From “Plan and Pray” to “Sense and Respond”

Wargaming Defense Acquisition

Technomics
Better Decisions Faster

ICEAA Professional Development and Training Workshop

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Please see the long-form paper that accompanies this presentation for more in-depth research and conclusions

From Plan and Pray to Sense and Respond

> *"Accelerate change or lose. There's no second place in combat."*
>
> General CQ Brown, Chairman of the Joint Chief of Staff

This paper rises to the Chairman's challenge.

It provides an **innovation playbook** in the form of a Departmental **acquisition engine** that can force our enemy's hand through adaptability, agility, and fungibility.

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Outline

- Yesterday: ***React*** Strategy
- Today: ***Plan and Pray*** Strategy
- Tomorrow: ***Sense and Respond*** Strategy
- Metrics: Measures of Contract Adaptability (***MOCA***)
- ***Acquisition Wargaming***
- Summary

Prelude

"… a changing ***external landscape*** generates friction and leads to an acquisition process that is ***too slow***, ***not responsive enough*** to joint needs, ***too expensive*** and ***too complex***."

"If Sisyphus had a job in the Pentagon, it would be acquisition reform …" to meet the exigencies of the fight

[Ms. Michèle Flournoy & Dr. Kathy Hicks]

Technomics' framework for acquisition wargaming seeks to smash the boulder

Context – Phases of the Fight

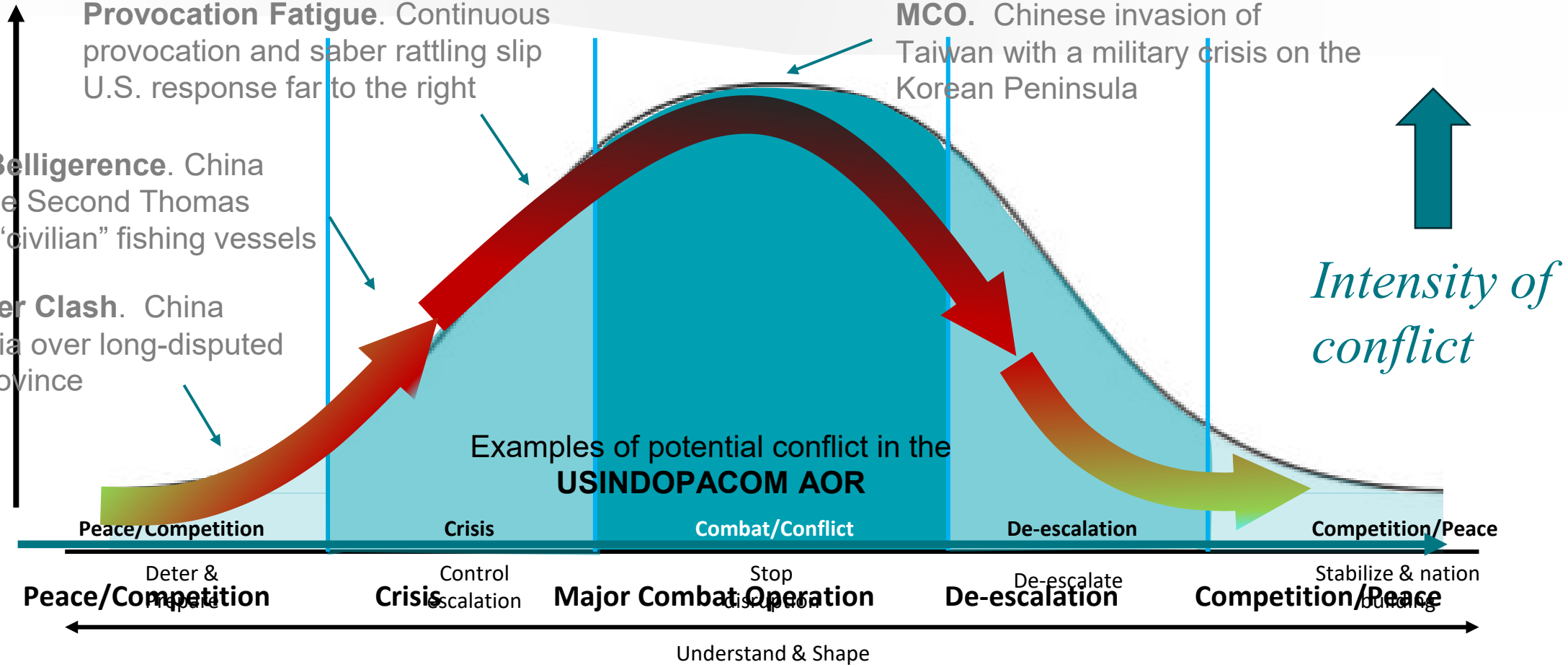
China Conflict Vignette

Provocation Fatigue. Continuous provocation and saber rattling slip U.S. response far to the right

MCO. Chinese invasion of Taiwan with a military crisis on the Korean Peninsula

Coercive Belligerence. China occupies the Second Thomas Shoal with "civilian" fishing vessels

Distant Border Clash. China pressures India over long-disputed Aksai Chin province

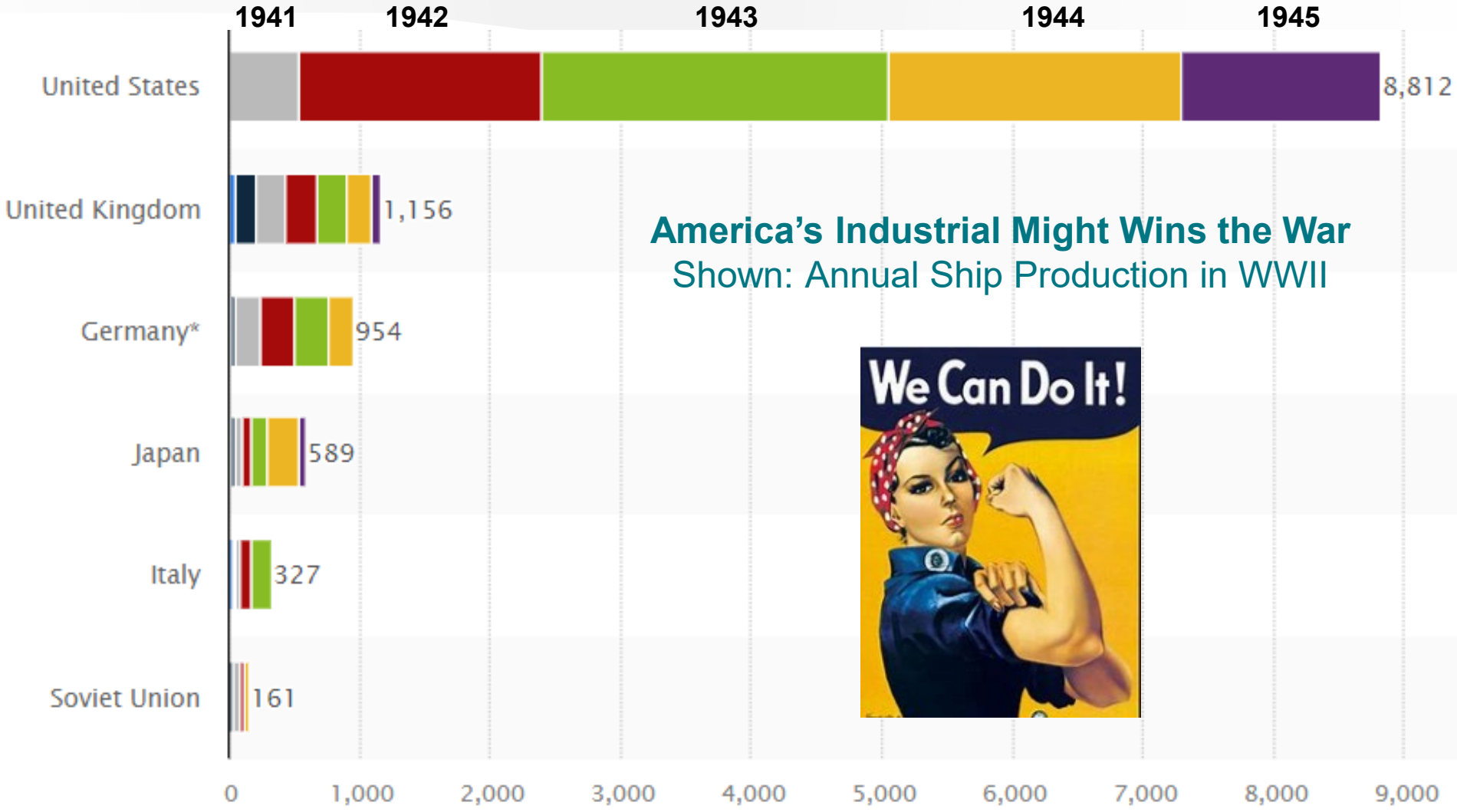


DoD acquisition needs to provide assets to prevail in all phases of the fight across all warfighting domains: air, ground, sea, undersea, space, cyber

Role of Acquisition Organizations:	Incrementally improve legacy systems	Anticipate warfighting requirements	Design/build new adaptive systems	Build new systems	Incrementally improve legacy systems

Strategy of yesterday was to React

Pre-Pearl Harbor



America's Industrial Might Wins the War

Shown: Annual Ship Production in WWII

Source: Statista

React – but will the industrial base support tomorrow?

Consolidation of the Industrial Base

Number of Prime Contractors

Type of System	1990	2023
Tracked Combat Vehicles	3	1
Ships and Submarines	8	4
Fixed-Wing Aircraft	8	3
Tactical Missiles	13	3
Satellites	8	4

> 50% drop

*"Our main strategic competitor today, the PRC, has spent the last **20 years** building a modern military carefully **crafted to blunt the operational advantages** we've enjoyed for decades."*

Dr. Kathy Hicks, DEPSECDEF

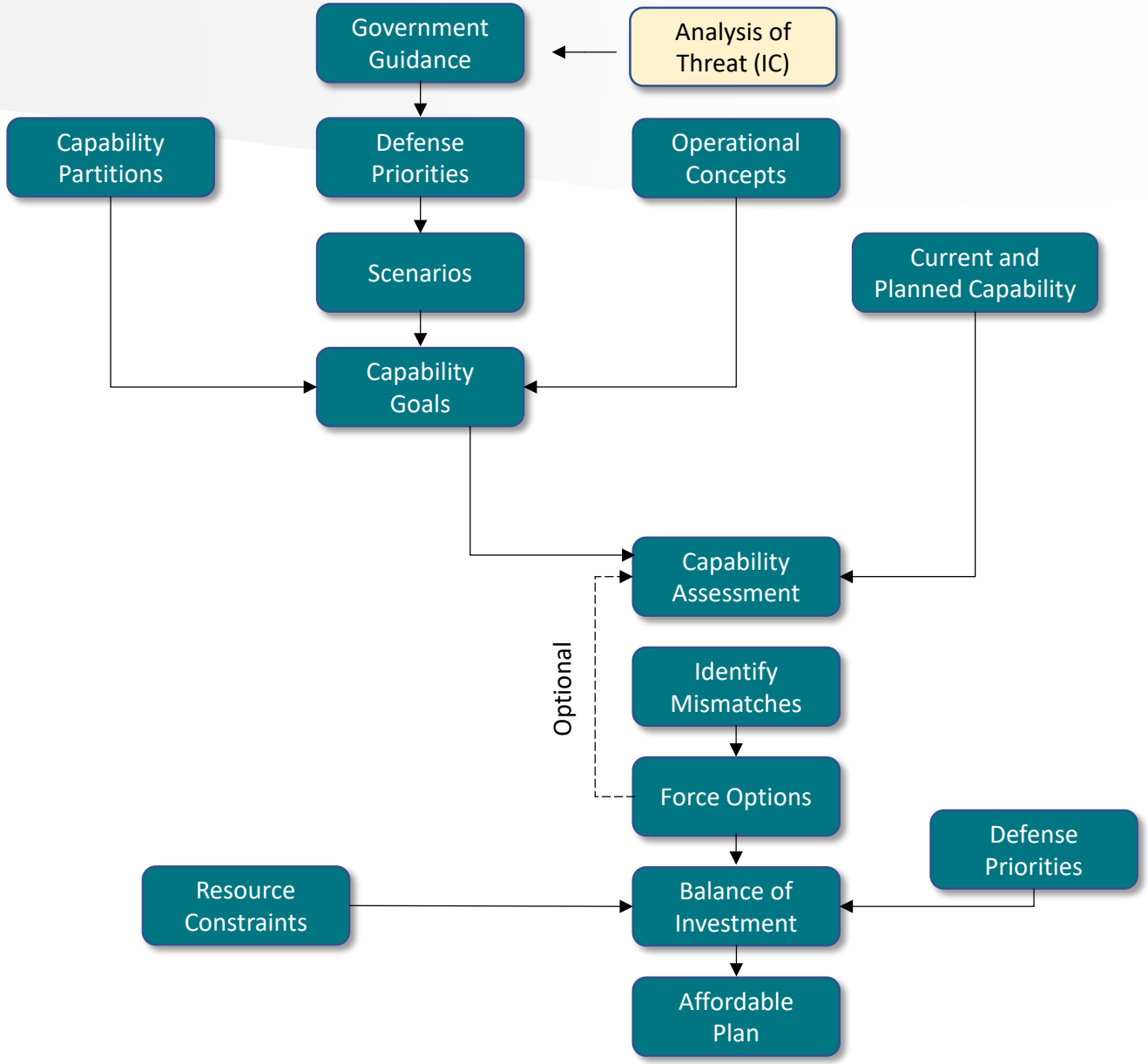
Plan and Pray Strategy

NATO's Canonical Gold Standard

Concept: Start with what you think you want to achieve and work to determine what you think you need

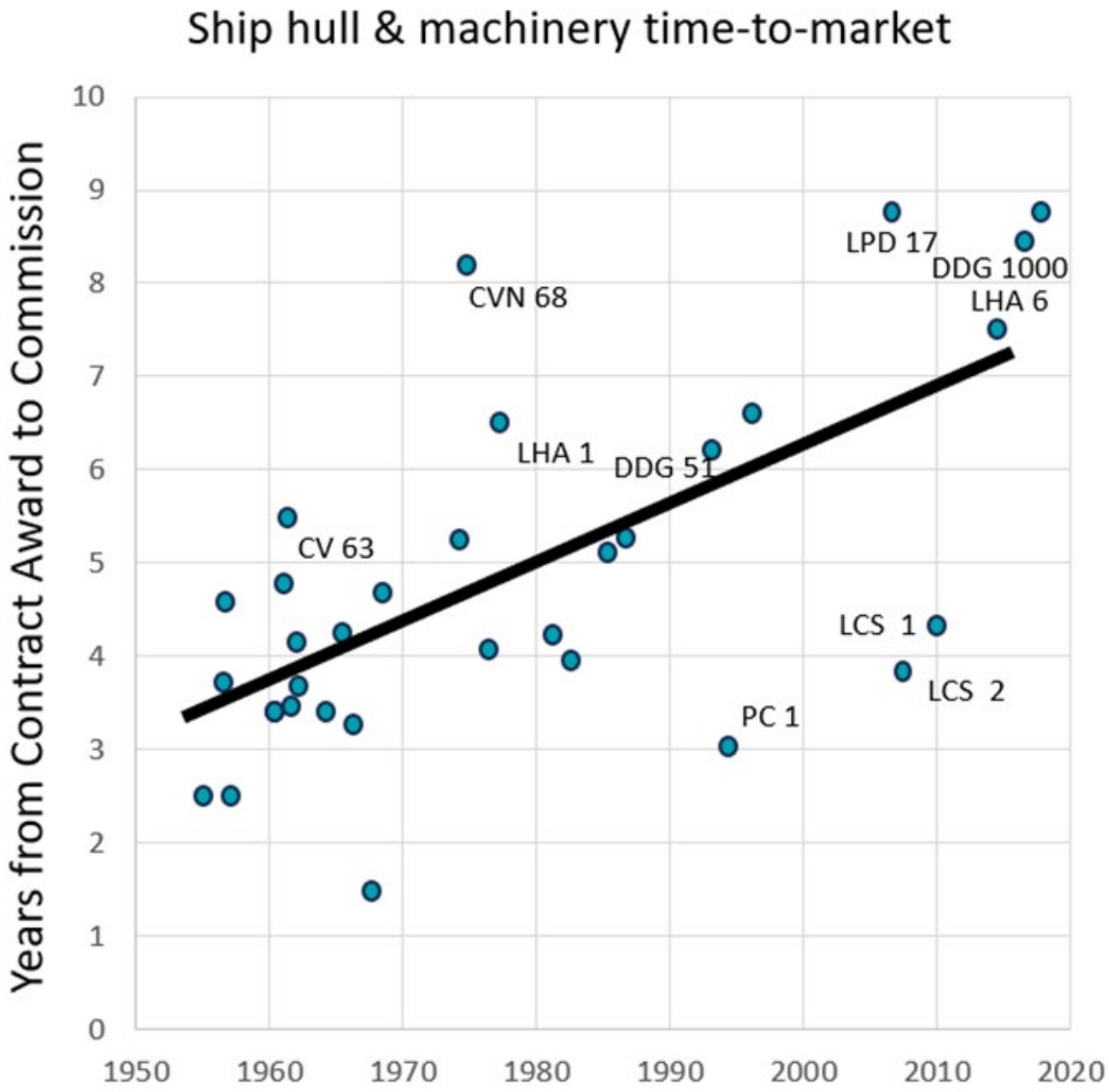
Process: Identify threat then define requirements based on warfighting scenarios. Assess options to build the force

Typical Outcome: Replace older systems with the same system with some improvements, but usually at higher cost



Plan and Pray – Pain Points

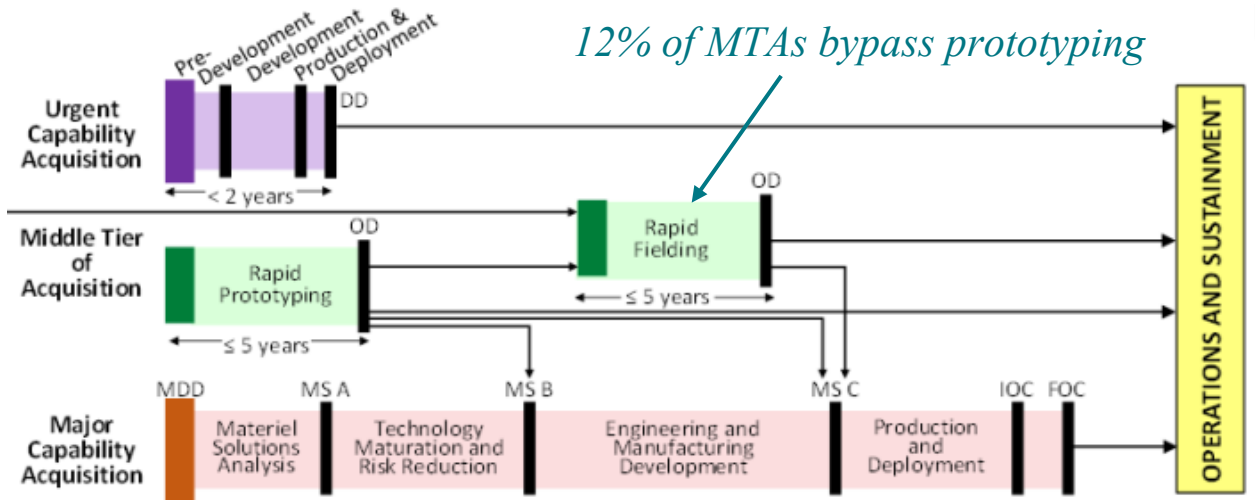
- Reliance on prescience
- Slow adoption of new technologies
- Inflexibility of PPBE process
- Long cycle times
- Affordability analysis not focused on O&S
- Difficulty trading off between capabilities
- Rigid Institutionalization



"*We plan, and hope we get it right.*"
NATO Assistant Secretary General for Defense Investment, former Canadian Ambassador Wendy Gilmore

Plan and Pray – Recent Innovations

Adaptive Acquisition Pathway (Partial View)



Very small "*m*" in DOTmLPF-P

URGENT CAPABILITY ACQUISITION

Joint Rapid Acquisition Cell (JRAC) in USD(A&S)

- Identify and Validate Needs
- Acquire and Deploy
- Operate and Sustain

MIDDLE TIER OF ACQUISITION

- Identification and Validation of Need
- Rapid Prototyping
- Rapid Fielding

Transition to New or Existing Programs

- Transition to EMD
- Transition to Production and Deployment
- Transition to Sustainment

"Rapid Fielding: minimal development"

Issues: tension between schedule imperative & governance; visibility of costs; lack of metrics

Bottom Line: Step in the right direction, if done enough to be effective

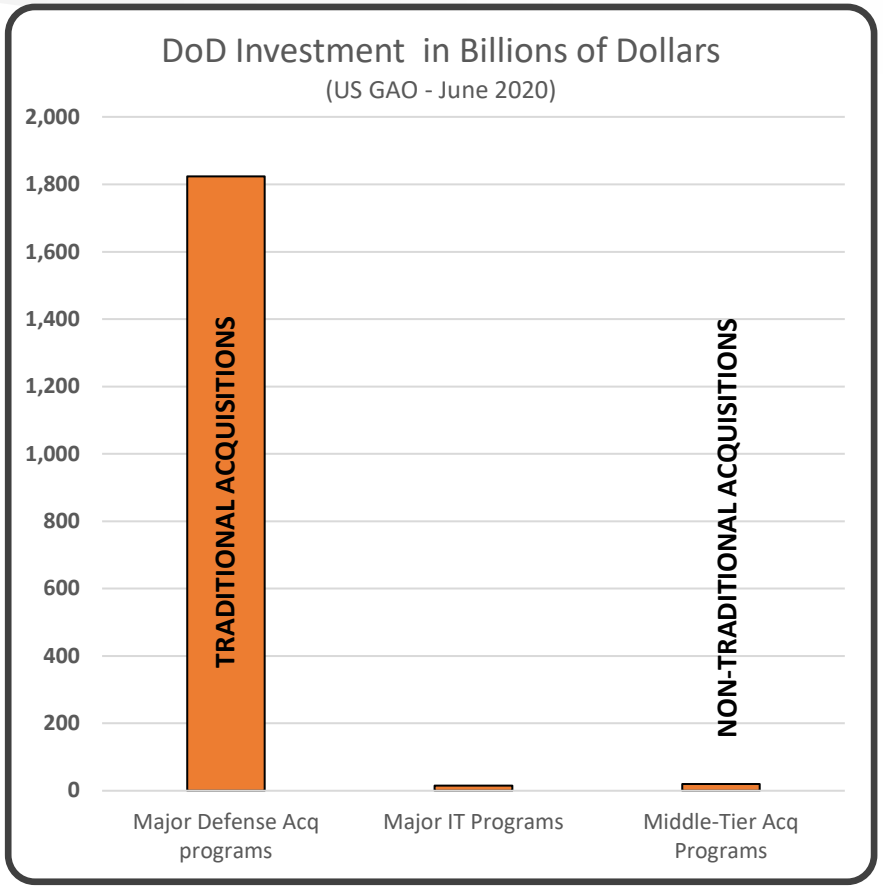
How is implementing adaptability going?

According to GAO, not very well…

Middle-Tier Acquisition (MTA) programs are *one* solution, but are a very small part of the budget

Prospective MTA Metrics

- Cost growth
- Time between start date & (1) outcome determination (OD) & (2) IOC & (3) FOC
- Number of prototypes fielded vs canceled
- Initial TRL levels
- Potential MDAP vs non-MDAP magnitude



Source: US GAO Report to Congressional Committees GAO-20-439 – June 2020

Plan and Pray – Leadership Issues With Current Strategy

"U.S. excels in Force-generation and Force-employment. But U.S. is weaker in Future Force-design."

Admiral Christopher Grady, Vice Chairman of the Joint Chiefs of Staff

Paradigm of Tomorrow: Sense and Respond

Strategy

- Adopt new methods to address the fast and changing face of battle
- Break down historical norms
- Rethink requirements generation in acquisitions
- Emphasize near-peer competition

Tactics

- Use Measures of Contract Adaptability (MOCA) to gauge responsiveness

A novel risk-driven framework with laser focus on adapting acquisition processes to meet a generational warfighting change

Sense and Respond

The Planned Force

The Current Force

All Services and warfighting domains

- Government Guidance
- Defense Priorities
- Scenarios
- Capability Goals
- Balance of Investment

Technomics' Metrics & Model (scored using key attributes)

- Adaptability
- Mass (quantity)
- Attritability
- Scalability
- Speed to contract
- Timeline: innovation to product

Multiple futures: sense & respond

Acquisition war gaming:

adaptive capabilities to manage shocks

Idea to product - fast

Sense and Respond – The six Measures of Contract Adaptability (MOCA)

Time to Contract & Production

Technology incubation to IOC to FOC

Adaptability of Industrial Base

Flexibility to change (OEMs & supply chain)

Scalability

Capacity utilization; buffer against risk

Response to the Fight

Relevance to change in the “Face of Battle”

Logistics Footprint

Modest or massive. Manageable?

Fungibility

Affordability. Attritability (e.g., Replicator)

Emphasizes measurability to predict acquisition success … to meet warfighter needs *on time*

MOCA – Time to Contract, Time to Production

Time to Contract & Production

Technology incubation to IOC to FOC

Current Problems

- **Average Award Timelines**
  - Competitive bids: 387 days
  - Sole-source contracts: 278 days
- **Process Bottlenecks**
  - Extended reviews, Request for Proposal (RFP) issuance, proposal evaluations, and negotiations
- **PPBE**

PPBE encodes divisions between research, production, and operations activities that can stymy iterative or feedback-based development.

New programs with emergent technology must typically wait more than two years to be included in the budget.

MOCA – Scalability

Scalability

Capacity utilization; buffer against risk

- **Definition.** Ability to get technology into production at scale, with plant capacity, work force, and supply chain in place to meet the exigencies of the battlefield

- **Key considerations**
  - Production Capacity →
  - Cost effectiveness

Shortages
- 155mm ammunition
- Javelin missiles
- Rocket motors
- HIMARS
- Patriot batteries

Covid: paper towels, hand sanitizer

Scalability Drivers

Driver	Unit
Production Capacity	Max units per time
Throughput	Units per time
Lead Time	Time
Resource Utilization	Percentage
Downtime	Time
Production Cost	Dollars
Yield Rate	Percentage
Scrap and Rework Rates	Percentage
Lead Time Variability	Time
Available Sq Footage	Sq Footage
Space Utilization	Percentage
Capital Expenditures	Dollars
Modularity of facility	Percentage

MOCA – Logistics Footprint

Logistics Footprint

Modest or massive. Manageable?

- **Definition**
  - Size, scale, and complexity of logistical operations & resources required to support military forces
- **Key Considerations**
  - Personnel involvement
  - Geographical spread
  - Companies, components, and materials involved
  - Contingency plans
  - Backup components, additive manufacturing, alternative suppliers
- **Potential Disruptions**
  - Sole-source suppliers versus multiple vendors
  - COTS components versus specialized

Logistics Footprint Drivers

Driver	Unit
Number of suppliers	Suppliers
Number of parts	Parts
Location of suppliers	Distance
Transportation	$/mile; $/Unit
Mode of Transportation Utilization	Percentage
Time in Transit	Time
Inventory Turnover Ratio	Percentage
Days of Inventory	Time
Warehouse Capacity Utilization	Percentage
Waste	Units

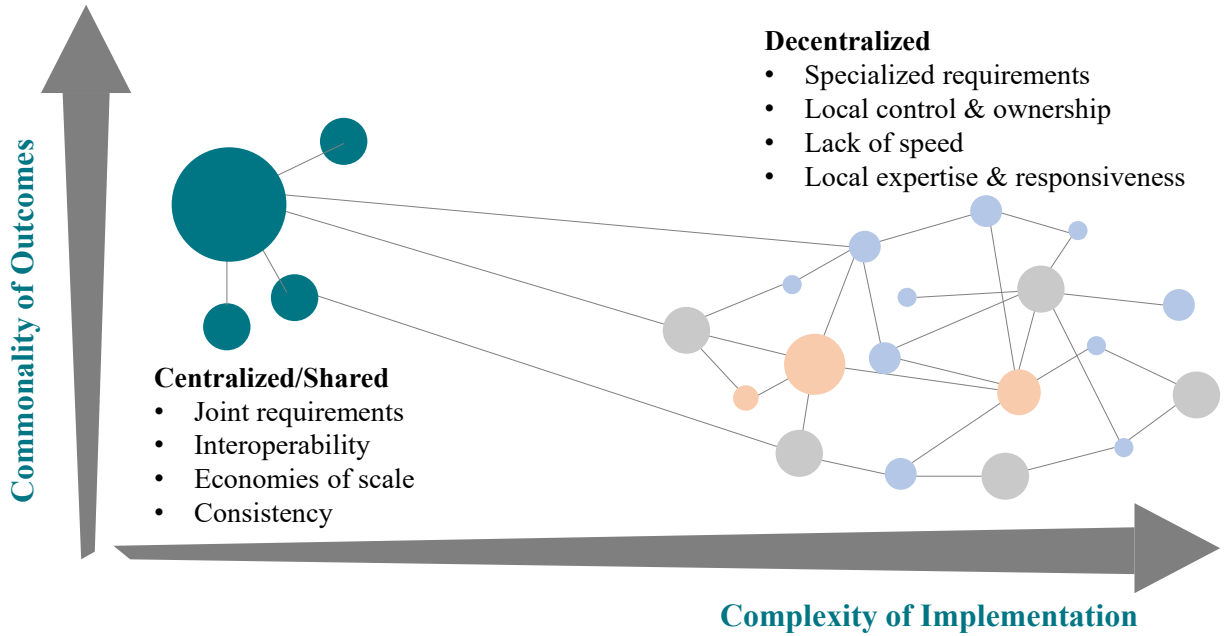
MOCA – Adaptability of Industrial Base

Adaptability of Industrial Base

Flexibility to change (OEMs & supply chain)

- **Definition**
  - Ability to efficiently modify and adjust operations and outputs in response to evolving military needs, technological changes, and other external factors

- **Who's Involved**
  - Major defense contractors
  - Suppliers and subcontractors
  - R&D organizations
  - Technology Innovators



Improvements Needed

- Diversifying sources and reducing dependency
- Expanding supplier capability
- Fostering resilient supply chains

MOCA – Response to the Fight

Response to the Fight

Relevance to change in the “Face of Battle”

- **Definition:**
  - The speed with which OEMs and their vendors respond to the exigencies of the battlefield, such as the need for drones and 155mm ammunition
- **Key Questions:**
  - Readiness
  - Ease of transport into the battlefield
  - Mission success rate
  - Versatility against a range of threats

Ukrainian drones, 155mm rounds fired from howitzers, HIMARS, Javelin missiles have destroyed 2,000 Russian tanks

- Both sides (Ukraine and Russian Federation, now keeping tanks and ground combat vehicles off the front lines – their survival is measured in minutes

MOCA – Fungibility

Fungibility

Affordability. Attritability (e.g., Replicator)

- **Definition**
  - Degree to which the material solution is affordable, attritable, and cost effective
- **Affordable**
  - Evaluate cost of acquisition and operation
- **Attritable**
  - Expendability of system in combat environments
- **Cost Effective**
  - Balance between capability performance and cost

Fungibility Drivers

Driver	Unit
Cost-Effectiveness	Dollars
Uses Per Dollar	Dollars
Modularity	Percentage
Interoperability	Percentage
Maintenance and Sustainment	Dollars;
Reusability	Rate
Unit Cost	Dollars

Defense is expensive (and ultimately unsustainable) in an asymmetric warfare world: (e.g., a $4M Patriot missile versus a $200K Iranian drone)

Acquisition Wargaming

Traditional wargaming: a strategic exercise in which opposing forces are commanded in simulation of an armed conflict – run by all our military branches today

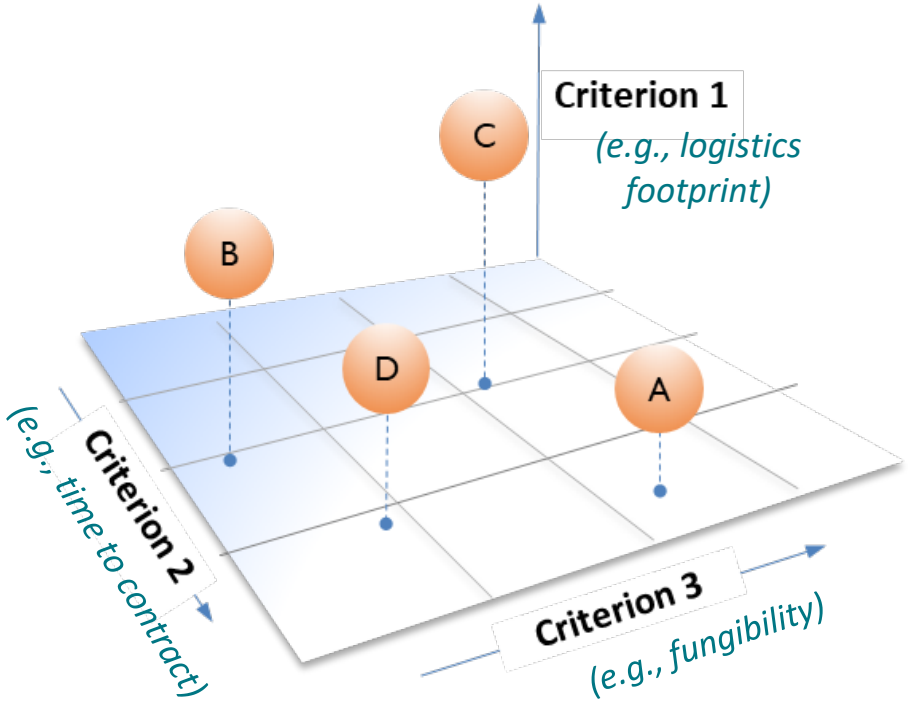
- **History Lessons**
  - Nearly all preexisting systems obsoleted
- **Run the metrics – use MOCA**
  - MOCA can test fungibility and adaptability
- **Evaluate contract structures**
  - Time from technology to production
  - Repositioning for emergent sensors/payloads
- **Test responses to emergent threats**
  - Sense and respond
- **Assess response to countermeasures**

Evaluate prospective acquisitions using the Sense-and-Respond Metrics against different wartime vignettes and with many simulations

Conflation of Metrics: Problem Space

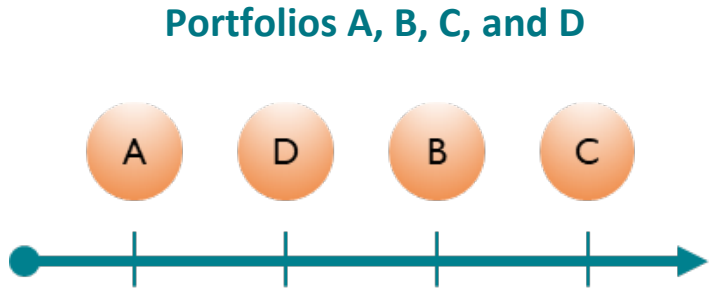
Multi-Criteria Problem

No clear-cut solution in building portfolios



Mono-Criterion Problem

One-dimensional assessment scale

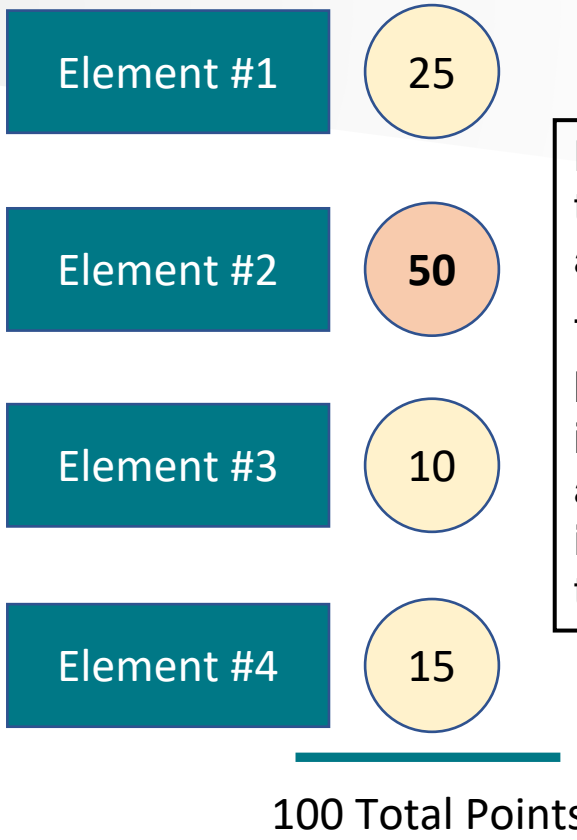


Criteria aggregated to a common scale of value

Challenge: Scoring and ranking prospective programs and portfolios to reach a group decision

Acquisition Wargaming

- Evaluation of Methods – ongoing
  - Spans the spectrum of techniques
  - Simplified
    - E.g., Borda Count (stakeholder preference)
  - More complex
    - Min/Max normalization
    - Median normalization
- Objective
  - Illuminate trade space for leadership
    - With a focus on acquisition wargaming
    - AoAs, Force Structure design; or Pareto frontier of possibilities for a material solution



Each scorer allocates a total of **100 points** among the four elements

This allows the scorers to both **rank** the elements in order of preference and to assign a **relative importance** between them

Traditional Rank Ordering [Most to least important]:

Element #2 > Element #1 > Element #4 > Element #3

(Most) *(Least)*

Summary

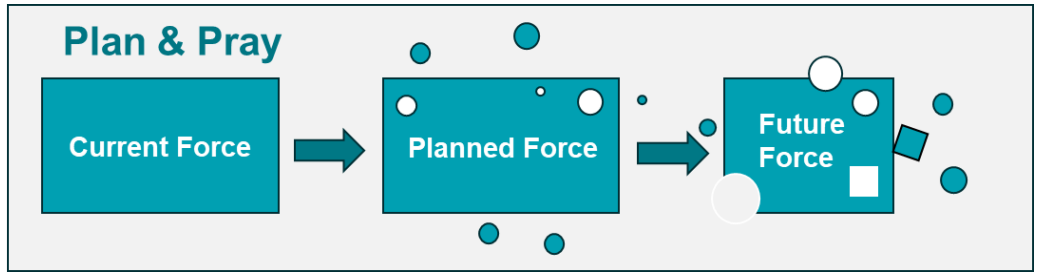
A hundred years ago, the US followed the REACT strategy, ignoring threats until it was almost too late

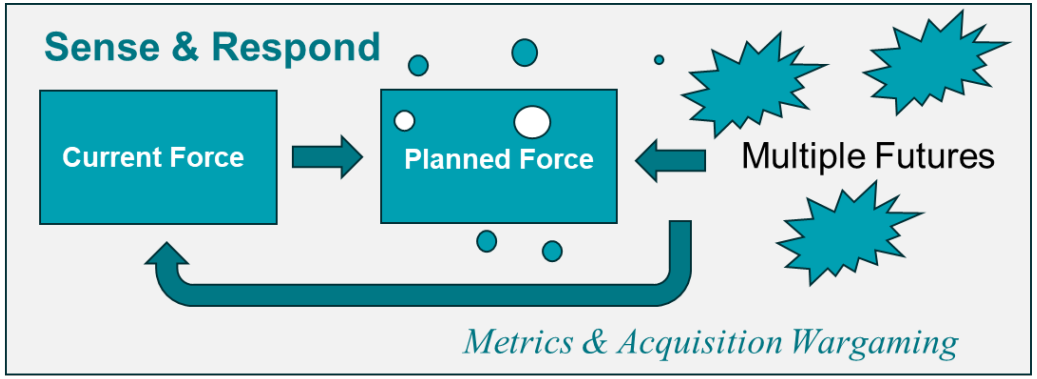
Today, we PLAN AND PRAY; predicting what systems we will need to counter and design requirements for monolithic military systems

Tomorrow, we need to SENSE AND RESPOND to new threats as they emerge rather than building systems with requirements that pray we got it right

MOCA provides a new framework for evaluating programs with direct *and* indirect metrics of adaptability

Acquisition Wargaming can help to laser focus MOCA on warfighting vignettes for future system response





Extensibility of Research

- Sensitivity Analysis
  - Identify specific platform responses to changing stimuli of battle
  - Go through many iterations of vignettes to determine systems that frequently adapt and identify those that do not adapt well
  - Create Pareto Curves showing possibilities frontier for systems & replacements
- Order of Battle for Acquisition Organizations and Oversight
  - What would happen in first days after conflict?
  - What are objectives of first 30 days? 90? 365?
  - What would be cancelled immediately?
  - What would be rescoped or increased?

Framework detailed in paper could help with many planning aspects


Technomics
Better Decisions Faster
We believe this work is critical and hope you found it compelling.
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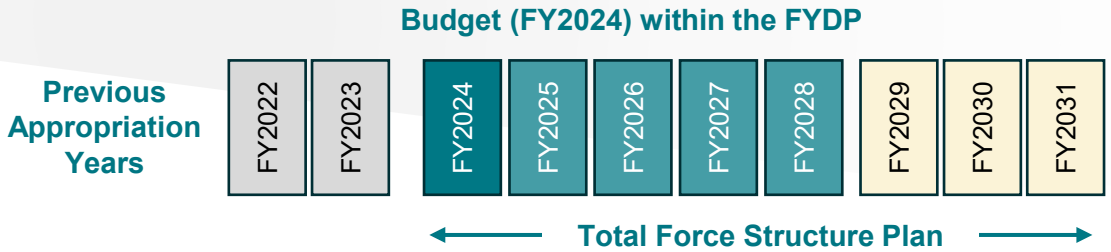
Backup
MOCA - Timelines



- PPBE *encodes* divisions between research, production, and operations activities that *stymy* iterative or feedback-based *development*.
- New programs with emergent technology must typically wait **more than two years** to be included in the budget.