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NATIONAL SECURITY IMPLICATIONS OF ACCESS TO STRATEGIC MINERALS IN A TURBULENT WORLD

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"National security" is a catholic term and, consequently, is resistant to simple definition; however, the working definition of Trager and Simonie is an appropriate starting point: "National security is that part of government policy having as its objective the creation of national and international political conditions favourable to the protection or extension of vital national values against existing and potential adversaries."[1] A major element in this definition is protection. This is perhaps the key role of the central government and arguably its only unique function. National security is, however, dependent not only upon a country's military might but also upon the strength of its economy. Should hostilities occur, the nation with a well-developed defense industrial base has the ability to mobilize its full economic potential within a reasonable time and is likely to prevail. Furthermore, because distinctions between war and peace are now blurred, and conditions such as armed conflict, international crisis, or intense competition blend into each other, "national security" has acquired political, ideological, and economic connotations, as well as military overtones.

Economic prosperity and national security exist in a symbiotic relationship. The strength of the economy largely influences the level of research and development, which in turn affects the sophistication of military requirements. Only a strong economy can sustain a high level of defense spending and permit the flexibility that enables rapid conversion from peacetime production to wartime mobilization. A well-structured defense base, especially vital in the U.S., provides security for allies and trading partners, as well as protection for lines of global communication. If the economy of the U.S. were to falter, international commitments might be jeopardized and parts of the essential trading network might be lost. The result could be that the economy would be denied certain strategic resources and would decline further, causing defense production capabilities to be seriously reduced. Thus, national security would face a vicious descending spiral that would undermine not only the readiness of the armed services but also the viability of the domestic economy.

The defense industry must have the authority to decide which minerals are strategically vital. This is recognized in the Strategic and Critical Materials Stock Pile Revision Act of 1979, which provides a two-part definition of

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1. Trager & Simonie, *An Introduction to the Study of National Security*, in NATIONAL SECURITY AND AMERICAN SOCIETY 612 (Trager & Kronenberg, eds., 1973).

strategic minerals. The first part defines strategic minerals to be those materials that would be needed to supply the United States' military, industrial, and civilian requirements during a national emergency. The second part requires that the mineral is not produced in the United States in sufficient quantities to meet such needs. A national emergency is defined as a general declaration of emergency involving the national defense. The declaration is made by the President or Congress. Focusing on the first element of the definition, the Office of Minerals Policy and Research Analysis (Department of the Interior) for its Critical Minerals Index (1979) considered the importance of the mineral to the functioning of the United States economy. The definition of the Office of Technology Assessment Report (1985) considers the requirements for essential civilian and military uses.[2] In these definitions, the element concerned with the ultimate use is considered the "criticality" of the material. A major problem, however, is that the defense industry can be variously delimited. For example, the production of major weapons platforms is so dependent upon a range of ancillary industries that the boundary of what can be legitimately called "defense" is blurred. In addition, the requirements of the machine tool industry, obviously vital in the production of military hardware, should probably be considered critical. Similarly, from a downstream perspective, computers and software for command and control systems have become increasingly essential to defense preparedness. Thus the minerals needed by a wide range of similar high technology industries should be designated critical. However, the true point of conjecture from both perspectives becomes how far back through the production network these materials and their components can be categorized as critical to national defense.

These problems are compounded by the fact that virtually no detailed tracing of source routes to the ultimate minerals has been attempted for even major units within defense-related industries. Various attempts are under way at present to remedy this situation, but the establishment and continued monitoring of a complete defense industrial data base for the U.S. presents many difficulties, not the least of which is the changing pattern of supply and demand. Furthermore, the viability of certain key industries, often at a lower tier, must be maintained. How this can be achieved with often small, erratic, but critical defense requirements must be resolved. With a lack of specific defense-related data, the only alternative method to obtain a perception of criticality is by examining the industrial base. The broad mineral requirements of such key industries as electronics, energy, machinery, steel, and transportation are known. They include, for example, nickel, columbium, tantalum, titanium, cobalt, chromium, tungsten, and platinum. However, as the defense industry becomes increasingly dominated by high technology, other minerals such as indium, gallium, beryllium, and germanium will become increasingly critical. A study of the European North Atlantic Treaty Organization aerospace industry concluded that, for various reasons, the following

2. Office of Technology Assessment, Strategic Materials: Technologies to Reduce U.S. Import Vulnerability 409 (1985).

minerals were critical and most at risk: chromium, cobalt, hafnium, manganese, columbium, titanium, tungsten, and vanadium.[3]

This information can be supplemented by evidence from the few studies made of individual systems. The best known of these is the study that monitors the changing requirements of the Pratt and Whitney F-100 Turbofan engine used in the F-15 and F-16 aircraft. Similarly, the needs of the M-1 tank engine have been indentified and assessments have been made for the MX system. Presently, the overall needs of the Strategic Defense Initiative are under scrutiny. However imperfect the overall knowledge of the industrial defense base mineral requirements may currently be, at least the relationship between minerals and national security is clear.

Before a critical mineral is considered strategic, the second part of the various two-part definitions must be met. In each case, with varying emphasis, this means that the critical material in question is not produced in the United States in sufficient quantities to meet such needs, and the resulting import dependence may lead to a risk of supply interruption. Thus, for a mineral to be designated strategic the following criteria, listed in their order of application, must be present: (a) the mineral is critical for defense and defense-related industries; (b) there is a marked degree of import dependence; and (c) there are few significant sources of supply. Many critical minerals are obtained from domestic sources, but reliance on foreign supplies clearly brings vulnerability. If there are few suppliers, then, in the short-term, there must be the potential for resource geopolitics. If the number of world producers is restricted, vulnerability must be at least medium-term; if world reserves are scarce, there would likely be long-term difficulties.

Using U.S. trade figures compiled by the Bureau of Mines, it is possible to identify those critical minerals for which there is a high percentage of import reliance.[4] Prominent among them are manganese (99%), bauxite and alumina (96%), cobalt (95%), tantalum (94%), platinum-group metals (91%), chromium (82%), nickel (74%), and tungsten (71%). There is also a group of minerals for which statistics are withheld or unavailable, and it is reasonable to assume that some, such as gallium, indium, rubidium, rhenium, tellurium, and zirconium, could be considered strategic. Additionally, the U.S. is 91 percent import-reliant for fluorspar, crucial in the production of aluminum and steel. Thus, because domestic supplies cannot satisfy defense industry demands, as many as thirty-five minerals can be considered strategic.

Recognizing that a mineral is strategic does not in any way mitigate the difficulty in defining an acceptable level of dependence that does not constitute unacceptable vulnerability. World trade obviously depends upon parity of advantage, and the U.S. is the major advocate of free trade. Therefore, to assess vulnerability, the key suppliers must be identified and examined in

3. Anderson, *Factors Affecting the Supply of Strategic Raw Materials With Particular Reference to the Aerospace Manufacturing Industry*, in NATO, MATERIALS SUBSTITUTION AND RECYCLING 2.1-2.20 (1984).

4. U.S. BUREAU OF MINES, DEP'T OF INTERIOR, MINERAL COMMODITY SUMMARIES 185 (1985).

light of the current world geopolitical scene. The major actors can be characterized as superpowers, mesopowers and micropowers, all of which are of some significance when mineral reserves are considered. The U.S. has frequently obtained strategic minerals from the other superpower, the USSR, and currently is dependent on the Soviets for supplies of platinum-group metals. Among the important mesopowers are Brazil and South Africa, while several micropowers, such as Guinea, Gabon, and Bolivia, are of significance. Interaction among these actors within varying global, regional, and local scenarios produces the responses that feed back and affect the system. For example, changing access to strategic minerals may alter not only the environment but also the power relationships.

A basic idea of U.S. geopolitical vulnerability can be obtained by examining the chief mineral sources with regard to: (a) potential political stability, (b) distance and possible logistical problems, (c) political orientation toward the U.S., (d) state of development of the mining industry, the infrastructure, and the mining history. Thus, for example, Canada, geographically contiguous and with land-based communications, must be considered the most secure source, followed by Mexico. At a level less reliable must be the politically stable countries situated at varying distances from the U.S. but reliant upon sea-lines of communication. These countries include the countries of the Common Market, Australia, and Japan. At a lower level are the countries of South America and the Caribbean, which, though enjoying differing levels of political stability, have the advantage of close proximity. Below this level are the less reliable sources: the potentially unstable less developed countries, countries with centrally planned economies, such as the USSR, and South Africa. South Africa is an interesting case. Although it has never seriously threatened to interrupt supplies to the U.S., the present political scene gives little opportunity for optimism.

After considering the various strategic minerals and their respective sources, the percentage of reliance upon each is then examined. If at least 50 percent of a strategic mineral originates from reasonably secure sources, then geopolitical risks are minimal. If, on the other hand, the figure is lower than 50 percent closer scrutiny is required. In such cases, a country providing as little as 20 percent of supplies can be considered a key source. Such an analysis indicates that there are five major suppliers to the U.S., each providing more than one critical mineral. These are Canada, Australia, South Africa, Mexico, and Western Europe. In the case of Western Europe, the reliance is chiefly upon refined minerals, for which there is a European dependence upon the primary sources. Except for Thailand, the other key suppliers providing one strategic mineral are Latin America: Jamaica, Brazil; Africa: Guinea, Gabon, Zaire (Zambia, Zimbabwe); Southeast Asia: Thailand, Malaysia, and the Peoples Republic of China. A detailed risk analysis of each of these demonstrates that, geopolitically, the major areas at risk are the countries of Africa, followed by those of Southeast Asia. The Peoples Republic of China, as a result of its political orientation, needs to be considered separately.

To carry out such a risk assessment, a model was developed and widely tested.[5] Geopolitical factors arise from the interplay at various levels of geography and politics. For convenience, the levels can be designated local, regional, and global. In certain cases, one level may be more important than another or may be totally irrelevant. Furthermore, the effect of a global political variable may well be felt on all three geographical levels, and conversely, a local geographical factor may influence political variables at all three levels. The key geographical elements are location and distance. Location implies the total physical and human geography with a concentration upon the key sources of strategic minerals. Distance varies according to the mode of transport and the route taken, but on all three levels there may be geographical influences. These may range from constraints at a particular port to problems of regional infrastructure or global choke points.

The relevant political input can be described as "policy," a resultant of several factors. Examples at the global level would be world trading and defense policies, while regionally, policies may result from the stance of a particular group of states, for example the Organization of Petroleum Exporting Countries (OPEC). Locally, policies will be either national or within national subdivisions and may concern such crucial aspects as labor, tax, development, and the environment. Thus the geopolitical environment becomes a product of the interplay between political decisions made by political bodies at global, regional, and local levels interacting with the factors of location and distance.

Having assessed the key sources, the other major elements in the global infrastructure are the routes that must be used to transport strategic minerals to the U.S. Under normal circumstances, in all cases except that of platinum-group metals, strategic minerals are transported by sea. Therefore, the crucial routes for the United States are those from the Caribbean and the eastern coast of South America, southern Africa, Southeast Asia, and Australia. The risks associated with these particular routes can be related not only to the overall distance, but also to the orientation of littoral states and particularly the dispositions of world choke points. Choke points occur where sea-lane restrictions lead to a concentration of shipping within a limited area. The most obvious constraints result from the configuration of the land, in which case freedom of navigation is often further curtailed by the restrictive depths of certain bodies of water. In such confined waters, islands, sandbanks, and wrecks, together with the normal activities of ferries and fishing boats, constitute hazards. The other major choke points are those constructed artificially by man, principally the Suez and Panama canals.

The number of natural choke points has been estimated at anything from 100 to 200; however, if the term is restricted to straits of under 24 nautical miles in width, the number varies between 109 and 119. Also, to save costs, ships tend to take the shortest routes. This leads to further concentration around headlands and promontories, such as the Cape of Good Hope, one

5. E. ANDERSON, STRATEGIC RAW MATERIALS AND GEOPOLITICAL RISK ASSESMENT: A MODEL 17 (1984).

of the more important choke points of the world. The major factor in assessing the importance of a particular route or choke point usually is the ship count, but the cost of alternative routes must also be considered. Vulnerability tends also to depend upon crucial geography, the characteristics of the submarine configuration, and the political posture of the riparian states. Taking these factors into account, the most important choke points in the world are Bab el Mandeb, Dover Strait, the Dardanelles, the Strait of Gibraltar, the Strait of Hormuz, and the Strait of Malacca. Important, but of less significance, are the Florida Strait, the Strait of Luzon, Lombok Strait, the Mona Passage, Oresund, and the Windward Passage. Each, of course, needs to be assessed individually with regard to particular risks, but it is clear that the U.S. is critically dependent for materials that transit the Southeast Asian, Caribbean, Red Sea, and Mediterranean choke points, together with Dover Strait. Furthermore, many strategic minerals are transported from South African ports and therefore need to round the Cape of Good Hope.

Thus, in summary, it is possible, by relating particular strategic minerals to their sources and sea-lines of communication to the U.S., to make an overall global assessment of vulnerability. Changes at any position within this structure, from the transport network or energy supply source of the supplier country to difficulties at the home ports, can lead to restrictions in supply. Furthermore, the capability of the U.S. Merchant Marine to transport the minerals under different environmental conditions must also be analyzed. For the world's greatest ocean-trading nation, the fleet is not only very small and out of date, but also restricted in certain crucial categories. As these various problems potentially influence reliability, they impinge upon the economy and thus the national security of the United States.