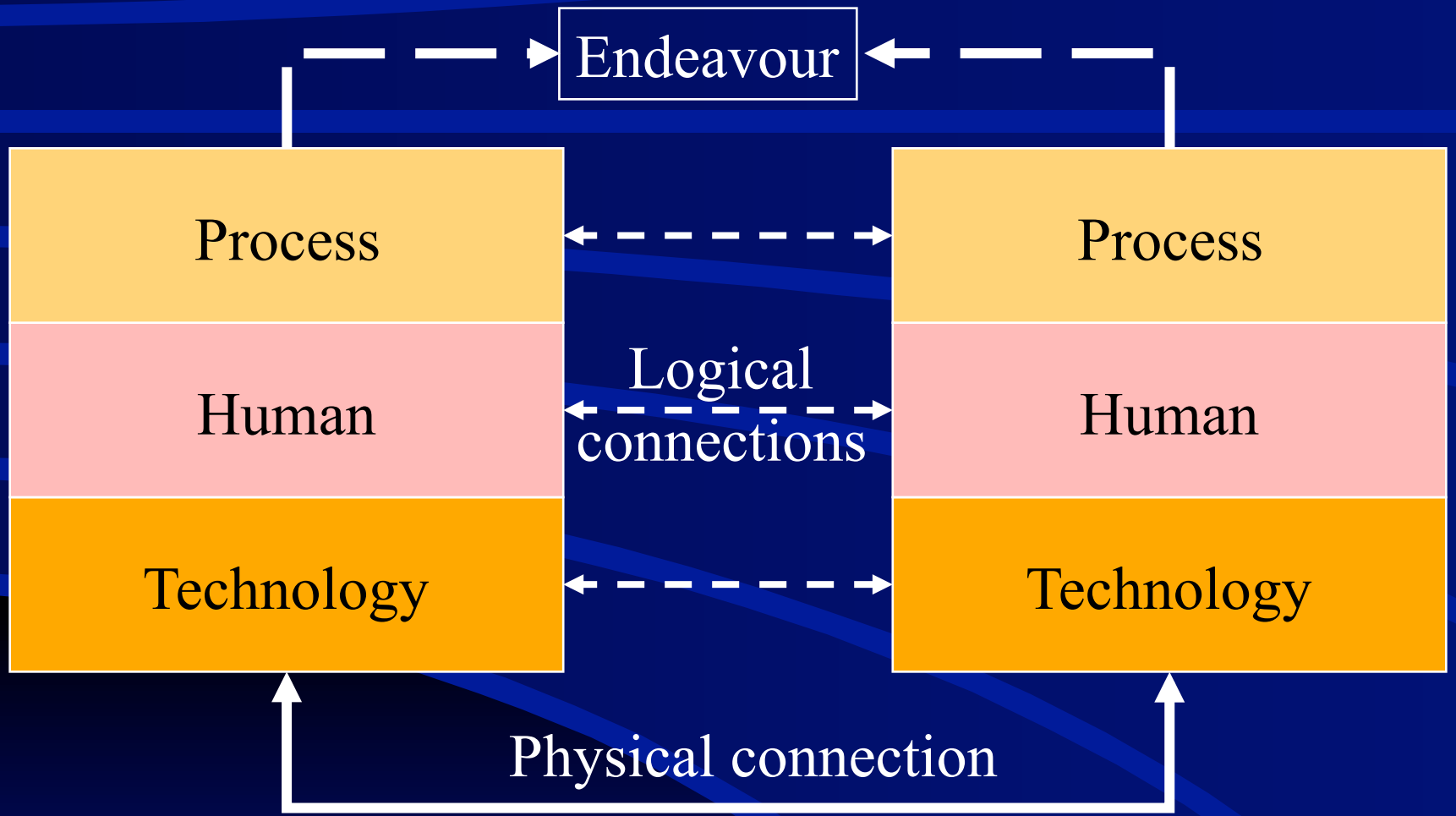
- Read "General Theory of C2 in time for:
  - "C2 Theory and Models"

Virtual Machine Viewpoint of C2




Decision Making
N
Generate options in sequence
Simulate mentally
Y
Recognition-primed decisions
Assess Situation
Identify threats & opportunities
Decision mode
Initiate action
Monitor
Naive decisions
Generate all options
Review all constraints
Select preferred option
Mission Management
Mapping on to C3I
Behaviour Mangement
Cognition
Interpre-tation
Behaviour selection
Stimulation
Behaviour
Stimulus
Stimulus
Stimulus
Motivation
Doctrine
Nature
Behavioural Influence
World models
Tacit knowledge
Ethics & morals
Belief system
Training
Constraint
Experience
Form
Situation display
Resources display
Battle damage display
Ship Control
Weapons Control
Radar
Navigation
Communications
Weapons management
Battle Damage Crews
Internal systems sensors
Weapons

C2—Virtual Machine Interaction



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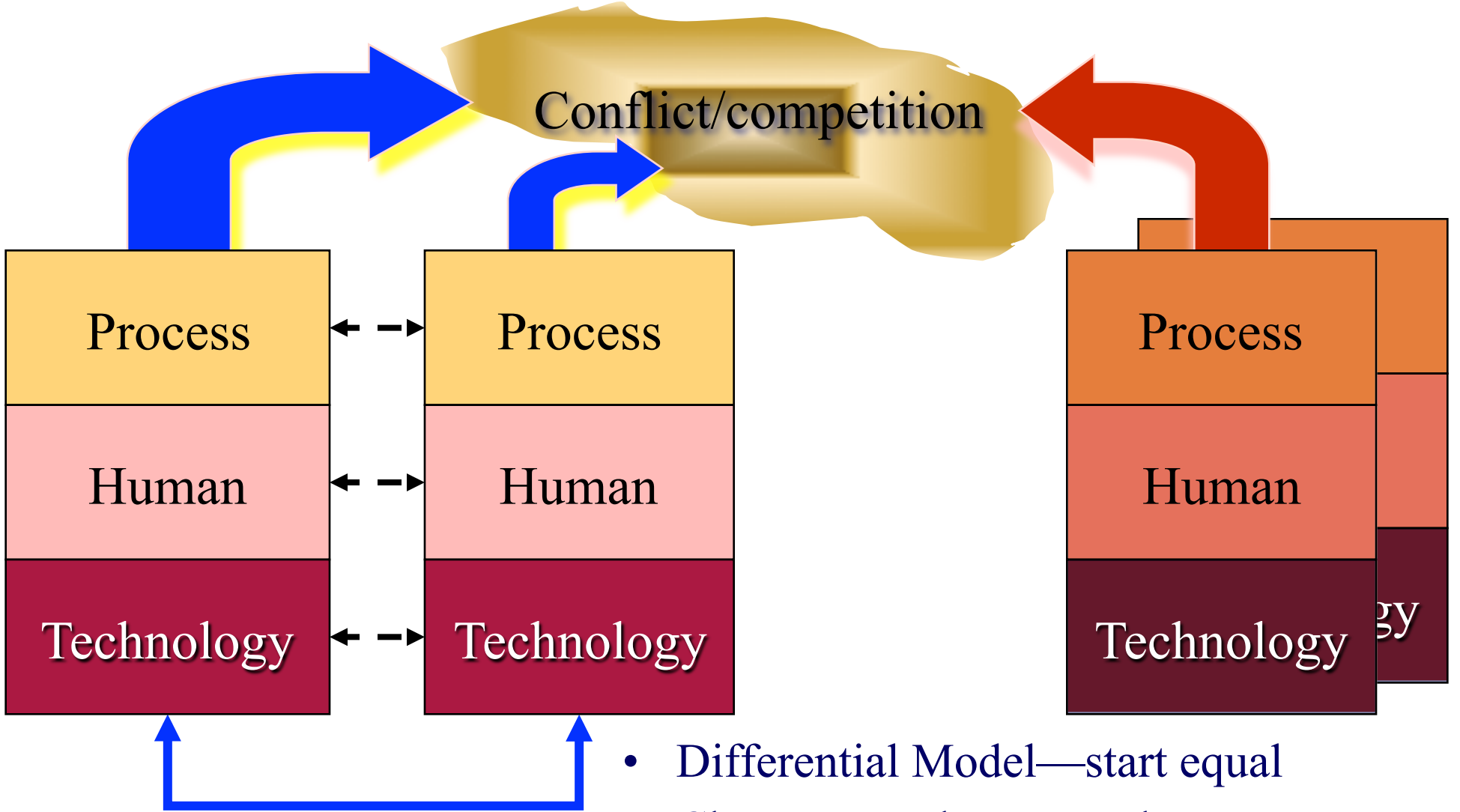
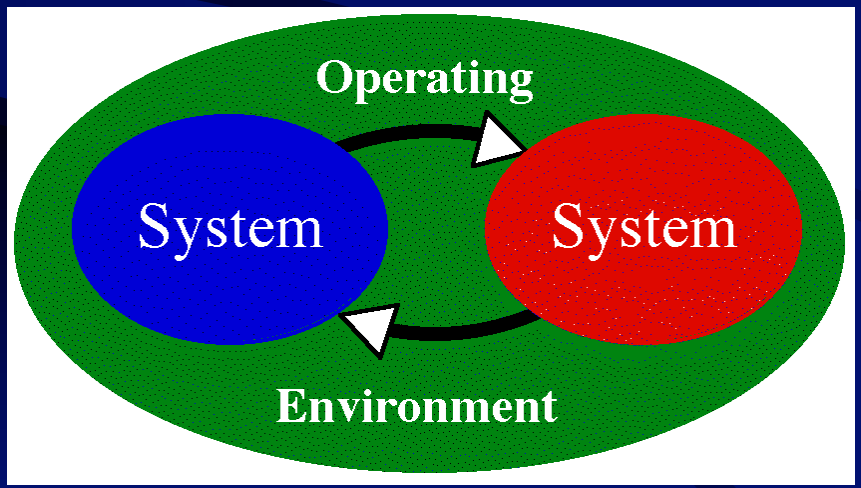


- Differential Model—start equal
- Change any element—observe advantage = measure effectiveness

Decision-Effectiveness

C^2 Effectiveness is *Emergent*

- Blue has an effect on Red—Blue's Effectiveness
- Red has an effect on Blue, too
  - Blue's effect changes Red's effect and vice versa
- Blue effectiveness definable *only* for given scenario/ situation/competition/weather, etc.
- Effectiveness–complex, dynamic, emergent property



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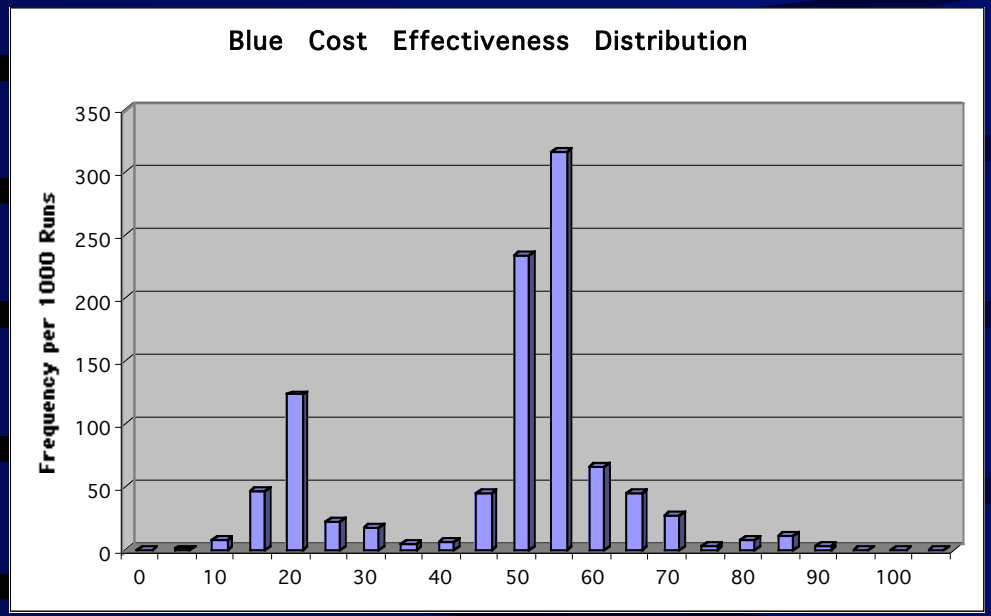
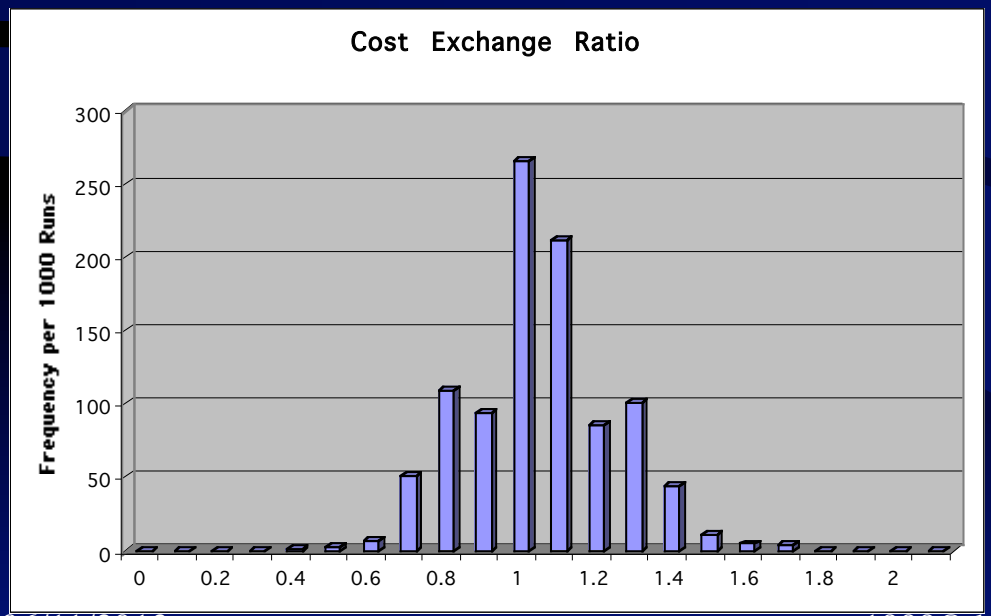
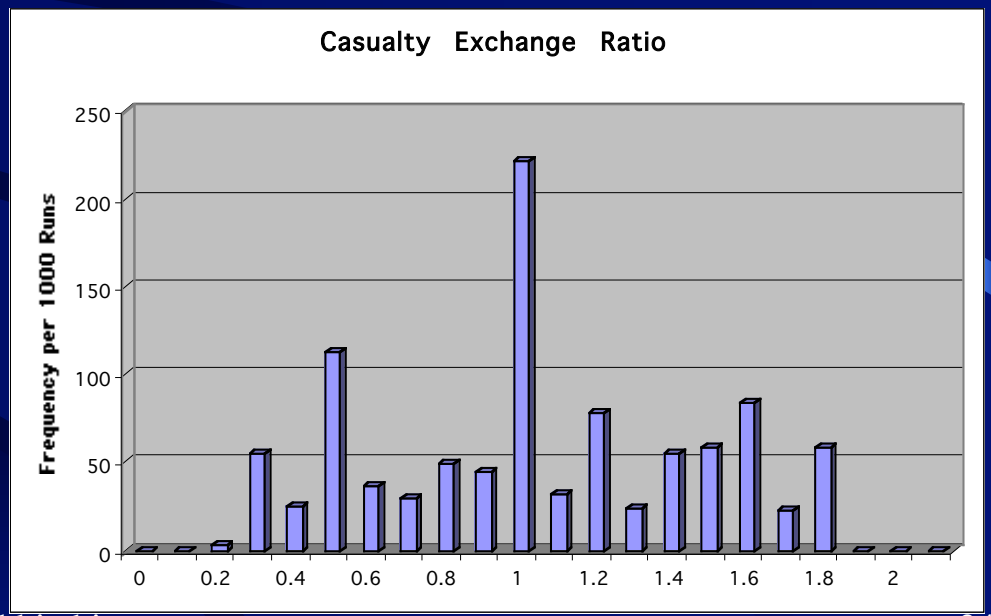
How to Measure?

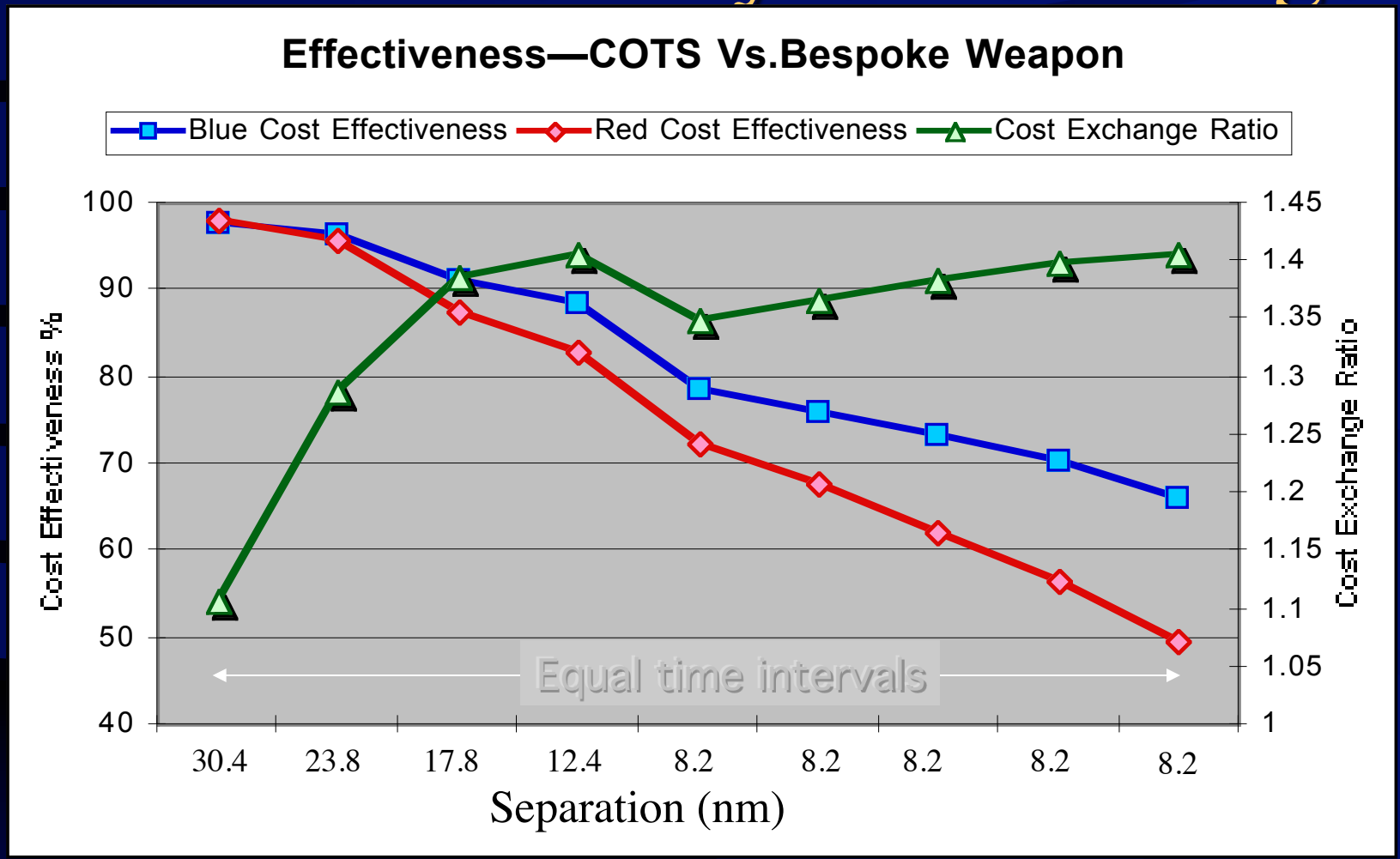
- Each MoE is a complex emergent property
- Combat unpredictability makes them more so!
- ***Not*** a simple weighting and scoring game!







Effectiveness—Dynamic/Emergent



- Casualty Exchange ratio = 1
  - COTS and Bespoke missile models have same Pk

Key Task Lists—Personnel

- Implement Augmentation Plans for WHQs
- Maintain Status of Personnel Situation
- Coordinate Personnel Flow
- Assess Personnel Situation
- Establish Priorities of Replacements
- Request Personnel Replacements
- Maintain Status of National Manpower Mobilization Plans
- Assess the Status of National Manpower Mobilization Plans
- Control National Manpower Mobilization
- Maintain Status of National Plans for Handling POWs
- Control National Plans for POWs

Key Task List—Intelligence—1

- Preparation for Change of Location of Command
- Obtain and Maintain all Necessary Intelligence from (NATO) Intelligence Centres
- Conduct Liaison with Intel Staffs of Appropriate Commands and National Intel Agencies to obtain Necessary Material
- Assess enemy Situation/Capabilities/Intentions
- Identify New or Modified Enemy Weapon Systems
- Assess Enemy Documents and Technical Data
- Assess/Evaluate Enemy Military Force Posture
- Establish/Maintain Order of Battle by Type:—
- GROBAT • AOB • MOB • NOB • FOB
- Maritime • NBC • Unconventional forces

Key Task List—Intelligence—2

- Co-ordinate Intelligence Collection Activities
- Assess Nato/National Collection Capabilities
- Assess Intel Collection Capabilities of National Forces Chopped to NATO
- Identify/Determine Intel Gaps
- Request Intel Collection
- Provide Tailored IN-Depth Intel Support
- Assess/Evaluate CI Activities
- Direct CI Activities
- Maintain Status of CI Activities
- Conduct CI Liaison
- Perform Indications and Warnings Analysis

Key Task List—Intelligence—3

- Assess Residual Enemy Capability (Battle Damage Assessment, BDA)
- Evaluate Mission Results
- Maintain Intel Target Base
- Disseminate Intelligence
- Manage Security Programme
- Issue Intel Tactical Attack Warnings
- Determine Essential Elements of Information
- Maintain Status of Recce Requests
- Review/Initiate Recce Requests
- Recommend Specific Targets
- Determine/Recommend Routes of Penetration & Egress

Key Task List—Intelligence—4

- Assess Target Material
- Develop Target Programmes
- Assess State of enemy Unconventional Operations
- Provide Guidance on Enemy POW Interrogation
- Determine Nature of Resistance in Neighbouring Countries

Key Task List—Operations —1

- General SUCOC Task (SUCOC above and below)
- Preparation for Change of Location of Command
- Maintain Status of Friendly Conventional Forces
- Assess Current Friendly Forces Situation
- Execute Pre-planned Emergency Actions
- Plan/Develop Emergency Actions
- Authenticate Emergency Action Messages
- Control Code-words
- Direct Implementation of Contingency Plans
- Assess Subordinate Plans/Approve Subordinate Command Op Orders
- Prepare Guidance on Concept of Use for Conventional & Nuclear Weapons

Key Task List—Operations —2

- Assess Military Balance
- Assess Political Military Situation
- Recommend Courses of Action to higher HQs
- Maintain Status on World-wide Situation for Political Military Purposes
- Select Target Categories/Areas/Campaign
- Nominate Conventional Targets
- Perform Weaponeering
- Determine Priorities for Courses of Action
- Issue Operational Orders and Directives
- Establish and Maintain Liaison
- Agree SOPs for use with Other Commands

Key Task List—Operations —3

- Request Mission Changes from Higher HQs
- Prepare for SUCOC
- COLOC
- Forecast own Combat Losses
- Determine Forces for Next Planning Period
- Apportion Forces for Tasks and Roles
- Assign Forces
- Allocate Resources
- Maintain Status of Selected Barriers/Defences Control Selected Military and Economic Demolitions
- Control Execution of Current Plans
- Relocate Units for Effective Utilization or Survival

Key Task List—Operations —4

- Maintain Status of Mission Execution
- Task/Coord/Direct Search and Rescue
- Evaluate Own Combat Losses/ Reasons
- Plan Joint/Combined Operations
- Coordinate Operations
- Analyze Action Reports
- Conduct Operational Training
- Control C2 Countermeasures
- Establish/Maintain Courier Service
- Initiate Courier Routes

Key Task List—Unorthodox Operations

- Coordinate Unorthodox Warfare
- Coordinate Deception Operations
- Coordinate Employment of Unconventional Military Forces
- Coordinate Escape and Evasion Operations
- Coordinate Psychological Operations

Crisis Management (Alerts/Deterrence)

- Analyze and Assess Requirements within Inventory of Preventive Measures
- Disseminate Alert Declarations Cancellations
- Manage Rules of Engagement
- Control Alert Implementation
- Manage Reinforcements
- Manage Assembly/Staging Areas

Other C2 Areas

- EW
- Meteorological/Oceanographic/Geographic
- NBC
- Logistics—sources, resources, transport, storage, allocation, medical, war consumable, sustainable periods of operations
- Communications
- Public Information/media

	Stable	Dynamic	Deducible	Doctrinal
Performance	Fixed Obstacles, Routes, Hazards Action Element Capabilities Interoperability Orbats Plans	Positions Strengths Going Weather Plans Engage/Disengage/ Move	Positions Balance of Forces Threats Rates of Closure Weaknesses Enemy Intentions Penetration and Egress	Cost-Exchange Ratios SOPs Enemy Tactics Tactics & Strategy
Survivability of Performance	Availability of Alternates Self Defence Damage Tolerance Signature	Alternate Status Self defence Status Emcon Status	Attrition Overrun Forecast Action Element Strengths	Mobility vs Armour Attack/Defend Ratios Stand/Withdraw Ethic SUCOC/COLOC
Availability of Performance	Reserves Replenishmnet Cycles	Warcon, POL Spares Transport Readiness	Combat Days Remaining	Predicted Conflict Duration

Typical C2 Information Template