Assessing Resource Options for National Security Preparedness

JAMES S. THOMASON

The dissolution of the Soviet Union, and the attendant loss of what had been the one truly global national security threat over the last half century, have profoundly altered US military force structure requirements and DOD purchasing requirements. This evolution is reflected in the department's Bottom-Up Review, a major analysis of post-Cold War US national security requirements. The force structure levels that DOD recommends in that assessment as a prudent hedge against "new dangers" are smaller than those made by the Bush Administration several years ago. Related to these force reductions are significant declines in DOD purchases of all kinds of goods and services—from rations to remotely piloted vehicles, from ammunition to anti-submarine warfare equipment.

The end of the Cold War has produced many hopeful signs and opportunities for constructive, peaceful change in international security. While some observers argue that the Clinton Administration's force structure and budget recommendations go too far, others argue that they don't go nearly far enough. Almost all agree, however, that the nation needs to pay some attention to US abilities to bolster defense assets—since history suggests that at some point the security environment could again take a significant turn for the worse. Careful assessments of a spectrum of potential threats, and efforts to devise and monitor sensible ways to address them, remain crucial to the national security and economic well-being of the United States. Given the smaller active US force structure and the shrinking defense industrial base, regular assessments may be even more important than before.

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While significant concerns have arisen in the Congress, the executive branch, and the media about the ability of the US industrial and technology base to adequately support the national security strategy in the post-Cold War era, there is little consensus as to just what kind of attention is needed. This article outlines an analytic framework designed to address these concerns systematically. The process is illustrated here through initial assessments of two notional cases. These particular cases derive from a family of planning scenarios in the first post-Cold War Joint Military Net Assessment published by the Joint Chiefs of Staff, but are similar to scenarios examined in DOD's Bottom-Up Review. Many other specific cases can and should be assessed through the process proposed here.

The first part of this article outlines the process. The second part depicts the two planning cases, illustrating them with an industry-level analysis. The third part suggests how this process could be employed in a constructive partnership between the executive and legislative branches of the federal government.

Regular assessments of the US industrial and technology base can help ensure that preparations for potential national security problems are undertaken as far in advance as possible. Such assessments can also help to bring leading-edge military technology to bear on potential adversaries in the least expensive way, potentially reducing US casualties in a conflict. Periodic assessments would implement the 1992 revisions of the Defense Production Act and the FY93 Defense Authorization Act, which together significantly alter the national security resource preparedness planning and reporting process.

Analyses of the type presented here can—and should—form the core of a repository of industrial readiness assessments. Applied across the spectrum of national security preparedness planning cases and updated and reissued every year, the analyses could in fact become the basis for such a repository. Without this kind of disciplined approach, individual analyses may not be used to full advantage or may be shelved and forgotten altogether.

A Framework for Graduated Response Planning

A five-step framework for graduated response assessment and planning is depicted in Figure 1 on page 50; it defines a straightforward problem-solving sequence. The first step identifies a potential planning crisis or a natural disaster. Step 2 estimates the additional assets known or believed to

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***Step 1*:**	**Identify the crisis or disaster**
***Step 2*:**	**Estimate additional assets needed or desired to address the crisis or disaster**
***Step 3*:**	**Measure baseline capability of the United States to obtain those assets** **a. Shortages at various times** **b. Time to complete**
***Step 4*:**	**Devise relevant response options and analyze effects**
***Step 5*:**	**Refine plausible, promising response options** **a. Refine estimates** **b. Develop implementation plans** **c. Test and refine**

Figure 1. Five-Step Framework for Graduated Response Planning

be needed to address the problem. Step 3 measures the ability of the United States to obtain these assets under an agreed upon set of planning assumptions and conditions. Step 4 analyzes alternative resource preparedness options. Step 5 refines and tests available options, focusing on promising strategies and options discovered earlier.

A process for assessing the capacity of US industry to produce defense-related materiel would:

- provide regular estimates of how long it would take the US defense industrial base to produce various additional defense items, under varying production priorities and financial incentives to producers
- estimate integrated readiness and sustainability requirements for key military items, including spares, ammunition, and soldier support items
- incorporate trade-off assessments of the feasibility and peacetime costs of different ways to obtain critical materiel items; examine various warning assumptions as well as battlefield payoffs of alternative ways to spend peacetime budget dollars
- suggest guidelines for trade-off analyses, such as when one service's sustainability "surpluses" of an item (e.g., a missile) may be used to offset that (or another) service's sustainability "shortfalls" of closely related items

Graduated response planning, properly conceived, includes but is not limited to a set of policy options for a particular crisis or even for a set of potential crises. As a planning and assessment process, it would focus the attention of planners and decisionmakers on:

- the time really required to bring additional resources to bear in a security crisis or other emergency
- possible early, relatively low cost "hedging" options that could significantly reduce the time now required to make those additional resources available
- the importance of developing pre-crisis inventories of assets that cannot plausibly be obtained during a crisis

Illustrating the Framework

The five-step assessment process is illustrated here using macroeconomic simulations of two planning cases. In each case, supply and demand conditions are compared with industry-level benchmark projections, and a number of response options are compared. One great advantage of beginning the assessments at the industry level of analysis is that scenario demands can be compared with potential production possibilities at all tiers or levels of the industrial base, industry by industry. No other analytic tool available today permits this comprehensive look at the planning problem. In the full planning process envisioned, these initial industry-level analyses would be used to identify and define potentially widespread lower-tier problems in manufacturing and services. Analyses by materiel item and manufacturing firm(s) would then address any problems identified at the macroeconomic level.

Case One Description

Case One is defined by four significant assumptions. The first is that the conflict assumed the form of a protracted "Son-of-Desert Storm," a four-month contingency in Southwest Asia; the scenario is based on unclassified guidance from a recent Joint Military Net Assessment. This case assumes that several US Army divisions, Air Force air wings, and carrier battle groups, as well as a Marine Expeditionary Force, have deployed to the Persian Gulf and engaged in intense conflict (with associated attrition) with Iraqi forces. The second assumption is that the conflict has been successfully concluded by the United States and its allies. The third is that the specific planning task now at hand is to replenish within one year all US materiel and consumable inventories lost or expended during the four-month conflict.[1] The fourth assumption is that losses will be replaced without interfering with normal peacetime production of goods and services.

With these assumptions satisfying Step 1 in the planning process, Step 2 involves estimating the additional assets necessary or believed to be useful for addressing the planning crisis. Step 3 involves measuring baseline capabilities. This includes several substeps: translating the quantities of items projected to have been expended or lost into a set of plausible demands on

US materiel production capacities, adding to them projected baseline military and civilian demands during the recovery period, comparing them against the likely peacetime production capacity of the United States (coupled with normal levels of projected US imports) during the recovery period following the hypothetical conflict, and gauging the magnitude of any possible replenishment or recovery problems under the assumed baseline recovery conditions. Step 4 then entails designing potential resource preparedness options that the United States might use to alleviate potential problems identified at Step 3. Step 5 has not yet been implemented with respect to this planning case, but several promising options have in fact been identified in Step 4. Some options could be evaluated in subsequent assessments and in DOD tests, exercises, and periodic wargames. This article analyzes assessments for this case to date and describes several response options.

Case One Results

Key results of the analyses conducted at Steps 3 and 4 for Case One are presented here. Results of four response options are summarized; each option differs from the others in terms of the assumptions it makes about industrial recovery and the extent of government intervention in the recovery process.

Response Option 1: Baseline Assumptions.[2] Figure 2 lists the 15 US industrial sectors likely to experience significant difficulties meeting Case One demands within one year under baseline assumptions.[3] The table also lists representative firms by sector.

Sector	Representative US Firms
Ammunition	Olin, Hercules, Thiokol
Plating/Polishing Eq.	Uglisis, P.L.S. Industries, Precision Galvanizing
Engineering Instr.	Kodak, Allied Signal
Control Eq.	Allied Signal, Honeywell, Johnson Controls
Computers	IBM, Digital Equipment, Unisys, Hewlett Packard
Aluminum	Aluminum Co. of America (ALCOA), Reynolds
Communications Eq.	GTE, AT&T, ITT, Motorola
Tires	Goodyear, Goodrich
Oil Products	Exxon, Mobil, Texaco, Shell, ARCO
Machine Tools	Treblig, Phelps Tool & Die, Aerosmith Tool & Die
Steel	Bethlehem Steel, Inland Steel, Armco, USX
Aircraft	McDonnell Douglas, Boeing, General Dynamics
Semiconductors	Harris, DEC, Advanced Micro, Rockwell, TI
Electronics	GE, Westinghouse, Motorola, TRW, TI, Honeywell
Vehicles	General Dynamics, GM, Ford, Chrysler, Mack

Figure 2. Representative US Firms in 15 Industrial Sectors with Recovery Output Shortages at One Year in Case One

Baseline assumptions used by the models are summarized as follows:

- Most economic activity in the United States continues at normal or near normal levels during the recovery.
  - peacetime operating capacity production levels
  - normal civilian demands and projected military peacetime demands
  - normal imports and exports
- Defense inventory drawdowns resulting from the Case One conflict are to be replenished within one year of the end of the hypothetical conflict.

Figure 3 shows how much more output the 15 US economic sectors would still need to produce 12 months after the conclusion of hostilities to complete the recovery. The largest remaining shortages occur in the oil products, communication equipment, and computer products sectors. But all 15 sectors in Figure 3 show shortfalls of at least $1 billion (1988$) in total output.[4] To approximate current year (1994) dollars, multiply the estimates by 1.4.

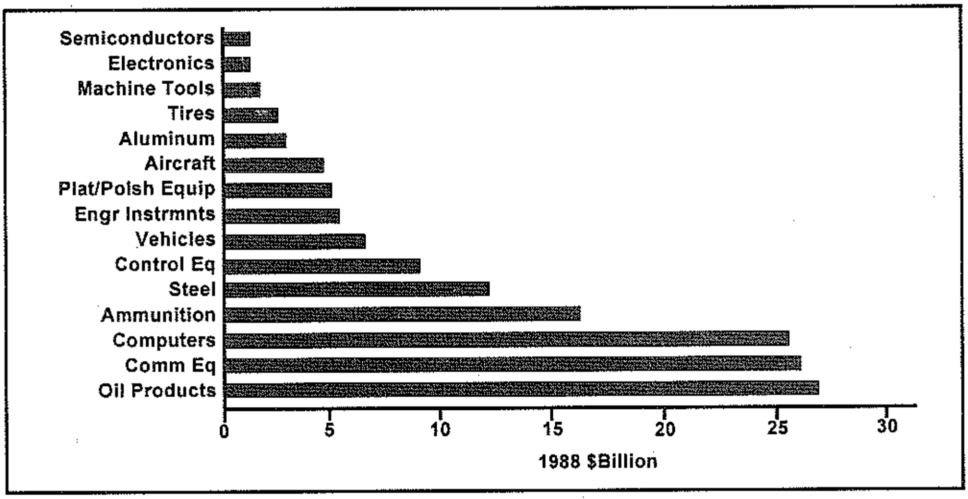

Figure 3. Case One Recovery Output Shortages at One Year, Baseline Assumptions

Figure 4, on page 54, compares output backlog after one year, shown in Figure 3, with current annual peacetime operating capacity in each sector. Note that some sectors showing large backlogs in Figure 3 actually have peacetime capacities so large that backlogs could be eliminated in a few months. Yet seven major US industrial sectors still display replenishment shortages equal to at least three months' normal production capacity: ammunition, plating and polishing equipment, engineering instruments, control equipment, computers, aluminum, and communication equipment.[5] The most notable, ammunition, shows a backlog greater than the annual peacetime operating capacity of the industry.

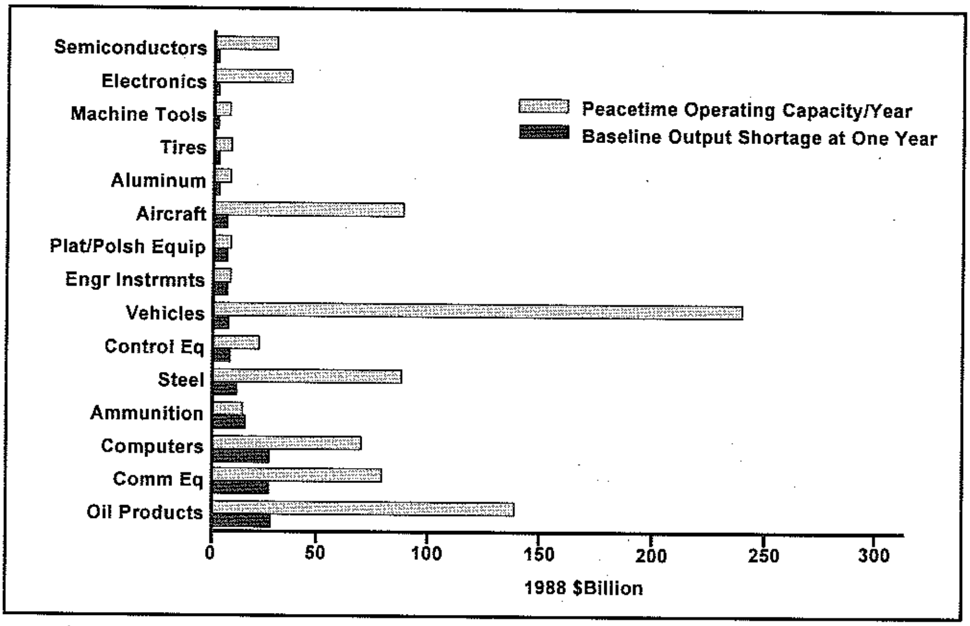

Figure 4. Case One Recovery Output Shortages at One Year Under Baseline Assumptions and Peacetime Operating Capacity

These seven sectors are more prominently displayed in Figure 5, on page 55; they are the first seven industries, reading from bottom to top. In this display, backlogs at the one-year mark—indicated as "baseline output shortage"—are shown as a percentage of a year's peacetime output capacity of the industry. This chart will also serve to explore various other assumptions about US industrial processes during a recovery from one major regional contingency. The increasing levels of government intervention in the process are described below as Options 2, 3, and 4.

For these seven industries, shortages range from over 100 percent, for ammunition, down to about 30 percent for communication equipment.

The estimates indicate the time required to replenish these military assets if the peacetime capacity of the given sector could be devoted fully to this task. Under this assumption, it would take more than another year of production to overcome the residual ammunition shortage, nine more months' production from two sectors—US plating and polishing equipment, and engineering instruments—another six months' production from the control equipment industry, and three to five months' additional production each from the computer, aluminum, and communication equipment sectors.

Response Option 2: Full Imports. Importing more goods during the recovery period could help a lot, especially with aluminum. Full imports combined with US domestic production might eliminate the backlog in that sector within the first year.[6] This option could also assist significantly in

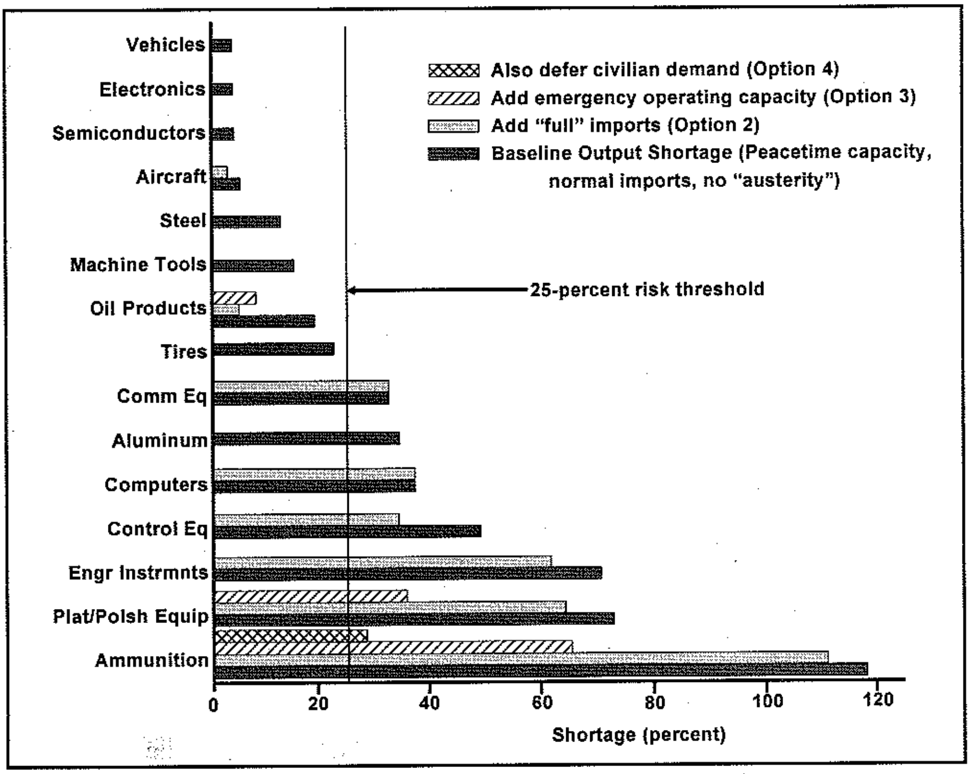

Figure 5. Case One Baseline Recovery Shortages at One Year and Effects of Selected Options (shortages as a percentage of sector 12-month peacetime capacity)

ammunition, control equipment, and engineering instruments. But in six of seven industries it could not reduce shortages below the risk threshold of three months' production capacity.

Response Option 3: Full Imports and Use of US Emergency Operating Capacity. This option assumes that the estimated emergency operating capacity (EOC) of each of these sectors could be used in addition to full imports during the first year of the hypothetical recovery. This situation is set in contrast to the previous limit of peacetime operating capacity in each sector. With this change, residual shortages at the one-year mark would be reduced dramatically. They would drop below one-quarter of a year's production capacity in all but two industrial sectors (ammunition, and plating and polishing).

Response Option 4: Full Imports, US Emergency Operating Capacity, and Use of Industrial Capacity Normally Used by the Civilian Sector. In addition to full imports and the use of emergency operating capacity, this option involves deferring some civil sector demands for output from the 15 industrial sectors until after the recovery. With actions of this kind, output shortages could conceivably be eliminated by the one-year mark in all 15 sectors except one—ammunition. Note that even the residual ammunition shortage at the one-year mark is here only half what it was under Option 3.

Case One Discussion

This analysis suggests that we can recover from this case relatively quickly—assuming that the response options defined here could be implemented on this schedule. Without considerable planning, however, that would not be a safe conclusion. The assumed production capacities are not likely to be usable in a military recovery. Careful planning and testing would be required to use even the available capacities. Thus, it could be useful to conduct detailed assessments of the top five US firms in each of the 15 sectors identified through this case.[7] Insight into our ability to recover from Case One will become available only when the participants in the resource preparedness process have developed the plans, procedures, and contracts to do so. Accordingly, graduated response planning should be guided by continuing assessments of national industrial capability and responsiveness.

Analysis to refine initial options such as those described here would occur at Step 5 of the process. At that step, planned recovery efforts might include exploiting functionally similar production capacity to overcome specific shortages within the proposed recovery time limit. Precision guided munitions, for example, might be produced instead of some of the ammunition replenishment requirements initially identified in Case One. And items and systems not yet in full production could be accelerated into production after careful consideration of how to do it safely. The analytical processes anticipated by this concept would be continuous and iterative; solutions would always be tentative, useful only until the next, improved round of analysis.

Case Two Description

The second case presents a substantially more demanding national security planning crisis than Case One. Here the United States has confronted and successfully resolved two concurrent, major regional crises—the Case One scenario just discussed, and a second conflict in which the United States has assisted the Republic of South Korea in defending itself after a conventional attack by North Korea.

Case Two baseline planning assumptions are identical to those used in Case One: assets will be replenished within a year of the end of the conflict(s); US industries will be able to operate at up to peacetime operating capacities; the President's budget and economic projections (including imports) will prevail; and the United States will try to replace conflict asset losses while producing goods and services to meet normal projected civil and peacetime government spending targets. One assumption—that the United States has decided to replenish all of the materiel assets it used or lost in both of the hypothetical concurrent conflicts[8]—has been added to Case Two.

Case Two Results and Discussion

Figure 6 shows baseline estimates of the percentage of each sector's annual peacetime operating capacity output left to produce after a year of recovery for both cases. Baseline shortages from Case One (see Figure 5) are shown for perspective.

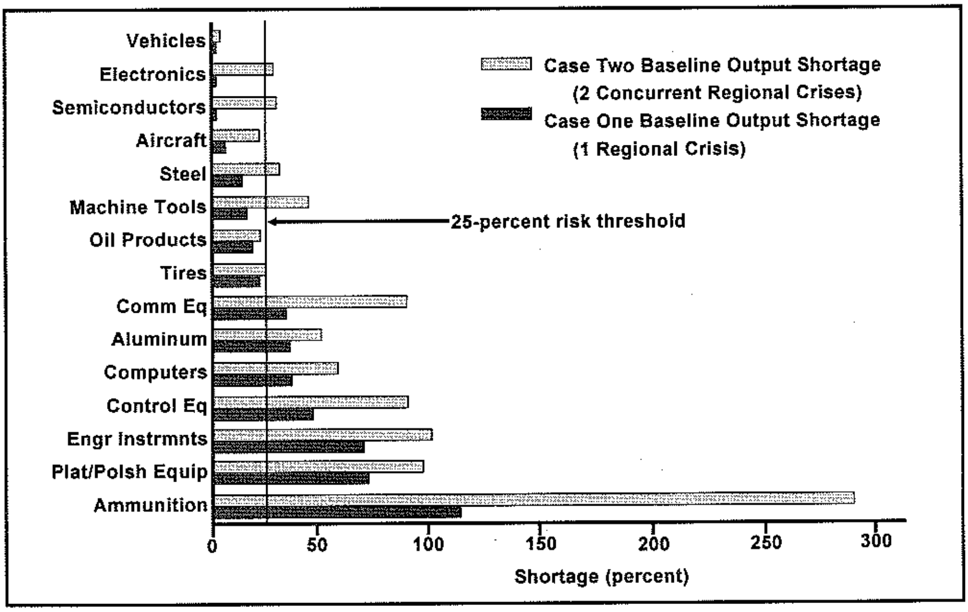

Figure 6. Case One and Case Two Baseline Recovery Shortages at One Year (shortages as a percentage of sector 12-month peacetime capacity)

In Case Two, 12 of the 15 sectors equal or exceed our benchmark risk threshold. In fact, seven of the 15 sectors—compared to three of 15 sectors in Case One—exhibit shortages of two or more quarters.

Figure 7 on page 58 shows how the same alternative graduated response options used in Case One could help alleviate shortfalls. Options depicted for Case Two are directly comparable to those discussed for Case One above. The figure shows that the full imports option in Case Two could potentially reduce from 12 to six the number of sectors exceeding the 25-percent risk threshold. Employing emergency operating capacity as well as full imports in the first recovery year may reduce the number of sectors exceeding the threshold to three: ammunition, plating and polishing equipment, and communication equipment. Deferring civilian demands in addition to the full imports and EOC options during this first recovery year could eliminate the residual production shortages in the plating and polishing as well as in the communication equipment industries. The conditions that define Option 4 could also reduce residual shortages in the ammunition sector, although not below the risk threshold.

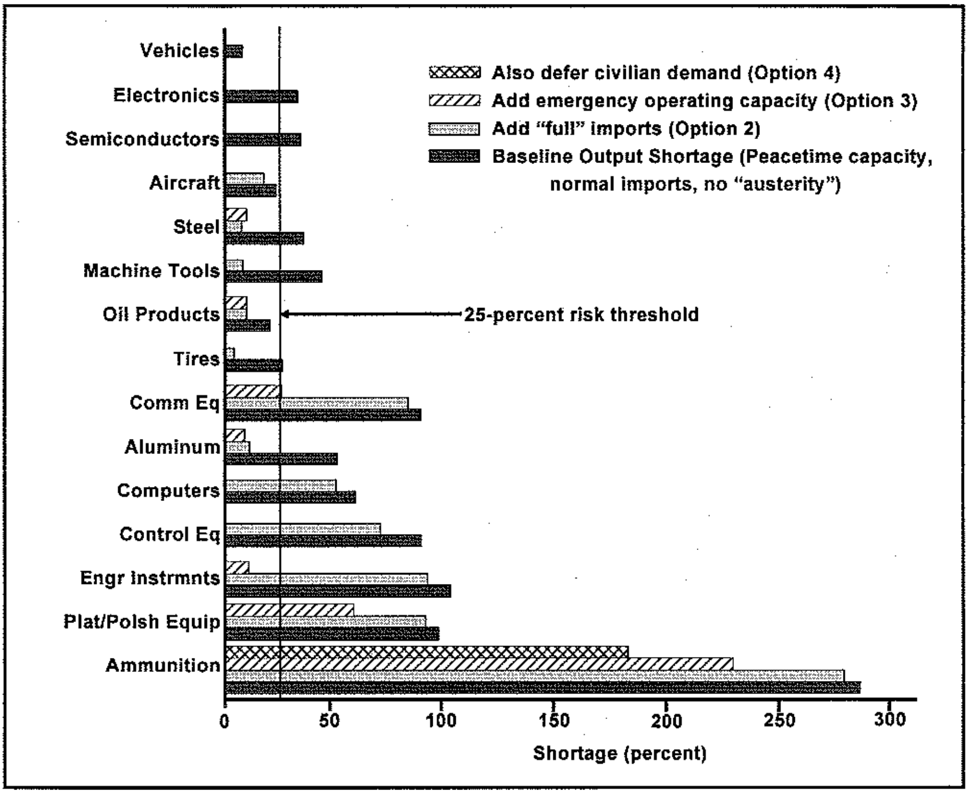

Figure 7. Case Two Baseline Recovery Shortages at One Year and Effects of Selected Options (shortages as a percentage of sector 12-month peacetime capacity)

Toward a Continuous Graduated Response Assessment Process

A continuous graduated response assessment process would examine the supply and the demand sides of resource preparedness options systematically and in increasing detail in search of promising options and particularly salient planning cases. Both the executive and legislative branches have taken important steps in this direction over the last few years. A heightened awareness of the need for national resource preparedness planning has been reflected in recently enacted legislation (the 1992 Defense Production Act and the FY93 Defense Authorization Act). Since the spring of 1992, the Office of the Secretary of Defense (OSD) has been using a new criterion to identify truly essential defense production lines and manufacturing processes. OSD now believes that manufacturing lines and processes should be preserved only when additional production output could plausibly be needed faster than we could restart them or build new, identical or functionally equivalent capabilities.[9] A refreshing new perspective, this initiative seeks to minimize accidental as well as intentional biases in the results of any examination of industrial capacity.

But there is still considerably more to do. For instance, there may be benefits to maintaining and perhaps even improving production acceleration capabilities for important spares and consumables in the post-Cold War security environment. The United States ought to develop and assess a range of possible mixes of inventories, domestic production capabilities, and collaborative production schemes with key friends and allies. The Joint Staff has recently indicated its concern that this issue be addressed on a coherent basis by OSD. One good initiative in this area is the recently completed Integrated Army Mobilization Study.[10] Unfortunately, the results of this effort have not been widely disseminated to date.

The federal government has a range of options for developing a credible process to assess the capability of the US industrial and technology base to respond in a timely manner to a variety of national security challenges. Getting good information in this area depends first on knowing the right kinds of questions to ask and, second, on knowing how to interpret the answers. The process proposed in this article would draw continuously on a range of micro-level analytic techniques and databases to double check and refine macro-level assessments of the sort presented here.

A good prototype for an effective intergovernmental process, one that works back and forth from the macro to the micro level of assessment, is the current National Defense Stockpile planning process. In place now, this process uses planning groups that include officials from the Departments of Defense, Commerce, Labor, Interior, and State as well as the Federal Emergency Management Agency; integrates over 70 separate databases; uses three interrelated computer modules; and draws together policy inputs from departments and agencies throughout the federal government. For details on how the process works, see the DOD *1993 Report to the Congress on National Defense Stockpile Requirements.*

Some observers may see our illustrative cases—a protracted son-of-Desert Storm and concurrent regional crises—as too remote to warrant extensive planning and use of limited resources. But developing a credible assessment process for potential national security resource problems, regardless of perceptions of probability, is a crucial task if the United States is to remain a strong world leader. The United States must understand how to employ, sustain, and replenish the existing military force in a number of widely divergent threat situations. Managing and reducing the associated risk are essential elements of our national security strategy. The country cannot and should not be called upon to do everything, but it can—and must—lead, both in conducting assessments of a whole range of potential problems and in formulating and implementing plans to address them should they arise.

NOTES

The author would like to express his appreciation to several individuals for their helpful comments on earlier drafts of this article, most notably Mike Austin, Peter Brooks, Doug Scott, Joe Muckerman, Paul Halpern, Herschel Kanter, Dave Graham, and Fred Breaux.

1. The Requirements Module of the JIMPP Force Mobilization Model was used to prepare these estimates. The module estimates the cost to replace these assets from a given scenario, by major budget category. For Case One, the recovery budget estimates for DOD in the following key categories were as follows (in $88Bs): operations and maintenance ($36), aircraft ($42), tactical missiles ($37), weapons and tracked combat vehicles (WTCV) ($4), ships ($7), ammunition ($11), and other (mostly combat support equipment and other consumables) ($28). The total for Case One across these budget subcategories was $166 billion. (Multiply these values by 1.4 to express them in 1994 dollars.) Details about the JIMPP Requirements Module may be found in James S. Thomason, "The JIMPP Requirements Module: Concept and Data Base Development Plan," IDA Working Paper 88-5, 13 September 1988; James S. Thomason et al., "Graduated Mobilization Planning for the Department of Defense: Concepts, Responsibilities, and Options," IDA Paper P-2517, August 1991; Richard White, "The Theoretical Foundations of FORCEMOB," IDA Paper P-2652, 1992; and the *1993 Report to the Congress on National Defense Stockpile Requirements*, Department of Defense, May 1993.

2. The analysis was done using the Resolution of Capacity Shortfalls (ROCS) model, a 135-sector model of the US economy. The industrial sector model and the associated databases of the Integrated Civilian Industrial Mobilization Planning Process (ICIMPP), i.e. the ROCS model, were used to prepare industry-level estimates at both Step Three and Step Four for this illustration. Dr. Doug Scott of FEMA and Dr. Peter Brooks of IDA provided extraordinarily valuable assistance in preparing these estimates and distilling key results of the ICIMPP runs. ROCS was developed by Mr. E. L. Salkin of FEMA. It is a PC-based Input/Output model that explicitly tracks the US economy in terms of 135 industrial sectors (recently disaggregated to 241 sectors). The ROCS model can produce a wide range of graduated response options at a macro or industry level. Software documentation for the model was completed in April 1990. See E. L. Salkin, "A Procedure to Identify Shortages of Capital Stock—The ROCS Model," in J. Sullivan and R. Newkirk, *Simulation in Emergency Management and Technology* (The Society for Computer Simulation, 1989). Many of ROCS features are similar to those in the Industry Level Model of the JIMPP FORCEMOB system, and the two modules use a number of the same databases.

3. The 135 ROCS sectors provide a comprehensive picture of the US economy. Salkin, ibid., contains additional information about ROCS sectors and their correspondence to US Department of Commerce Standard Industrial Classification (SIC) codes.

4. Total output is the sum of final output and intermediate output in a sector. For details, see R. E. Miller and P. D. Blair, *Input-Output Analysis: Foundations and Extensions* (New York: Prentice Hall, 1985).

5. For illustrative purposes this analysis arbitrarily posits that any production backlogs still expected to exceed 25 percent of an industrial sector's annual Peacetime Operating Capacity after a year of recovery effort pose an unacceptable risk to military readiness and need to be fixed. DOD should establish some benchmark standards of this kind to ensure proper materiel readiness.

6. Full imports are defined here as the sum, across all international trade regions, of the maximum level of imports obtained by the United States in that sectional product category from the given international trade region during any of the last six years, times the estimated trade reliability (varies from 1.00 for "completely reliable" to zero for "unreliable") of the given region in the context of this planning scenario. In these estimates, the reliability decrements are imposed only upon the extra imports (above and beyond the baseline "normal" import projections) in any and all of these cases based on private communication with Dr. Douglas Scott, 5 November 1992.

7. A number of detailed assessments of the capability of specific firms to produce additional goods and services on a time-urgent basis have been conducted over the last decade. The section "Toward a Continuous Graduated Response Assessment Process" discusses several possible assessment options for the federal government as it tries to establish how long it takes firms to produce various items under different production conditions and priorities, given that firms don't generally have strong peacetime incentives to accurately determine how well they could do under priority conditions.

8. The DOD recovery budget estimates for Case Two, by category (1988$B) were estimated as follows: operations and maintenance ($83), aircraft ($96), tactical missiles ($100), weapons and tracked combat vehicles (WTCV) ($11), ships ($20), ammunition ($26), and other (mostly combat support equipment and other consumables) ($69). The total for Case Two across these budget subcategories was $404 billion.

9. The briefing by DASD (P&L/Production Resources) in "IDA-FEMA-DOD Resource Preparedness Seminar Three," 26 June 1992, as well as a follow-on briefing by ODASD (P&L/PR) in Seminar Four of the IDA-FEMA-DOD 1992 Seminar Series, illustrate the approach.

10. See Logistics Management Institute, Final Report of the Integrated Army Mobilization Study (IAMS), April 1992.