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**Dynamic Stockpiling
Simulation and Optimization for
Effective Mobilization**

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I N S T I T U T E F O R D E F E N S E A N A L Y S E S

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National Security Context/Environment

- More volatile now and fraught with challenges from major power competitors and other potential state-level adversaries than it has been in many decades.
- Challenges not subsiding; if anything, becoming more serious each year.
- Accordingly, the United States needs to prepare swiftly and significantly to address and overcome these challenges in a number of ways:
 - Reduce the vulnerability and increase the surge potential of national security supply chains, including foundational S&CM supply chains
 - Ensure that the U.S. has what is needed to sustain the country's critical infrastructure and be ready to deter, fight, and succeed in future conflicts

Misconception #1 About the DIB

Misconception #1: The Defense Industrial Base (DIB) is irrelevant in a major conflict emergency context because it cannot contribute much to that initial conflict.

Why is this a misconception?

After an initial conflict ends, the U.S. deterrence posture will almost certainly be seriously weakened (win, lose, or draw), inviting **other** adversaries to attack, and also may be crippled when it comes to preparing for a second conflict with the **initial** adversary.

Rapid recovery and replenishment is thus crucial to strengthening deterrence and to preparing for a second major conflict.

Misconception #2 About the DIB

Misconception #2: The National Defense Stockpile (NDS) contains materials needed to satisfy **just** the DIB in an emergency.

Why is this a misconception?

The NDS is, by law, a stockpile of strategic and critical materials (S&CMs) to be released in the event of a national emergency. Moreover, stockpiling should meet **gaps** in defense **and** essential civilian needs (including energy, emergency services, law enforcement, etc.) for the emergency.

In practice, the overwhelming majority of stockpiling needs are in the essential civilian sector. By comparison, defense needs and gaps are relatively small in dollar terms—but are very important and involve quite specialized materials **not** captured on the Department of Interior’s “critical minerals list.”

NDIS Implementation Plan Just Issued by DoD

- The National Defense Industrial Strategy (NDIS) Implementation Plan just issued
 - Strongly emphasizes S&CM stockpiling
 - Emphasizes defense industrial base mobilization (DIBMOB) preparation more broadly
- Focus for NDS should include relevant critical minerals and also other key, often quite specialized materials for which there are not enough “safe supplies”
 - Significant increased funding for NDS needs serious consideration
 - Timing of NDS acquisitions should be accelerated
- The NDIS Implementation Plan represents a step in the right direction
- The NDIS, and complementary efforts underway at IDA, help provide the analytical basis for identifying risks (material gaps) and methods for mitigating these risks

Our Simulation/Optimization Work: What We'll Cover Today

1. Introduce our dynamic multi-model stockpile simulation and optimization process/system for effective mobilization
2. Share the focus of our analytic framework (RAMF-SM): mobilization planning and preparedness for one key element—strategic and critical materials
3. Describe our risk metric: the fraction of essential goods and services (civilian and military) that cannot be obtained without access to enough safe supplies of key S&CMs
4. Explore the capabilities of RAMF-SM in the context of protracted conflict and mobilization

RAMF-SM = the Risk Assessment and Mitigation Framework for Strategic Materials

Need for Assessments (DIBMOB Preparation)

- Urgent need for government to prepare now (with industry and allies) for mobilization (DIBMOB)
- Heightened threats make risk management and resilience planning and action even more important

DIBMOB = Defense Industrial Base (DIB) mobilization

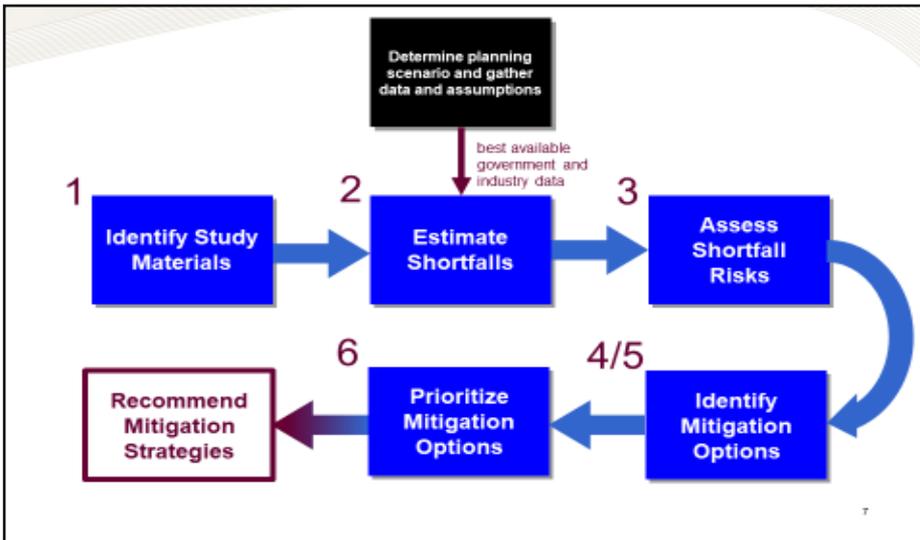
Planning and Preparation Are Challenging but Doable and Critically Important

- COVID and the Ukraine conflict have shown how challenging good planning and preparation can be for important supply chains.
- The RAMF-SM system (and analogues to it) should be viewed as a core part of a coherent NDIS and national emergency mobilization planning system.
- Many of the RAMF-SM details are “limited distribution” due to national security concerns—but some of the most important simulation and optimization concepts in RAMF-SM are publicly releasable.

RAMF-SM Overview

- RAMF-SM is aligned with DoD strategy and policy
 - Aligned with the new DoD 2024 NDIS
 - Aligned with, and facilitates examination of, scenarios discussed in the current U.S. National Defense Strategy and related documents
- How it works
 - Identifies essential items that are currently unlikely to be available in sufficient quantities (for defense AND essential civilian purposes), given a high-priority major national security emergency
 - Offers recommendations on how to fill those gaps by stockpiling or other cost-effective risk mitigation approaches
- Features
 - Acts as a dynamic stockpile simulation and optimization system
 - Addresses more than 150 strategic and critical non-fuel materials that would be needed in a major national security emergency: the top-priority congressionally mandated scenario in this area

RAMF-SM Process Steps



Step 3: Assess risk of accepting likely net shortages in the case: fraction of essential goods and services that cannot be produced on time without more safe supplies

Steps 4/5: Identify relative cost and timeliness of plausible options to acquire more safe supplies of materials, and effect on risk; linear programming approach to priority purchases

Step 1: Elicit “materials of concern” from government and industry for the study cycle

Step 2: Estimate essential demands for S&CMs in planning case; estimate “safe” supplies of these S&CMs; estimate gaps in safe supplies; estimate plausible market response to gaps; estimate net shortfalls and then net shortages, by material

Step 6: Determine most plausible near-term mitigation options and recommend them for funding and additional assessments

Continuing Activities: Use available funding to implement most cost-effective options; continue assessments because context, and thus demands and supplies, are dynamic

Risk Mitigation Options in the RAMF-SM Structure

- Risk is measured in RAMF-SM as the value of the essential goods and services (both essential civilian and military) that **cannot** be produced for lack of enough key strategic and critical materials.
 - RAMF-SM estimates the risk in these terms by comparing essential demands against “safe” supplies.
 - It then estimates the reduction in risk achievable with increasingly robust “packages” of more top-priority materials at increasing acquisition budget levels.
- Acquisitions for the National Defense Stockpile are taken to be the benchmark approach to mitigate risk.
 - RAMF-SM also assesses readily available, more cost-effective approaches to acquiring additional safe materials than by stockpiling, such as qualifying other safe suppliers.
 - If so, RAMF-SM recommends that those approaches be adopted.

A “DIBMOB” Planning Scenario: The Base Case for S&CMs

The Base Case is, by law, the top congressionally mandated national security emergency for S&CM planning and preparation (and NDS sizing) features.

It consists of

- An initial high-intensity war, followed by
- Three years of replenishment, in order to strengthen deterrence and prepare for a subsequent conflict

In other words, the Base Case serves as a “protracted planning scenario” mandated by Congress.

DIBMOB: Prep/Planning Suggestions for Post-Conflict (1 of 2)

The following preparation and planning suggestions should be considered as actions that DoD can take now to best prepare for a post-conflict environment.

Planning

- Developing surge plans for conflict weapons; building contingency contracts with suppliers
- Leveraging RAMF-SM models and policy judgments to build an intergovernmental structure
- Facilitating decisions related to stockpile distribution; tests
- Evaluating full complement of risk mitigation packages, beyond NDS
- Exploring best methods for using current authorities

DIBMOB: Prep/Planning Suggestions for Post-Conflict (2 of 2)

Data

- Eliciting requirements about materials needed for key systems (which ones, amounts)

Acquisition/Capacity Expansion/Qualification/Policy Measures

- Building appropriate stockpiles and plans for smart DIBMOB
- Rapidly ensuring the safety of “safe supplies”
- Mitigating risks now associated with single points of failure—domestic and foreign
- Setting and enforcing restrictions against obtaining material from dangerous foreign sources
- Calling on prime vendors to identify current unsafe suppliers and move to alternates (or face significant penalties)

RAMF-SM Praised by GAO; Latest Report to Congress on NDS in Preparation

- The NDS has just been reviewed by the General Accounting Office (GAO), which has endorsed the analytics of RAMF-SM.
 - See GAO, “National Defense Stockpile: Actions Needed to Improve DOD’s Efforts to Prepare for Emergencies,” September 2024. [GAO-24-106959, NATIONAL DEFENSE STOCKPILE: Actions Needed to Improve DOD’s Efforts to Prepare for Emergencies](#)
- The latest set of findings and recommendations employing RAMF-SM are being readied now for submission to Congress early next year.
 - The report (*Strategic and Critical Materials 2025 Biennial Report on Stockpile Requirements, or Requirements Report*) indicates gaps in “safe” supplies to meet essential demands (military and civilian).
 - The report will likely also recommend immediate and significant additional action by Congress to fund the NDS up to safe levels, based on the findings and priorities identified using RAMF-SM.
- The NDS is a critical and dynamic part of DoD’s new National Defense Industrial Strategy (NDIS).
- The NDS should also be viewed by Congress as an essential component of an overall national defense industrial mobilization plan (NDIS+), which should itself be further developed and funded as soon as possible.

Questions or Comments?

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Thank you, Arch, MORS, and today's attendees, for the opportunity to share a bit about our work!

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