

March 1993

NATIONAL DEFENSE STOCKPILE

Views on DOD's 1992 Report to the Congress and Proposed Legislation



148596



**United States
General Accounting Office
Washington, D.C. 20548**

**National Security and
International Affairs Division**

B-245311

March 16, 1993

The Honorable Jeff Bingaman
Chairman, Subcommittee on Defense
Industry and Technology
Committee on Armed Services
United States Senate

The Honorable Earl Hutto
Chairman, Subcommittee on Readiness
Committee on Armed Services
House of Representatives

The Honorable Floyd Spence
Ranking Minority Member
Committee on Armed Services
House of Representatives

This report follows up on testimony presented before the related Subcommittees on May 21 and April 29, 1992. It presents the results of our review of (1) the analyses and assumptions used by the Department of Defense (DOD) to determine material needs in its 1992 Report to the Congress on National Defense Stockpile Requirements, (2) DOD's recommended disposal plans and associated legislative proposals, and (3) the U.S. ferroalloy upgrading program. We also reviewed agency actions on our prior recommendations and the participation of federal agencies and other experts in the stockpile requirements determination process.

The Fiscal Year 1993 Defense Authorization Act contains several provisions that address stockpile management, including acquisition and disposal of stockpile materials. These provisions are discussed in chapter 1.

We are sending copies of this report to interested committees and other Members of Congress; the Secretaries of Defense, Commerce, Interior, State, and Transportation; and the Directors, Defense Logistics Agency, Federal Emergency Management Agency, and Office of Management of Budget. We will also make copies available to other parties upon request.

B-245311

Please contact me at (202) 512-8412 if you or your staff have any questions concerning this report. Major contributors to this report are listed in appendix III.



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NASA Issues

Executive Summary

Purpose

The Department of Defense (DOD) reported in February 1992 that the government's \$9 billion stockpile of 99 strategic and critical materials should be reduced to a level of \$3.3 billion. Because of the reduced threat to national security from Eastern Europe and the former Soviet Union, DOD proposed the disposal or sale of certain quantities of 51 materials in the stockpile. DOD also proposed a moratorium on the purchases of stockpile materials because, in its view, stockpile requirements will decline further in the next stockpile requirements report.

In response to requests from the Chairmen of the Subcommittee on Defense Industry and Technology, Senate Committee on Armed Services, and the Subcommittee on Seapower and Strategic and Critical Materials, House Committee on Armed Services, GAO reviewed (1) the assumptions and methodologies DOD used in determining the material "goals," or requirements, it presented in the 1992 Report to the Congress on National Defense Stockpile Requirements; (2) DOD's recommended plans to dispose of unneeded stockpile materials and acquire needed ones; and (3) the ferroalloy upgrade program. Actions taken on prior GAO recommendations concerning stockpile requirements and federal agencies' participation in the DOD requirements determination process were also reviewed.

Background

Under the Strategic and Critical Materials Stock Piling Act of 1946 (50 U.S.C. 98 et seq., as amended), DOD maintains a stockpile of strategic and critical materials—for example, aluminum, cobalt, and platinum—to sustain military, industrial, and essential civilian needs during a 3-year conventional global war. In determining requirements for the stockpile, DOD uses a complex modeling process to consider various assumptions, such as military force structure, the kinds and amounts of materials being produced in the United States, and the availability of materials from foreign sources. DOD then computes the amounts of inventory that exceed or do not meet the estimated requirements and determines the amount of materials that need to be purchased or that can be sold without disrupting material markets. As required by the Stock Piling Act, DOD presents to the Congress an annual report on its stockpile material requirements and an annual plan that proposes disposals and purchases of certain materials. In the 1992 report on requirements, DOD said that it would need 24 materials valued at about \$3.3 billion. This figure includes \$1.2 billion in 11 materials that DOD needs to purchase. (See app. I.)

Results in Brief

DOD's overall process for estimating stockpile requirements is limited as a basis for determining specific estimates. Material consumption ratios, used to convert estimates of economic activity into requirements for strategic and critical material, were up to 10 years out of date. The use of these outdated, but critical, ratios in the models casts doubt on the validity of the requirements presented in DOD's 1992 report. DOD sensitivity tests showing the consequences of alternative assumptions on requirements examined only a narrow set of alternatives. GAO's review showed that alternative assumptions concerning material consumption ratios and foreign country reliability ratings can change estimates dramatically. Notwithstanding the shortcomings in DOD's assumptions and methodology, the size of the current stockpile, changes in threats to U.S. national security, reductions in forces, and increasing warning times support judicious disposal of outdated and clearly excess materials and a temporary curtailment of uncommitted purchases.

GAO believes that DOD could dispose of obsolete materials such as vegetable tannins without risk to national security or disruption to the material markets. Caution is advised, however, in disposing of other materials because DOD's methodology in determining requirements for these materials is limited.

DOD has excess ferromanganese and ferrochromium in the stockpile, and the alloys are readily available on the world market. The continued procurement of these alloys is not economical, but each of the alloys has only one U.S. producer, and sudden withdrawal of the government program could affect each producer's ability to compete on the commercial market. The Fiscal Year 1993 Defense Authorization Act allows the purchase of alloys to continue at least through fiscal year 1993.

Principal Findings

Requirements Determination Process Is Limited

Although DOD appears to have used a reasonable methodology for generating material requirements in its 1992 report, it has not adequately tested the sensitivity of goal estimates to reasonable alternatives of certain key assumptions. One key assumption is the reliability of foreign countries in providing needed materials during a conflict. The State Department expressed concern that the country reliability ratings it provided were highly subjective and accurate for a few months at best. Additional

sensitivity tests of country ratings showed requirements about 50 percent larger in total value than those in DOD's 1992 report.

DOD did not do sensitivity analyses to characterize the uncertainty associated with material consumption ratios. These critical ratios are used to convert estimates of economic activity into material requirements. They must be reasonably accurate to produce a meaningful estimate. The source data used to derive the ratios for the 1992 report, however, was 10 years old. GAO used DOD's methodology to reconstruct 15 material consumption ratios (MCR) for each year between 1972 and 1983. We found MCRs could change dramatically over a 10-year period. Specifically, nine went down by half or more, one doubled, two went up over fourfold, and three remained about the same. Also, DOD did not do sensitivity analyses to reflect other MCR-related uncertainties, including changes in inventory levels, price speculation, and comparability of wartime and peacetime ratios.

Cautious Disposal of Some Materials Is Prudent

For the most part, the levels of disposals in DOD's annual material plans appear reasonable; however, a cautious approach to some of the proposed disposals would be prudent. GAO believes that DOD can proceed with most disposals until a new stockpile study, incorporating updated material consumption ratios and more thorough sensitivity analyses, is produced. DOD need not retain outdated materials such as asbestos, vegetable tannins, and thorium nitrate or materials of an inferior grade. To minimize possible impacts on commercial markets, GAO believes that DOD should dispose of materials such as cobalt, ferroalloys, chromium, and manganese ores only after full consultation with experts in other federal agencies and with producers and users.

Program managers from cognizant federal agencies said they had not been consulted about DOD's current disposal plans. In the past, the Market Impact Committee had played an important role in advising on the development and execution of disposal plans. Given the uncertainty of the data on material consumption ratios and the narrow sensitivity analyses DOD did on key assumptions, the views of federal agency experts and users of critical materials may be crucial in deciding what materials to dispose of.

Ferroalloy Upgrade Program Is No Longer Needed

Because the ferrochromium and ferromanganese stockpile inventories significantly exceed DOD's requirements and the alloys could be obtained from foreign sources at lower prices and substitute domestic facilities in

an emergency, GAO believes that the continued procurement of the alloys under the upgrade program is neither necessary nor economical. The Fiscal Year 1993 Defense Authorization Act authorizes the disposal of excess chromite and manganese ores, as well as the respective ferroalloys, under certain conditions. The upgrade program is scheduled to continue at least through fiscal year 1993.

Recommendations

GAO recommends that the Secretary of Defense

- in future determinations of material requirements, present a broader range of sensitivity tests to assess the uncertainties associated with a variety of assumptions, including MCR data, foreign country reliability, warning time, and alternative war scenarios;
- obtain and use updated data on material consumption ratios, or if such data cannot be obtained, create expert advisory working groups or committees to help determine material requirements;
- develop a range of stockpile requirements to cover U.S. security threats; and
- use the Market Impact Committee or create a committee of federal and independent experts to advise stockpile managers in planning and implementing acquisitions and disposals.

Agency Comments

GAO sent a draft of this report to DOD on November 17, 1992. DOD provided official oral comments in December 1992. At that time GAO began evaluating each of those comments and determining how they should be treated in the final report. (See chs. 2, 3, and 5.) DOD's written comments arrived 2 months after requested, and have not been included in the final report because they are virtually the same as those discussed in December. Interested parties can obtain DOD's comments by calling (202) 512-8412.

DOD generally concurred with our recommendations concerning the use of a broader range of sensitivity analyses and obtaining updated material consumption ratio data. DOD did not concur with our recommendation to develop a range of stockpile requirements. Our recommendation on the Market Impact Committee is being addressed by DOD in consonance with the Fiscal Year 1993 National Defense Authorization Act, which formalizes the Committee. The act also requires the creation of an advisory committee with members from industry and other federal agencies to make recommendations on stockpile operations and modernization.

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Abbreviations

DOD	Department of Defense
FEMA	Federal Emergency Management Agency
GAO	General Accounting Office
GMR	graduated mobilization response
MCR	material consumption ratio
OMB	Office of Management and Budget
SIC	standard industry classification

Introduction

In 1946, the Congress enacted the Strategic and Critical Materials Stock Piling Act (U.S.C., title 50, section 98 et seq.), which authorized a stockpile of materials sufficient to supply the military, industrial, and essential civilian needs of the United States during a national emergency. The stockpile comprises 99 materials,¹ including aluminum, beryllium, chromium, cobalt, germanium, industrial diamonds, manganese, and platinum, valued at \$9 billion as of January 31, 1991.²

Under the Stock Piling Act, the Department of Defense (DOD) must include in a periodic study and report on estimated stockpile requirements the assumption that the United States will need enough materials, not likely to be produced domestically, to sustain the U.S. economy during a conventional global war of not less than 3 years. However, DOD is making detailed force structure reductions of about 25 percent, and the breakup of the Soviet Union has resulted in a changed and reduced threat. DOD used a new war scenario to reflect those changes in force structure and threat as of January 1991. DOD adapted the new war scenario to the statutorily mandated 3-year conventional war assumption and determined stockpile requirements accordingly. DOD's 1992 report includes an alternative requirements computation based on what DOD considers a more realistic scenario, a 3-month war with a 1-year mobilization period. Requirements under this scenario are reduced to less than half of those under the mandated scenario. Previous studies have resulted in wide variations in stockpile goals that have ranged from \$16 billion in 1979 to \$600 million in 1985 and, finally, to \$3.3 billion in 1992.

The Requirements Determination Process

In February 1988, management of the stockpile was transferred by executive order from the General Services Administration and the Federal Emergency Management Agency (FEMA) to DOD. The Stock Piling Act requires DOD to provide to the Congress a periodic report on stockpile requirements. In addition to determining requirements, DOD also identifies materials that are excess to its needs and makes plans to try to sell certain materials. Two of the materials DOD has identified as excess to its needs are ferromanganese and ferrochromium; however, DOD is mandated by law to acquire certain amounts of these ferroalloys annually.

¹DOD lists 107 items in table 6 of its February 1992 stockpile requirements report. Eight items had zero balances in inventory.

²We use values as of January 31, 1991, to coincide with the time frame and values determined by DOD in its 1992 requirements report to the Congress.

To compute the requirements for its 1992 report to the Congress, DOD conducted a study for which it developed 23 planning assumptions, including attrition rates, shipping losses, foreign suppliers' reliability, civilian austerity measures, force structure, and a 3-year war scenario. DOD used a complex modeling process in the study to compute estimated requirements based on these assumptions. DOD found that it has requirements for 24 materials valued at \$3.3 billion. Included in this requirement is the need to buy quantities of 11 of these 24 materials worth about \$1.2 billion; however, DOD proposed that the materials not be purchased because stockpile requirements were expected to decline further in the next stockpile requirements report.

Plans for Disposing of Materials

After DOD has determined the requirements for the stockpile, the amounts of inventory that exceed the proposed requirements are computed. DOD concluded that it could dispose of certain amounts of 51 materials in the stockpile. DOD's Annual Materials Plan includes a list of excess materials that it wishes to sell on worldwide markets, their estimated values, and the estimated proceeds from the sale of those materials. DOD has proposed the sale of the 51 materials over 5 years, beginning in fiscal year 1993. Appendix II shows two of DOD's proposed alternatives for disposing of stockpile materials in fiscal year 1993.

The Ferroalloy Upgrade Program

The ferroalloy upgrade program was established in 1984 under an executive order and was subsequently mandated, under 50 U.S.C. 98d³ to continue through fiscal year 1993. The law requires that minimum annual quantities and total quantities of high carbon ferrochromium and ferromanganese be added to the stockpile. Only two manufacturers produce these ferroalloys. Because DOD has excess quantities of these ferroalloys, it has recommended that the Congress repeal the law requiring the acquisition of these materials.

Recommendations in Our 1987 Report

In our report entitled National Security Council Study Inadequate to Set Stockpile Goals (GAO/NSIAD-87-146, May 4, 1987), we made several recommendations to the Director of FEMA to improve the process used to determine stockpile requirements. See chapter 5 for DOD's response to these recommendations.

³Section 1501 of the Fiscal Year 1989 Defense Authorization Act, Public Law 100-456.

Stockpile Provisions in the 1993 Defense Authorization Act

The Fiscal Year 1993 Defense Authorization Act contains several provisions that addresses stockpile management, including acquisition and disposal of stockpile materials. The act authorizes the President to dispose of significant quantities of 44 obsolete and excess materials in the stockpile beginning October 1, 1992. Before disposals can be made, however, the President must submit a revised annual materials plan to the Congress, and the President must certify that the disposals will not adversely affect the U.S. ability to supply needed stockpile materials during a national emergency. Disposals of chromite and manganese ores in fiscal year 1993 can be made only for processing in the United States and its territories and possessions, and DOD may not begin disposal of ferrochromium and ferromanganese before October 1, 1993. The President is to notify the Congress in writing, including full explanation and justification, of any proposed changes in quantities of materials. Unless the Congress opposes, the proposed changes become effective on or after the 30th legislative day following the notification.

The act also formalizes the establishment of two committees to assist in stockpile management. An advisory committee, consisting of federal agency and outside representatives, will make recommendations to the President regarding the operation and modernization of the stockpile. A market impact committee, consisting of representatives from federal agencies and other persons the President considers appropriate, will advise and make recommendations to the stockpile manager concerning the projected domestic and foreign economic effects of all stockpile acquisitions and disposals. The recommendations in this report are consistent with the act's provisions and are being maintained to ensure that appropriate agency actions are taken and reported.

Objectives, Scope, and Methodology

In response to requests from the Chairmen of the Subcommittee on Defense Industry and Technology, Senate Committee on Armed Services, and the Subcommittee on Seapower and Strategic and Critical Materials, House Committee on Armed Services, we reviewed (1) the assumptions and methodologies DOD used in determining the material requirements it presents in the 1992 Report to the Congress on National Defense Stockpile Requirements, (2) DOD's recommended plans to dispose of unneeded materials and acquire needed ones, and (3) the ferroalloy upgrading program. We also reviewed, as requested, agency actions on our recommendations made in 1987 and federal agencies' and other experts' participation in the stockpile requirements determination process.

We performed our work at the Office of the Secretary of Defense; the Defense National Stockpile Center, Defense Logistics Agency; the Department of Commerce; the Bureau of Mines, the Department of the Interior; the Department of State; the Office of Management and Budget; the Department of Transportation; the Federal Emergency Management Agency; a commercial materials user; and several industry associations.

We based our assessment of the impact on national security of the proposed disposals of materials on DOD's estimated requirements, which were derived from its modeling process, and on a review of DOD's rationale for requirements of materials not included in the model. In assessing the credibility of DOD's modeling process, we performed sensitivity analyses to test the consequences of alternative assumptions on requirement estimates. We analyzed alternative assumptions in the critical areas of foreign country reliability and the use of material consumption ratios. To assess the impact of proposed disposals on the market, we compared the proposed disposal quantities to production quantities, discussed the proposed disposals with government and industry representatives, and related the value of materials proposed for disposal to historical information.

To assess the ferroalloy upgrade program, we reviewed historical information, including legal requirements, government costs and market prices, stockpile inventories and requirements, and the availability of ferroalloys from sources other than the two contractors involved in the program. In addition, we discussed with government and contractor representatives the two ferroalloy contractors' potential for converting from government to commercial sales.

We did our review from August 1991 to August 1992 in accordance with generally accepted government auditing standards.

Requirements Determination Process Is Limited as a Means of Estimating Stockpile Requirements

Although DOD has improved its process for determining stockpile requirements for strategic and critical materials, the overall process is limited as a basis for determining specific estimates. DOD used a reasonable set of planning assumptions and options in its 1992 report but did not adequately characterize the uncertainty associated with key assumptions. Most important, key material consumption data on industry's use of strategic and critical materials was appreciably outdated. Specifically, DOD conducted no sensitivity analyses¹ on the assumptions describing industry's production and use of materials and no sensitivity analyses of combinations of reasonable alternative assumptions. A limited sensitivity analysis of assumptions concerning the availability of materials from foreign sources was conducted. Although DOD is negotiating with Commerce to update material consumption data, Commerce officials believe that it may be several years before quality data can be provided.

DOD's Methodology Appears Reasonable

DOD appears to have used a reasonable methodology and set of planning assumptions to generate material requirements in its 1992 report. DOD considered the 3-year war scenario; military forces to be mobilized; requirements for the military, industrial, and civilian sectors; available foreign supplies; and domestic production. DOD also factored in warning and mobilization periods. Finally, by changing factors, DOD tested the sensitivity of suppliers' reliability, shipping losses, prices, mobilization year shortfalls, plant capacities, and civilian austerity. These analyses resulted in requirements for stockpile materials that ranged from \$2.9 billion to \$3.8 billion.

Because of the reduced threat from Eastern Europe and the former Soviet Union, DOD proposed—in addition to its prescribed 3-year war scenario—what it considers a more realistic war scenario—a 3-month war with a 1-year mobilization period. Although the requirements under this alternative would cost about \$1.3 billion, or about \$2 billion less than those under the 3-year war scenario, quantities of seven stockpile materials valued at \$195 million would have to be acquired.

¹Sensitivity analyses are intended to show how requirements estimates might change as a result of such contingencies as the loss of a key foreign supplier, unexpected shipping losses, or variations in estimates of material consumption.

Analysis of Foreign Countries' Reliability in Providing Materials Was Limited

In estimating the availability of material from foreign sources, DOD did not adequately reflect the uncertainty of ratings applied to each country, did not rate countries that mined ore processed in another, and did not combine analyses of country reliability with analyses of other pertinent factors.

The reliability ratings are important because the United States relies on foreign countries for most of the strategic and critical materials in the stockpile. For example, the United States is almost entirely dependent on foreign countries for columbium, manganese, platinum, cobalt, and chromium. Dependence on foreign suppliers for all other materials in the stockpile varies considerably.

How DOD Derived Reliability Ratings

The State Department assessed foreign countries' reliability in supplying materials using a methodology that rated the countries on a scale of one to six. A rating of one meant that during a war a country would likely be unwilling to supply the United States, while a six meant that a country could produce and deliver its full capability and would likely take extraordinary measures to provide even more material. Several DOD groups also reviewed information on countries' reliability and resolved differences between State's and DOD's ratings by adopting the more conservative rating of the two. The ratings were then converted to percentages for use in the model.

Sensitivity Analysis on Country Ratings Does Not Reflect Uncertainty

We and Department of State officials do not believe that DOD's sensitivity analysis of countries' reliability adequately reflects the uncertainty of the ratings. Officials in State's Office of International Commodities stressed that their ratings are highly subjective and are accurate for a few months at best. In one analysis, DOD used reliability ratings from its 1989 study and computed a stockpile requirement that was \$194 million, or 6 percent, lower than the proposed requirement in the 1991 study. In another analysis, DOD reduced the reliability rating for one key country by 50 percent, which increased stockpile requirements by only \$5 million. We do not believe that these two analyses adequately reflect the uncertainty associated with foreign country reliability. Moreover, DOD did not impose ratings on all pertinent sources of supply. Specifically, DOD did not rate countries where material was mined but did rate countries where the same material was processed. Thus, DOD may have overstated the availability of certain materials.

Because of our concern about the uncertainty of country ratings, we asked DOD to conduct additional sensitivity analyses on ratings we believed were characterized by substantial uncertainty for the foreseeable future.² DOD tested alternative ratings for a number of different countries in different combinations selected by us. By lowering the ratings for just a few countries, we found that the estimated requirements increased for 10 of the 19 modeled materials with requirements in the 1992 report. Also, requirements were established for two materials that had no requirements or goals in DOD's 1992 report. For some materials, requirements were manyfold larger than those proposed by DOD in the 1992 report. In terms of total value, this test suggested requirements that were about 50 percent greater than those proposed in DOD's 1992 report. An alternative rating for one key country is largely responsible for this difference.

Finally, DOD did not combine analyses of country reliability with analyses of other pertinent factors, for example, shipping losses or industry's use of materials. Some sensitivity analyses on country reliability for studies done in past years were more thorough. The application of similar analyses could result in broader ranges for stockpile goals.

Sensitivity of Material Consumption Ratios Not Reflected in DOD Report

DOD did not include in its 1992 report an analysis that characterizes the uncertainty associated with material consumption ratios (MCR), which are used to convert estimates of economic activity into material requirements. Each MCR represents an estimate of how much of a material is used for each billion dollars worth of a specific industry's output. Although DOD used about 2,000 MCRs as factors in its model, less than 200 are influential in producing a meaningful estimate, and these must be reasonably accurate. The source data used to derive MCRs for the 1992 report, however, was appreciably outdated, thus compounding the uncertainty associated with their use. The 1992 report includes MCRs that are based on data more than 10 years old.³ In addition, DOD did not present sensitivity

²These test results differ from those we presented in testimony on April 29, 1992, before the House Armed Services Subcommittee on Seapower and Strategic and Critical Materials because of a DOD programming error. As a result of the error, this earlier testimony substantially understates the effect of the reliability rating for one key country on estimated requirements.

³According to DOD, MCRs are calculated as the ratio of 3 years of materials consumption data by industry, obtained from analysts at Commerce, to 3 years of industry output on a product class basis, obtained from the Census of Manufacturers. Commerce last updated the materials consumption data for all materials during 1985-86, which produced estimates for 1983. Allowing for the lag-time in constructing MCRs, estimates for 1989 could have been available for the 1992 study; therefore, the MCRs used in the 1992 study were at least 6 years out of date from what was possible. Adding to this the years that the MCRs are projected forward in the 1992 study means that the MCRs applied to the war years are based on data more than a decade old.

analyses of the uncertainty related to MCRs that can arise from other factors such as price speculation and changes in inventory levels.

DOD Used Unverifiable Sources and Outdated MCR Data in 1992 Report

To analyze the consequences of using outdated MCRs, we attempted to obtain the raw data DOD used to construct MCRs. DOD was unable to provide that data because it did not keep historical files or documentation. We did obtain raw data for some of the potentially important MCRs from Commerce data covering 1972-83, but nearly half of the data we requested had been discarded. We calculated our MCRs in a manner nearly identical to that described by DOD and found that of the 15 MCRs we examined, our estimates were within 10 percent of DOD's MCRs for 4, within 20 percent for another 6, and substantially different for the remaining 5.⁴

We also examined how much an MCR could change over 10 years. Among 15 MCRs, 2 increased by more than 4 times their level of a decade ago, 1 doubled, 3 had decreased to less than 25 percent of their prior level, 6 were about one-half their prior level, and only 3 had remained about the same.

Such dramatic changes in MCRs over a decade are possible for many reasons, including (1) technological advances, for example miniaturization, which would reduce materials consumption; (2) substitution of alternative or cheaper materials, which could increase consumption of some materials and reduce consumption of others; (3) greater production efficiencies (less waste), which would reduce materials consumption; and (4) changes in the dominance of the various products contained in particular standard industry classifications (SIC),⁵ which could increase or decrease the consumption of particular materials.

Other Factors Related to Uncertainty of MCRs Not Considered

DOD's 1992 report does not present sensitivity analyses of the uncertainty related to MCRs that could arise from additional factors, for example, changes in inventory levels, price speculation on materials, and the likelihood that wartime MCRs are not comparable to peacetime MCRs.

⁴We attempted to verify the MCRs used in the 1992 study by constructing comparable MCRs from Commerce data and Census of Manufacturers' actual data, whereas DOD had used forecasts of Census data.

⁵SIC codes are four-digit standard industry classifications used by the Department of Commerce to categorize economic data on an industry or product basis.

We asked DOD to conduct sensitivity analyses on 15 estimated MCRs representing 11 materials, 7 of which have proposed requirements in the 1992 report. In most cases, we examined both increases and decreases in the MCRs. We determined the amounts we raised and lowered each MCR by using either past values of that MCR, according to the variance or the extremes of those values, or the MCR we calculated from Commerce's source data if it differed greatly from DOD's MCR. For the seven materials included in the 1992 report, five requirements increased in ranges from 17 to 55 percent, six decreased from 25 to nearly 100 percent, and one nearly tripled or decreased to zero. The requirements for the other four materials did not increase. By combining our MCR analyses, we found that the total value of proposed requirements could increase by 35 percent or decrease by 29 percent.

Our sensitivity analyses are somewhat conservative in that we did not examine all materials or test plausible extreme values of MCRs in each case. A more thorough analysis or a combination of MCR analyses with analyses of other factors could result in broader ranges of proposed requirements than those DOD proposed in its 1992 report.

Although DOD has asked the Department of Commerce to update the data used to calculate MCRs, one Commerce official said that it might take several years to develop the expertise and cooperative industry relationships necessary to collect data comparable in quality to that obtained in 1985.

Conclusions

DOD has made progress in improving the stockpile requirements determination process by considering a reasonable number and type of assumptions and options. However, the process used, taken in its overall context, is limited as a basis for determining specific estimates of stockpile requirements because these assumptions and other data are characterized by a significant degree of uncertainty. Our broader ranges of sensitivity analyses on various assumptions show that estimates can vary significantly. The use of outdated data in the modeling process is even more critical. If DOD cannot obtain more recent MCR data, DOD may have to rely more on input from other federal agencies and experts. We believe it would be prudent to place less emphasis on computing specific point estimates of stockpile goals and, instead, develop a range of stockpile requirements, sized in volume and value, to cover identified U.S. security threats.

Recommendations

We recommend that the Secretary of Defense

- present a broader range of sensitivity tests to assess the uncertainties associated with a variety of assumptions, including MCR data, foreign country reliability, warning time, and alternative war scenarios;
- obtain and use updated MCR data in determining stockpile requirements or else create working groups or committees composed of experts in the relevant subject areas to determine requirements; and
- develop a range of stockpile requirements, based on sensitivity test results, to cover identified U.S. security threats.

Agency Comments and Our Evaluation

DOD concurred with our recommendation that it present a broader range of sensitivity tests in future reports. DOD said that sensitivity analyses in future requirements reports will include changes in the values of key assumptions in both a higher and lower direction by at least 15 to 20 percent plus combinations of changes in key variables in the same direction.

DOD partly concurred with our recommendation that updated MCR data be obtained and used. DOD signed a memorandum of understanding with the Department of Commerce on July 17, 1992, to update the MCRs over a 2-year period. As of December 1992, there had been no new MCRs developed for use in the DOD requirements report due to the Congress by January 15, 1993. DOD has kept us informed about efforts to develop an alternative methodology for estimating material consumption that is said to be less dependent on year-to-year variations in consumption and could be used to substitute for some MCRs.

DOD only partially concurred with our recommendation that advisory working groups be established if the MCRs cannot be updated. DOD stated that it uses advisory working groups to help develop requirements for non-model materials, but it would be too late to establish such groups for modeled materials for the 1993 report. DOD said that advisory committees would be formed if by July 1994 there were materials for which neither an updated MCR nor an alternative quantitative methodology was available. We believe that in the interim some type of mechanism, such as advisory working groups, is needed to address requirements for those materials that are not covered.

DOD did not concur with our recommendation that stockpile requirements be developed in ranges, based on sensitivity test results, to cover identified

Chapter 2
Requirements Determination Process Is
Limited as a Means of Estimating Stockpile
Requirements

U.S. security threats. DOD believes that requirements for each material must be expressed in terms of a single-point estimate because the Critical Materials Stock Piling Act limits disposals to those materials that exceed stockpile requirements. We believe that requirements can be presented as point estimates; however, the requirements should be qualified to show that sensitivity to contingencies could cause them to vary significantly above or below the point estimates.

In further support of its position, DOD believes that (1) foreign country reliability assessments are good for several years, (2) the Market Impact Committee is now adequately involved in reviewing proposed disposals, (3) MCRS will be updated in time to prevent unwarranted disposals, and (4) amendments to the Stock Piling Act give DOD flexibility to change requirements when planning assumptions change.

As we have reported, the State Department believes that country reliability ratings, in some cases, may be good for only months. Even if reliability ratings have remained relatively stable over the past decade, dramatic changes can occur quickly. Few, if any, foresaw the changes that have taken place in Eastern Europe in the past couple of years. Sensitivity tests we had done showed that some requirements were 50 percent higher than those proposed in DOD's 1992 report.

We are encouraged that the Market Impact Committee has been formally established and, will perhaps be more actively involved in advising DOD on the projected economic effects of stockpile disposals and acquisitions. We remain concerned about the use of outdated data in determining requirements and disposals, however. In addition, recent legislation authorizes DOD to propose changes to stockpile requirements based on changed planning assumptions, DOD must still determine requirements based on assumptions in existing legislation. DOD must justify proposed changes to such requirements to the Congress and they must wait 30 legislative days before changes are enacted.

Caution in the Disposal of Excess Stockpile Materials Is Prudent

DOD has proposed the disposal, or sale, of 51 strategic and critical materials, beginning in fiscal year 1993, based on its assessment of requirements for national security and the effect disposals would have on material markets. (See app. II.) On the basis of sensitivity analyses we conducted from a national security perspective, we determined that most of DOD's proposed disposals are reasonable; however, a more cautious approach to some of the proposed disposals would be prudent. Further, although DOD attempted to account for the impact of disposals on materials markets in its fiscal year 1993 Annual Materials Plan, DOD had not made full use of the Market Impact Committee's expertise in determining what materials should be disposed of. Under FEMA, the Committee had played an important role in the development and execution of the plan.

Sensitivity Analysis Shows Risk in Disposing of Six Materials

Results from a sensitivity analysis of the stockpile modeling system should provide a reasonable basis for assessing the national security risk associated with the proposed disposal of stockpile materials. As a test, we asked DOD to conduct a sensitivity analysis on the country reliability assumption, and we used the results of that analysis to categorize the proposed disposal of each material as a low, medium, or high risk.¹ From this analysis we determined that the proposed disposal of six materials could be considered a high risk from a national security perspective. Those six materials were antimony; chromite (refractory grade); three platinum group metals (iridium, palladium, and platinum); and the tungsten group. Most disposals posed a low risk because available supplies substantially exceed demands or because the materials are obsolete or of an unusable grade; none posed a medium risk.

The results of this analysis are more likely to overstate than understate the true risks associated with proposed disposals. We did not consider other alternative assumptions or data estimates, which could alter our classifications of proposed analyses, or the uncertainty that is associated with them. We believe, however, that a sensitivity analysis of country reliability is more likely to result in higher requirements than a sensitivity analysis of any other assumption. Consequently, the disposals we

¹For this analysis, we reduced the reliability ratings for a number of countries based on our perception of the uncertainty associated with those ratings. If the amount of a given material in inventory minus the proposed disposal was more than 25 percent below our alternative proposed requirement, we classified that disposal as high risk; between 0 and 25 percent—medium risk; 0 percent or below—low risk. The results were not sensitive, however, to the selection of 25 percent versus, for example, 33 percent as the cutoff. We adjusted the risk classifications on the disposals of cobalt and quartz from medium and high risk to low risk based on a Defense Logistics Agency official's comments about the grade of the materials slated for disposal and their current importance to national security.

classified as high risk should be considered as having a low probability of compromising national security.

Twenty-two materials were not considered to have enough market activity to make quantitative modeling practical. Instead, during its 1991 study, DOD consulted with experts from other federal agencies and used data collected from available sources to determine requirements for these materials. In the 1992 report, DOD proposed reducing 22 materials with requirements worth \$1.2 billion to 3 materials with requirements worth \$0.4 billion (at Jan. 1991 prices). The three materials are beryllium metal, diamond industrial stones, and jewel bearings; requirements for the other 19 materials would drop to zero.

The reasons cited in the 1992 report for dropping the 19 materials to zero, coupled with the methodology DOD used to determine these requirements, appeared reasonable to us. DOD cited the availability of substitutes, declining usage, health and environmental impacts, and unnecessary requirements as reasons for eliminating requirements for the materials.

Experts Suggest Caution in Disposals That Will Affect Material Markets

For the most part, the levels of disposals, or sales, proposed in DOD's Annual Materials Plan appear to be reasonable during good market conditions. However, market conditions for each material vary, and DOD is obliged not to disrupt the markets for these materials.

DOD's fiscal year 1993 Annual Materials Plan includes two 5-year alternative plans for disposals, starting in fiscal year 1993. Under the plan, DOD has asked for authorization to dispose of 51 materials worth \$392 million in one plan and worth \$634 million in the other plan. Disposals under both plans are equal to or less than the computed excesses in DOD's 1992 report. The first plan meets the legislative requirement that disposals not exceed obligations, which are planned at \$150 million. The second plan assumes that a maximum limitation of \$1 billion will be legislatively mandated. (See app. II.)

Domestic industry associations and several foreign countries have expressed concern about the effect proposed disposals would have on material markets. According to a recognized expert, disposal of about 5 percent of world production per year during good market conditions is a good rule of thumb. We compared the proposed disposals of 29 materials to world production using the 5-percent rule of thumb. We determined that

most of the proposed disposals under DOD's two alternative plans were under 5 percent.

The first plan includes three materials over the 5-percent benchmark (graphite natural/malagasy crystalline, 7.9 percent; mercury, 6 percent; and tin, 5.8 percent). The second plan includes three additional materials that exceed 5 percent (bauxite/metal grade Jamaica, 5.6 percent; cobalt, 5.6 percent; and palladium, 6.9 percent).

Experts favor disposal of stockpile excesses during escalating market conditions as a means of minimizing the impact on usual markets. They also agree that predicting future market conditions is virtually impossible. An industry expert cited a price swing for cadmium from around \$9 a pound in 1988 and 1989 to \$1 a pound currently, a drop that illustrates the volatility of the market. Some government and industry representatives were concerned that current markets (with low demands and low prices) could be unduly affected by substantial stockpile disposals.

DOD's proposed disposal of cobalt in current markets has generated considerable interest. DOD computed an excess inventory of 12.7 million pounds of cobalt, which was proposed for disposal in the fiscal year 1992 and 1993 Annual Materials Plans. DOD requested expedited authority for the disposal of 6 million pounds of this excess. The U.S. use of cobalt in 1991 was estimated to be about 16 million pounds, or 21 percent of world mine production. Although the United States no longer mines and refines cobalt, U.S. reclamation from shavings and other usable scrap accounts for about 3 million pounds, or 18 percent of domestic consumption. In addition, according to representatives from the Bureau of Mines and the Defense National Stockpile Center, mines and smelters could be reopened if the price of cobalt were high enough or the United States faced a national emergency.

Two experts—a government specialist and a user—believed that the disposal of cobalt was desirable in the current market because it could be sold for relatively high prices. On the other hand, a trader believed the supply and demand for cobalt were delicately balanced and that DOD's proposed disposal would disrupt the market. He added that the government could sell the cobalt for higher prices in the future.

DOD Pays Little Heed to Experts' Advice on Disposals

We recommended in our May 1987 report that the views of individuals and organizations with the requisite experience and expertise be sought during the requirements determination process, including the selection of

materials for disposal. By Executive Order 12626, dated February 25, 1988, DOD must consult with heads of cognizant agencies—for example, the Departments of Commerce, the Interior, and State and FEMA—when planning disposals. According to DOD officials, representatives in other agencies were contacted during the planning process, but the experts we contacted in those agencies said they had not been consulted on DOD's 5-year disposal alternatives.

When FEMA was managing the stockpile, the Market Impact Committee played an important role in advising on the development and execution of the disposal plan. The Committee—comprising representatives from the Departments of Commerce, State, and the Treasury; the Bureau of Mines; and FEMA—primarily sought to ensure that government purchases and sales of strategic and critical materials did not disrupt market prices. It also served as a forum for industry complaints and concerns.

Officials at the Departments of Commerce and State and FEMA expressed concern about the diminished role of the Committee. Since DOD has become responsible for the stockpile, the Committee has met only occasionally, with no consensus arrangement or process for resolving differing views. The DOD Inspector General agreed in July 1991 that the Committee had not consistently met to review the effects of proposed acquisitions and disposals on domestic and foreign markets. The officials commented that DOD apparently has little interest in the Committee or its views. DOD officials said that although Committee members could comment on the Annual Materials Plan, the Committee's advice would not necessarily be followed.

FEMA and the State Department have suggested that the Committee be formally instituted, either through legislation or by an executive order, to ensure that DOD considers the Committee's opinions on the effects of disposals on the materials markets. Formalization of the Committee would also ensure that members clearly understand their roles in the disposal process. DOD has developed a charter that spells out specific responsibilities of the Departments of Commerce, the Interior, and State in advising DOD and providing data for the setting of stockpile requirements. However, DOD indicated that the role of civilian representatives on the Committee would be only to offer advice on acquisition and disposal actions as they affect the materials markets. Final development and approval of the charter are pending.

**Revenues Have Been
 Below DOD's
 Requested
 Authorizations or
 Legislated Limitations**

The estimated value of materials proposed for disposal in the two alternative plans is significantly higher than the revenues received from sales in the past 4 years (1988-91). Furthermore, the revenues from those years were less than the amounts the Congress authorized to be disposed of and less than the value of the materials cited in the plans for those years.

The estimated values of the materials proposed for disposal in the two 1993 plans (\$392 million and \$634 million) were computed at 80 percent of market prices. (See app. II.) The 20-percent discount is intended to compensate for (1) the costs of loading and transporting the materials from storage sites to the marketplace and (2) the sale of materials without the usual market grade guarantees.

As shown in table 3.1, the estimated values of materials disposed of during fiscal years 1988-91 were above, below, and equal to the legislated limits; in all cases, the values and the legislated limits exceeded the proceeds.

**Table 3.1: Estimated Values, Limitation
 Amounts, and Proceeds for Disposals**

Dollars in millions				
Fiscal year	Estimated value of materials for disposal	Legislated limitation	Proceeds from disposals	Proceeds as a percentage of limitation
1988	\$275.0	\$126	\$80	64
1989	151.6	180	69	38
1990	180.0	180	63	35
1991	180.0	180	83	46
1992	257.2	150	^a	^a

^aProceeds through March 1992 totaled \$58 million.

Eight materials² represented the major disposals between 1988 and 1991. Various combinations of these materials represent 97 percent or more of the total proceeds each year. These include silver transferred to the Treasury for coinage programs and tin transferred to ferroalloy contractors under barter agreements that partially offset the costs of the ferroalloy upgrade program. Actual disposals of the materials were generally below the authorized quantities and estimated prices during the past 4 fiscal years. Between 1988 and 1991, materials worth about \$443 million were authorized for disposal, but revenues were about

²The materials were diamond bort, diamond stones, iodine, mercury, silicon carbide, silver, tin, and tungsten ore.

\$290 million. The difference (\$153 million) represents lower quantities sold (\$115 million) and lower prices of the materials (\$38 million).

Lower quantities of materials were sold because (1) the amount of material needed for coinage programs was limited, (2) legislation required that the usual markets not be disrupted, and (3) the demand for materials that did not meet market specifications was low. According to two experts, market specifications are now more stringent than they were when some of these materials were purchased, and some materials have deteriorated while in storage. The lower prices for materials resulted from, among other things, (1) the market prices' volatility, (2) the difficulty in predicting market price adjustments to account for moving costs, and (3) the sale of materials without the usual specification guarantees.

Conclusions

Because DOD has not used a wide range of sensitivity analyses and updated data in determining requirements and has not considered the views of the Market Impact Committee, its proposed disposals may be questionable. Indications are that prudent disposal of most materials would be appropriate; however, caution is advised in disposal decisions—at least until DOD obtains updated data and runs a wider range of sensitivity analyses on key assumptions during future studies of stockpile requirements. We favor a broad, flexible, longer term disposal plan, subject to annual congressional review and approval, that optimizes the amount of excess material authorized for disposal. Such a plan should be readily adjustable to ensure that disposals do not unduly disrupt the commodity markets. DOD has not consulted the Market Impact Committee or other experts on a regular basis in planning and implementing its disposal and acquisition programs. Such consultation is important because (1) the timing of disposals and acquisitions in the volatile minerals and metals markets is critical to ensure compliance with legislative requirements and avoid undue disruptions in the usual markets and (2) proposed disposals would significantly exceed prior government experience with annual disposals. We believe advisory committees comprised of individuals with expertise in stockpile materials and stockpile management should be appointed to advise and counsel stockpile managers.

Recommendation

We recommend that the Secretary of Defense use the Market Impact Committee or create a new committee comprised of civil federal agency

and independent experts to advise and counsel stockpile managers in planning and implementing stockpile disposals and acquisitions.

Agency Comments and Our Evaluation

DOD officials concurred with our recommendation that the Secretary of Defense appoint a committee of federal and independent experts to advise and counsel stockpile managers on stockpile disposals and acquisitions. They pointed out that the Market Impact Committee was institutionalized under an interagency charter effected in late 1992 and by a statutory mandate in the Fiscal Year 1993 National Defense Authorization Act. As we have reported, regular consultation with federal and other experts is very important to avoid or minimize material market disruptions.

DOD took strong exception to a recognized expert's suggestion that disposals of excess materials be limited to 5 percent of annual world production as a general rule of thumb. DOD believes that no single decision rule should be rigidly imposed in making judgments about the extent of market impacts. We did not recommend or intend that the 5-percent rule of thumb be rigidly adhered to as a standard for disposal of excess materials. We presented it as a recognized guide, along with other information, used in making disposal decisions. In DOD's two alternative plans, 23 of 29 materials proposed for disposal are within 5 percent of world production. We believe that market conditions at times would support disposals of less than 5 percent and at other times, disposals may feasibly exceed a 5-percent guide.

Ferroalloys Are No Longer Needed

In computing 1992 stockpile requirements, DOD identified excess inventories of ferrochromium and ferromanganese and the stockpile ores used for their manufacture. DOD is required by 50 U.S.C. 98d¹ to procure a certain amount of these alloys annually under the ferroalloy upgrade program. The government's cost for these ferroalloys is higher than their market prices. Because of the excess, DOD proposed that the law be repealed. However, each of the two ferroalloys has only one U.S. producer, and there is some concern about the viability of these producers without the government program.

DOD Is Required to Make Annual Procurements Under the Ferroalloy Upgrade Program

The ferroalloy upgrade program requires the annual procurement of minimum quantities and the maintenance of total quantities of high carbon ferrochromium and ferromanganese for the stockpile. The alloys are produced from chromium and manganese ores provided from the stockpile.

From 1984 through 1991, about 384,000 short tons of ferrochromium were purchased for about \$324 million, and about 417,000 short tons of ferromanganese were purchased for about \$275 million. These costs were based on the ores' replacement and upgrading costs,² which exceeded comparable market prices of ferrochromium and ferromanganese by an average of 25 percent and 36 percent, respectively, during the 8-year period. Using the original costs paid for the ores many years ago, we estimate that the cost of the upgraded ferrochromium was \$256 million, or about 1 percent below market prices, and that the cost of ferromanganese was \$237 million, or about 17 percent above market prices.

DOD Proposes Termination of Ferroalloy Program

DOD has recommended in its fiscal year 1992 Annual Materials Plan that the law mandating the ferroalloy program be repealed because inventories exceed requirements. During its 1991 requirements determination study, DOD computed significant excesses of both the alloys and the ores required to produce them. DOD considered that the stockpiled materials, several

¹Section 1501 of the Fiscal Year 1989 Defense Authorization Act, Public Law 100-456.

²Government costs include the replacement value of the ores furnished by the government and the producers' costs to upgrade them. Upgrading costs include barter credits that can be accumulated and exchanged for excess materials. Using barter credits in 1991, for example, the ferrochromium contractor obtained 1,080 short tons of tin, and the ferromanganese contractor obtained 1,848 short tons of tin, 101,308 pounds of chestnut tannin, 65,485 pounds of quebracho tannin, and 200 flasks (76 pounds per flask) of mercury.

foreign country sources, and substitute production facilities³ were sufficient to satisfy envisioned national emergency needs. Also, the fairly widespread world production of these ferroalloys suggests that U.S. emergency requirements could be met without a domestic ferroalloy processing capability.

Although DOD has recommended that the law mandating the ferroalloys upgrade program be repealed, it has not determined (1) the cost of terminating the contracts with the two producers of the alloys, (2) the cost of continuing the contracts to completion, and (3) the costs associated with the immediate implementation of a program to help the producers transition to the commercial market. Associated factors include the cost of any continued ferroalloy production, the impact on the proceeds DOD would receive from the sale of ore to the contractors at reduced prices, the sales of excess ferroalloys created by continued production, and the sale of remaining ores when the assistance was terminated.

U.S. Producers Face Difficulties in Commercial Market Without Ferroalloy Upgrade Program

The ability of the two U.S. producers of ferroalloys to compete in the commercial market without the government's upgrade program is questionable. According to these producers and experts from the Bureau of Mines, the current markets for ferroalloys are weak, as supply exceeds demand. Domestic consumption of ferrochromium and ferromanganese decreased from about 420,000 and 563,000 short tons in 1990 to about 360,000 and 449,000 short tons in 1991, respectively. Senior officers in the two companies expressed differing views on competing in the commercial markets.

According to one officer, his company could not compete in the commercial market alone because it lacks an adequate market share and because the current market price offered by foreign producers is low. The average January market price for ferrochromium was \$745 per short ton from 1985 through 1987 and only \$600 per short ton in September 1991. In addition, the government program currently represents 80 percent of the company's production versus 50 percent when the company operated at full capacity.

The other officer believed his company could compete in the commercial market if the government would (1) decrease the program at a rate that would permit an increase in the company's market share and (2) sell

³According to experts, ferromanganese can be produced in a blast furnace and both alloys can be produced in any electric furnace. Closed furnaces could be reopened, and existing furnaces could be diverted to produce these materials in the United States.

stockpiled ore at terms and conditions that would allow for a reasonable profit. A government subsidy would be required during the transition period. The Ferroalloys Association favors procurements through 1993 with a subsequent transition program for the producers.

Conclusions

Because ferrochromium and ferromanganese stockpile inventories exceed DOD's requirements and the alloys could be obtained from several other sources in an emergency, we believe that the continued procurement of the alloys is not necessary from a national security perspective. In addition, we can currently obtain these materials from foreign sources at a lower cost; therefore, the program is not economical. However, the law does not provide for continuing the program beyond fiscal year 1993, and the two U.S. producers could be seriously affected by a sudden withdrawal of government support. Although a program to help the two producers gradually transition to the commercial market may resolve their problems, DOD does not know how much such a program would cost.

Recent Congressional Action

The Fiscal Year 1993 Defense Authorization Act authorizes the disposal of most of the chromite and manganese ores and associated ferroalloys that were reported as being excess in DOD's 1992 report. Two limitations were imposed that would help the two U.S. producers. First, disposal of chromite and manganese ores of metallurgical grade may be made only for processing purposes within the United States and its territories and possessions during fiscal year 1993. Second, disposal of chromium and manganese ferroalloys may not begin before October 1, 1993.

Actions on Our Prior Recommendations

We previously recommended that the analyses of stockpile requirements (1) be directed and performed by individuals and organizations with the requisite experience and expertise, (2) contain direct input from the industries involved in material mining and processing, (3) consider a reasonable range of assumptions and options, (4) fairly present study participants' inputs, (5) verify or supplement economic models with the best available direct measures of material requirements, and (6) use assumptions and planning factors that are consistent with those used by federal departments for similar purposes.¹ DOD, which was assigned overall responsibility for stockpile management in February 1988, may not have adequately sought and considered input from outside sources during its requirements determinations process or reflected the concerns of other federal agencies in its 1992 report. The final report, including DOD's proposed legislation, was coordinated through the Office of Management and Budget (OMB). Other agencies' views were not given to us, and some senior officials we talked to had not seen the final report.

Responses to Our Recommendations

We found that experts in several federal agencies and outside the government provided essential information and resources used to develop the stockpile requirements proposed in DOD's 1992 report. This information included supply and capacity data provided by the Department of the Interior's Bureau of Mines and the Department of Agriculture, demand side data from the Joint Chiefs of Staff, economic forecasts from the Council of Economic Advisers, foreign country reliability assessments from the Department of State, and modeling resources and services from outside contractors.

Experts outside of DOD generally did not lead or chair interagency advisory groups, working groups, or joint work efforts involved in the requirements development process. Most industry input on the supply and demand of critical materials was obtained indirectly. The Departments of Agriculture and Commerce and the Bureau of Mines collected information from industry sources, market contacts, and other means and provided it to DOD.

Because of apparent conflicts of interests, DOD believes that industry should not be directly involved in determining requirements for the materials it provides. The DOD-sponsored Institute for Defense Analysis obtained much of the information needed for special studies of advanced materials, such as indium and rhodium, through direct industry contacts.

¹National Security Council Study Inadequate to Set Stockpile Goals (GAO/NSIAD-87-146, May 4, 1987).

These materials were not included in the economic modeling process because their use is limited; thus, they were assessed separately.

DOD appeared to use a reasonable set of assumptions and options, including those stipulated in the legislation, such as the war scenario; military forces to be mobilized; requirements for the military, industrial, and civilian sectors; available foreign supplies; and domestic production to compute requirements. DOD also factored in warning and mobilization periods. DOD also proposed alternative stockpile requirements valued at \$1.3 billion using a scenario that assumed a 1-year mobilization period and a 3-month war.

DOD performed sensitivity analyses by changing factors on foreign supplier reliability, shipping losses, pricing, mobilization year shortfalls, plant capacity, and civilian austerity. These analyses resulted in goals ranging from \$2.9 billion to \$3.8 billion. No sensitivity analysis was presented for MCRS in the 1992 report.

Regarding fair presentation of study participants' input, the 1992 report may incorporate civil agency views in that it presents the administration's position to the Congress; however, it does not contain dissenting or critical views, as we had recommended.

With respect to verification of economic models, we were told that the Institute for Defense Analysis does "reality checks" of selected strategic and critical materials by obtaining as much input as possible for more difficult analyses. Institute officials stated that they consult with the military services, the Defense Logistics Agency, the Defense Science Board, the Defense Advanced Research Projects Agency, and experts in the private sector. Direct measures of demand and supply for stockpile materials are not readily available. Thus, the Institute relies on experts in federal civil agencies responsible for industrial and economic activities for demand and supply information.

DOD officials agreed that assumptions and planning factors consistent with related programs should be used to compute stockpile goals. They expressed reservations about using the stockpile study assumptions and methodology for mobilization planning other than for the stockpile. The Departments of Commerce and State use a peacetime scenario to project lead times for adding new plant facilities and for increasing production. Under a wartime scenario, DOD assumes that production will increase

dramatically when new plants come on line more quickly, thus creating greater demand for strategic and critical materials.

We noted that the Department of Transportation and other agencies worked with FEMA to develop factors associated with industrial base planning and a graduated mobilization response (GMR). According to Transportation officials, many of the planning assumptions that apply to warning times, civil GMR programs, civil industrial capabilities, and cost and construction factors appear to be based on different assumptions than those DOD used in its requirements report. According to DOD, the fact that FEMA may use some different planning assumptions for its GMR and mobilization planning is not relevant to those aspects of the stockpile program that are determined by military intelligence estimates or statutory mandates.

Participation of Federal Agencies and Other Experts

Civilian federal agencies have generally participated in stockpile management and the requirements determination process on an informal, ad hoc basis. The Strategic and Critical Materials Stock Piling Act authorizes the establishment of an advisory group of government agency experts to help determine stockpile requirements and manage acquisitions and disposals. Although such a group may be convened when needed, none has been formally established. Agencies such as Commerce, the Interior, and State provide important input to the stockpile process but not in a coordinated, formal fashion. DOD is taking steps to establish such a group or committee and has developed a charter that spells out specific responsibilities for the Departments of Commerce, the Interior, and State in advising DOD and providing data for the setting of stockpile requirements. DOD said that the charter includes advisory participation in acquisition and disposal actions, for example, in the area of market impacts, but not in areas under the purview of warranted DOD contracting officers. Final development and approval of the charter are pending.

Officials at the Departments of Commerce and State and FEMA expressed concern about the diminished role of the Market Impact Committee. This Committee, which is composed of representatives from the Departments of Commerce, State, and Treasury; the Bureau of Mines; and FEMA, is primarily concerned with ensuring that government purchases and sales of strategic and critical materials do not disrupt market prices. It also serves as a forum for assessing industry complaints and concerns. When DOD became responsible for the stockpile, the Committee ceased to function on a regular basis. Although it meets occasionally on an ad hoc basis, there

is no consensus arrangement or process for resolving differing views. Agency officials commented that the Committee has been virtually nonfunctional for the past 2 years and that DOD apparently has little interest in the Committee or its views. Under FEMA, the Committee had been an important adviser on the development and execution of the plan.

In September 1991, DOD asked 10 civilian agencies to comment on the 23 planning assumptions used to compute stockpile requirements. Although several agencies had no comments, the general reaction seemed to be that the assumptions were suitable, given the planning and reporting requirements stipulated in the existing legislation. Some changes were made as a result of comments received. For example, FEMA questioned the projected expansion capacity of seven industries to produce materials within a year. DOD agreed that such an expansion over a longer period of time would not be overly ambitious. On the basis of an updated computer analysis and the use of a longer lead time, DOD reduced the number of capacity expansions to five for its 1992 report.

In January 1992, OMB circulated DOD's draft report to 12 civilian agencies for comment. Citing confidentiality and a process that tries to encourage candor and straightforward dialogue among the agencies, OMB declined to provide us with specific agency comments or their disposition. According to officials at several agencies, program experts had not been asked to review and comment on the 1992 report. Instead, comments were handled by the agencies' general counsels. OMB indicated that only two agencies, the Departments of Commerce and the Interior, had provided substantive comments. Officials from Interior's Bureau of Mines said that the updating of goals and specifications was long overdue and that they could not accept the present calculations without a better understanding of DOD's parameters, procedures, methodologies, models, requirements, and assumptions.

According to OMB, the final report takes into account comments received from the agencies. However, the report does not set forth separate agency views, whether they are positive or critical.

Conclusions

DOD has made progress in implementing most of the recommendations in our May 1987 report. However, most industry input on the supply and demand of critical materials is obtained indirectly. Recent reports to the Congress on stockpile requirements have not included identifiable comments and inputs from other agencies. DOD is working to include more

input from industry sources and federal agencies in future requirements reports. Because of recent congressional and agency actions, we are not making additional recommendations in this area.

Agency Comments

DOD stated that it will continue to consult industry experts for both demand and supply side data for off-line material requirements, such as advanced materials and agricultural and medicinal materials. However, for materials that are modeled, industry experts will be consulted, as appropriate, for supply side data that will also be confirmed by government experts. DOD said that because industry representatives have a business interest in the outcome of the requirements determination process, it prefers to use industry representatives as secondary sources only, and to rely on government experts and computer analysis for demand side data.

DOD also said it would discuss major methodological or substantive issues that arise during development of the report and explain why it decides on one position as opposed to another. DOD and OMB consider it inappropriate to include dissenting views expressed during the clearance process in a document that represents an administration's position on a public policy issue affecting legislation. We believe that a reflection of the views of other agencies in the final report would show that those views had been adequately considered.

Recent Congressional Action

The Fiscal Year 1993 Defense Authorization Act formalizes the establishment of two committees to assist in stockpile management. An advisory committee, consisting of federal agency and outside experts, is to be established by March 15, 1993, to make recommendations to the President regarding the operation and modernization of the stockpile. A market impact committee, consisting of federal agency representatives and others, is to be established to advise and make recommendations to the stockpile manager concerning the projected domestic and foreign economic effects of all stockpile material acquisitions and disposals. In making recommendations, the committee is to consult with representatives of producers, processors, and consumers of the types of materials stored in the stockpile.

DOD's Proposed Stockpile Goals in January 31, 1991, Prices

Dollars in millions

Material	Proposed goals	
	Units	Value
Bauxite (refractory)	69,000 ST	\$16.07
Beryllium metal	400 ST	180.00
Chromite (chemical and metallurgical grade ore)	34,000 SDT	3.93
Chromite (refractory grade ore)	159,000 SDT	15.87
Chromium (ferro)	621,204 ST	510.01
Chromium (metal)	26,835 ST	193.21
Cobalt	40,446,597 LBCO	339.75
Columbium group	11,126,841 LBCB	51.74
Germanium	68,198 KG	27.28
Graphite (natural, Ceylon, amorphous lump)	13,477 ST	26.28
Indium	248,846 TROZ	1.87
Diamond stones (industrial)	3,000,000 KT	103.05
Jewel bearings	84,000,000 PC	117.60
Manganese (ferro)	209,074 ST	129.74
Mica (muscovite film, 1st and 2nd quantities)	20,000 LB	.24
Mica (muscovite block, stained and better)	301,000 LB	1.69
Mica (phlogopite block)	316,518 LB	1.58
Platinum group (iridium)	14,454 TROZ	4.63
Platinum group (platinum)	240,351 TROZ	99.75
Quartz crystals	1,589,405 LB	9.54
Rubber (natural)	417,779 LT	444.24
Tantalum group	8,727,098 LBTA	351.66
Titanium sponge	53,315 ST	586.47
Tungsten group	30,976,038 LBW	81.47
Total		\$3,297.67

Legend:

ST = short ton
 SDT = short dry ton
 LBCO = pounds of contained cobalt
 LBCB = pounds of contained columbium
 KG = kilogram
 TROZ = troy ounce
 KT = carat
 PC = piece
 LB = pound
 LT = long ton
 LBTA = pounds of contained tantalum
 LBW = pounds of contained tungsten

Fiscal Year 1993 Proposed Disposals of Stockpile Materials

Dollars in millions		
	Plan A	Plan B
Aluminum metal	\$ 8.5	\$ 21.0
Aluminum oxide (abrasive)	1.2	1.2
Aluminum oxide (fused crude)	3.1	3.1
Asbestos (all types)	0	0
Bauxite (metallurgical, Jamaican)	10.0	10.0
Bauxite (metallurgical, Surinam)	7.2	7.2
Bauxite (refractory)	0	8.5
Bismuth	0.4	0.4
Cadmium	1.3	1.3
Chromite (chemical grade)	0.1	0.1
Chromite (metallurgical grade)	1.8	1.8
Chromium (ferro)	39.3	78.6
Cobalt	45.0	75.2
Copper	0	54.0
Diamond (industrial bort)	8.4	8.4
Diamond Stones	20.0	20.0
Fluorspar (acid grade)	3.4	3.4
Fluorspar (metallurgical grade)	1.8	1.8
Graphite (natural, Malagasy)	0.8	0.8
Graphite (natural, other)	0.4	0.4
Iodine	0.8	0.8
Lead	10.0	20.0
Manganese ore (metallurgical grade)	8.9	8.9
Manganese (battery grade, natural)	0.9	0.9
Manganese (ferro)	43.6	43.6
Mercury	0.9	0.9
Mica (muscovite block)	0.2	0.2
Mica (muscovite film)	0.5	0.5
Mica (muscovite splittings)	0.2	0.2
Mica (phlogopite splittings)	0.5	0.5
Nickel	30.3	60.6
Platinum group (iridium)	0	1.2
Platinum group (palladium)	0	15.2
Platinum group (platinum)	0	13.6
Quartz crystals (natural)	0.7	0.7
Rutile	4.0	4.0
Silicon carbide	3.0	3.0

(continued)

**Appendix II
Fiscal Year 1993 Proposed Disposals of
Stockpile Materials**

Dollars in millions

	Plan A	Plan B
Silver (coins)	\$41.6	\$48.4
Tin	43.1	43.1
Vegetable tannin (chestnut)	1.0	1.0
Vegetable tannin (quebracho)	1.0	1.0
Vegetable tannin (wattle)	1.0	1.0
Zinc	40.5	60.7
Total	\$392.2	\$634.0

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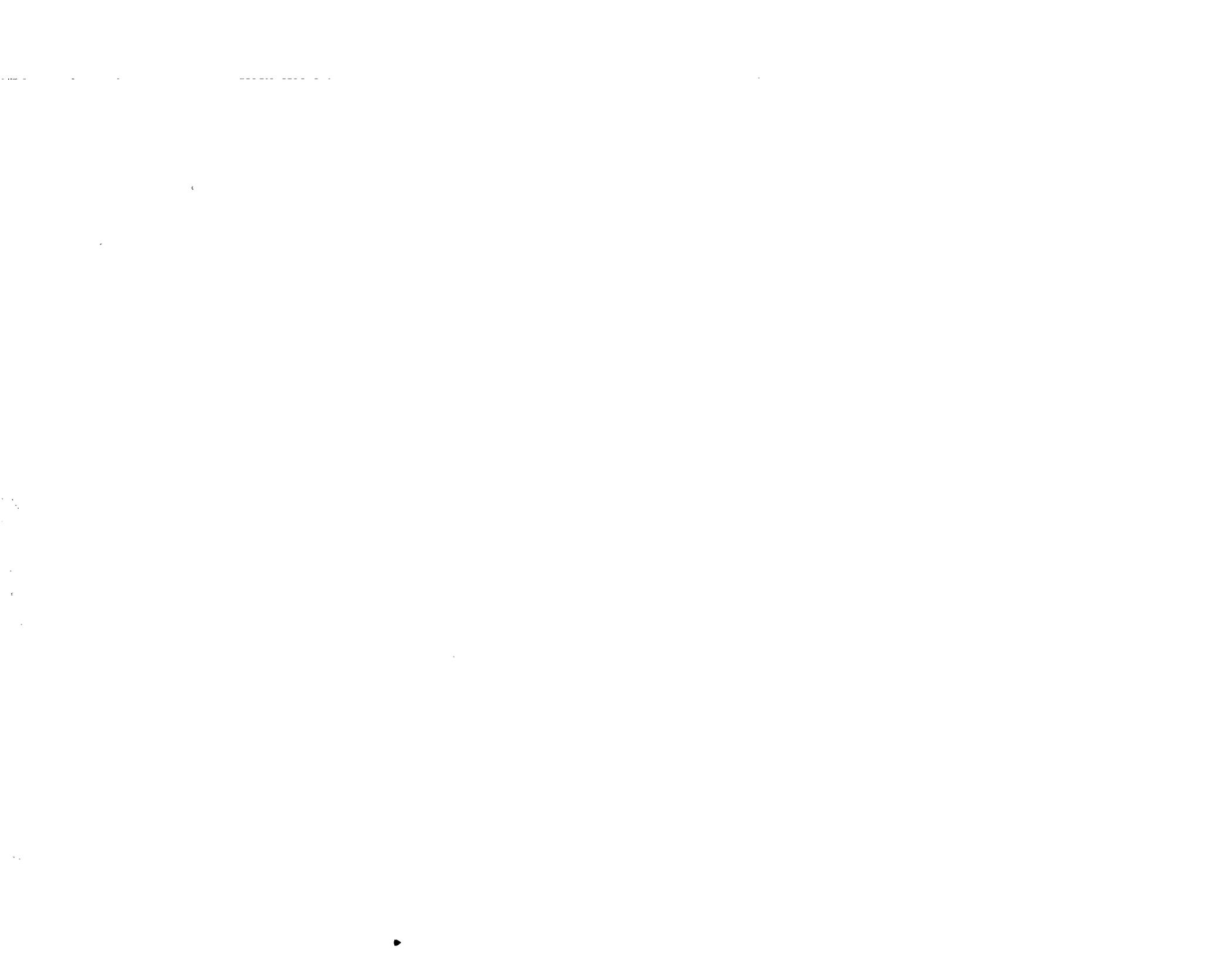
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