Chapter 1

Summary, Issues, and Options

Photo credit Ann Hawthorne

Argentina Range

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SUMMARY

Antarctica, home to penguins, seals, and whales and long of interest to explorers and scientists, is under increasing scrutiny as a potential source of valuable minerals. **Although little is currently known about Antarctica's mineral resources and no mineral deposits of commercial interest have been discovered yet, the potential that a discovery may be made is increasing.** Moreover, the 1959 Antarctic Treaty, the basic agreement governing the continent, did not establish guidelines for mineral resource activities. As a result, the United States and other Parties to the Antarctic Treaty launched negotiations in 1981 leading to the conclusion of the Convention on the Regulation of Antarctic Mineral Resource Activities in 1988.

The Convention on the Regulation of Antarctic Mineral Resource Activities would provide a framework to guide future decisions on whether Antarctic minerals should be developed, and if so, under what circumstances. While the Convention would establish rules governing minerals development, it does not presume that any exploration or development will ever take place.

Like virtually all treaties, the Minerals Convention is a compromise agreement. It took 7 years to negotiate and brokers the interests of claimants and nonclaimants, of developed and developing countries, and of countries with interests in mineral resources and countries mainly concerned with the environment. Alternatives to the Convention include declaring Antarctica off limits to any minerals activities. Given the history of Antarctic claims, the multilateral nature of the negotiation, and the conflicting interests at stake, **it is doubtful that a fundamentally different compromise could have been negotiated.**

For over three decades, the United States has advanced four main interests in Antarctica: maintaining the region as a zone of peace, preserving the freedom of scientific research, protecting the environment, and preserving an opportunity for U.S. industry to develop Antarctic resources if and when it becomes feasible to do *SO.*

If a major minerals discovery is made in the absence of an international agreement about Antarctic minerals, an unregulated "gold rush" could follow, unraveling the Antarctic Treaty System and damaging all U.S. Antarctic interests. The Minerals Convention would help maintain the continent's longstanding peace and stability. It would enable consideration of mineral resource activities. And, although some environmental groups would prefer banning all minerals development in Antarctica, the Convention is one of the strongest international environmental protection agreements negotiated to date. **OTA concludes that ratification of the Minerals Convention would advance U.S. interests.**

OTA does not expect that either an oil deposit or metal mine would be developed in Antarctica sooner than about three decades, if ever. Geologic, economic, environmental, and political constraints to minerals development there currently are substantial. A commercial oil or hard mineral deposit in Antarctica would have to be of world-class size and quality to be developed economically. Probably only a handful of such undiscovered resources are left in the world.

Any development that does occur will inevitably cause local environmental impacts. More

[1] Hereinafter referred to as the Minerals Convention,'' or, more simply, as the '' Convention.''

significant impacts might result from a major oil spill. Even the strong environmental standards established by the Minerals Convention—including the provision that no exploration or development is to be allowed until technology and procedures are available for safe operations—cannot guarantee prevention of all development-related accidents.

U.S. ratification of the Convention does not presume that the United States will sponsor prospecting, exploration, or development. However, if the Convention enters into force, the United States will have to decide which agency or agencies will represent it in Convention institutions. As well, domestic implementing legislation should address the need for a regulatory structure to manage any minerals activities the United States may sponsor.

Domestic legislation should also address the data and information needs that are likely to grow if U.S. minerals-related activities increase. Even if the United States does not itself sponsor such activities, environmental baseline data will be required to help the United States effectively monitor activities of other nations and to participate influentially in the Convention's institutions.

Because the United States may expand environmental data gathering, monitoring, and minerals reconnaissance and would need to regulate any Operators it sponsors, the Congress should consider institutional arrangements for future U.S. Antarctic activities. The present approach, which assigns primary authority to the National Science Foundation, may serve adequately. Or, Congress could consider granting responsibility for minerals activities to the Department of the Interior, the National Oceanic and Atmospheric Administration, or perhaps to a small Minerals Commission or a new U.S. Antarctic Agency.

Applied research needs related to potential minerals activities do not at this time appear to be more important than the basic research that has been the focus of the U.S. program under the Antarctic Treaty. However, modest funding for data acquisition would help advance long-term U.S. interests; cooperative projects among Parties to the Minerals Convention would help reduce the high costs of both applied and basic research.

Before exploration and development may be considered in Antarctica, a supplemental agreement on liability must be negotiated. The U.S. Senate must consider whether to give its advice and consent to ratification of the Minerals Convention before the Liability Protocol is negotiated or wait until it has been finalized.

INTRODUCTION

Antarctica has intrigued mankind for more than two centuries, certainly at least since Captain James Cook attempted to prove the existence of the southern continent as part of his second great voyage beginning in 1772. Speculation about the possibility of finding valuable resources in Antarctica began early. However, until recently the practicality of developing mineral resources in this coldest, stormiest, and most isolated land mass on Earth seemed too farfetched to deserve serious consideration. Mineral resource development in Antarctica is probably about three decades away under the most optimistic scenarios, and it may possibly never occur. Still, the countries most involved in Antarctica (the signatories to the 1959 Antarctic Treaty) determined in the mid-1970s that it eventually would be necessary to negotiate a regulatory framework for managing mineral resource activities there. In 1981, after they had concluded an agreement for regulating exploitation of marine living resources, they began to negotiate a minerals regime.

On June 2, 1988, after a 7 year effort, the United States and 32 other nations completed negotiation of a treaty to regulate possible future prospecting, exploration, and development of oil and other minerals in Antarctica. The treaty, known as the Convention on the Regulation of Antarctic Mineral Resource Activities, provides

a framework for determining what, if any, minerals exploration and development will be allowed to take place in Antarctica and for regulating any minerals activities that are permitted. **Before the Convention can take effect, however, it must be ratified by at least 16 members of the subset of participants to the Minerals Convention who have special interests and responsibilities in Antarctica.** The United States, long one of the most active and influential countries in Antarctica, is a prominent member of this group, known as the Antarctic Treaty Consultative Parties (ATCPs). Additional members include the other original signatories of the 1959 Antarctic Treaty and 10 more recent signatories that currently conduct research in Antarctica.[2] The United States also is one of nine countries that, individually, could determine the fate of the Minerals Convention: **If the United States, the Soviet Union, or any one of the seven countries with territorial claims in Antarctica do not become a party to the Convention, it will not enter into force. However, ratification by the United States could encourage others to do so.**

This assessment addresses the questions surrounding whether the United States should ratify the Minerals Convention, and, if it does, how the Federal effort could be organized to address the needs created by U.S. ratification. Central **to this study** is the description and analysis of the Minerals Convention in chapter 3. The Convention, and specifically implications of ratifying or not ratifying it, cannot be completely understood in isolation, so chapter 2 presents a brief history of the United States in Antarctica, a review of current U.S. interests, and a summary of why the United States and other countries decided to negotiate the Minerals Convention. Chapter 4 describes the mineral resource potential of Antarctica, and chapter 5 describes the environmental impacts of minerals activities. The status of technologies for exploiting Antarctica's mineral resources and a brief discussion of the economic feasibility of development are in appendixes A and B. The complete texts of the Antarctic Treaty and the Minerals Convention are included as appendixes C and D, respectively.

This first chapter summarizes OTA's findings and presents several options for organizing the Federal effort in Antarctica if the Minerals Convention is ratified. The United States has a strong interest in preserving the Antarctic Treaty System. The Minerals Convention supplements and strengthens this unique system of governance. Its entry into force would help ensure that Antarctica remains peaceful and demilitarized and that the current spirit of cooperation among ATCPs prevails. **The Minerals Convention is not intended to, and does not, promote Antarctic minerals development. Equally it does not ban minerals development altogether.** Rather, it sets out a framework of standards and principles (including stringent environmental standards) with which any *permitted* activities must comply and establishes institutional mechanisms to evaluate proposed activities. Although not completely satisfactory to either commercial or environmental interests, the Convention, OTA finds, strikes a workable balance between environmental protection and resource development.

It is unforeseeable whether Antarctic minerals will ever be developed: however, several nations will continue to conduct geological and geophysical research that may lead to a discovery. Political, environmental, geologic, economic, and technological hurdles to minerals development will continue to be significant. Technological hurdles may be the least difficult to overcome. By establishing a framework regime, the ATCPs have taken a large step toward ensuring that minerals questions do not become a source of conflict and, hence, that Antarctica is maintained as a zone of peace.

[2]The total number of ATCPs is now 22; an additional 17 states are signatories of the Antarctic Treaty. Thirty-three states attended the final meeting of the Minerals Convention. A complete list is given in ch. 2, p. 25.

THE CURRENT REGIME AND UNITED STATES POLICY FOR ANTARCTICA

Antarctica is the only continent with no commonly recognized national boundaries. Seven of the Antarctic Treaty Consultative Parties (ATCPs) have made claims to parts of Antarctica, of which three overlap.[3] Neither the United States nor any other nonclaimant country has recognized these claims. However, both the United States and the Soviet Union have reserved the right to make future claims in Antarctica based on their historic activities. **The lack of an agreed legal status for Antarctica is a key consideration in any effort to manage activities on the continent.** To date, governance has been achieved through negotiation and consensus, not exclusive sovereign control. This unique regime was established by the Antarctic Treaty and applies to the area south of 60 degrees south latitude (figure l-l).

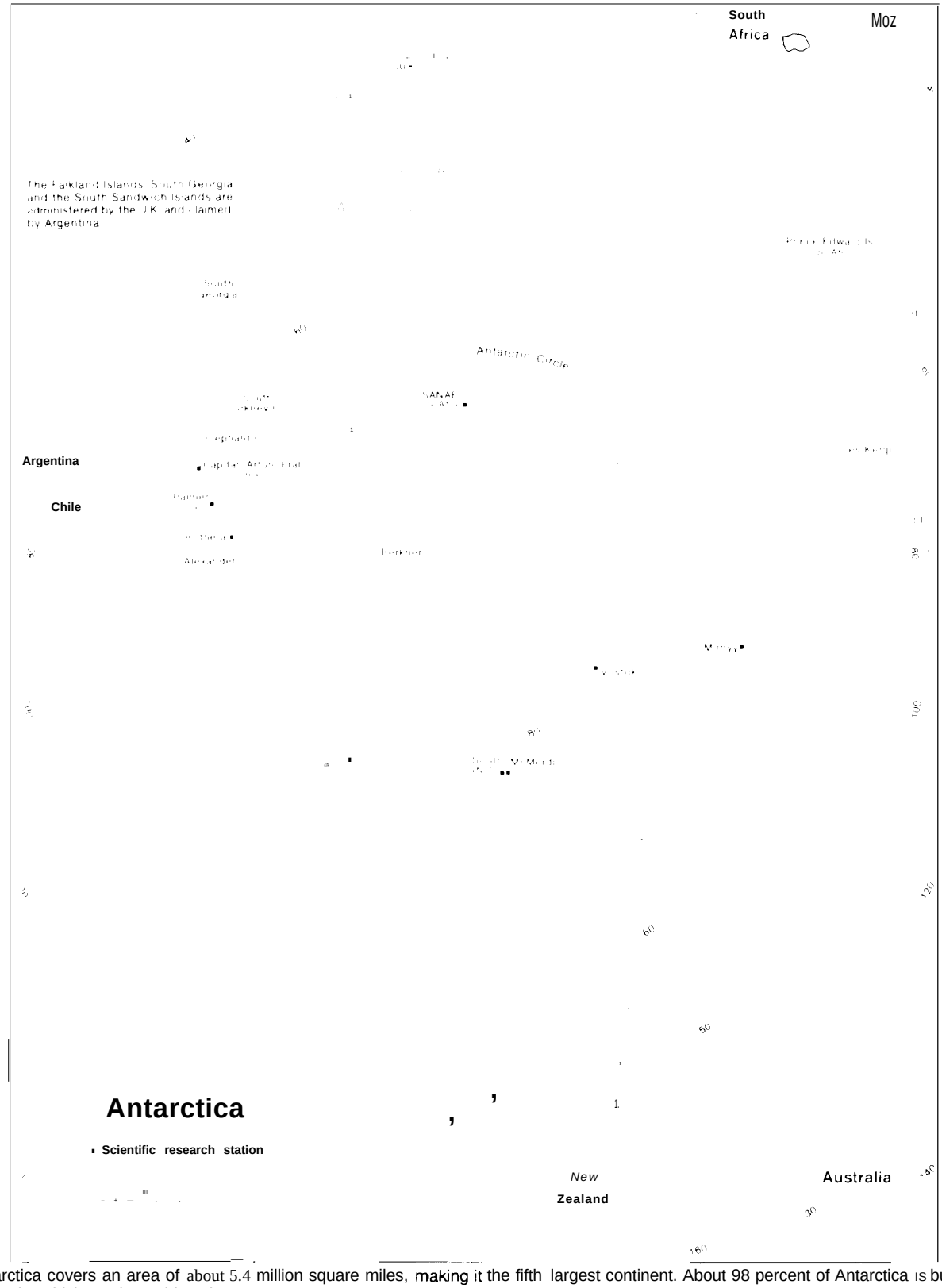
The Antarctic Treaty emerged in the wake of the 1957-58 International Geophysical Year, during which scientists from 12 nations established research stations throughout Antarctica and, in the process, developed cooperative relationships that both scientists and diplomats felt should be continued. In negotiating the 1959 Treaty, the 12 original parties pledged to use the continent for peaceful purposes, established an inspection system, and froze the dispute over claims. Claims would neither be accepted, denied, qualified, nor clarified; instead, the claims issue was sidestepped. They also agreed in the treaty that freedom of scientific research would continue, and that research plans, personnel, and results would be freely exchanged; that there would be neither nuclear explosions or weapons testing of any kind nor disposal of radioactive wastes in the Treaty area; and that ATCP-designated observers would have free access—including aerial observation—to any area and could inspect all stations, installations, and equipment.

The Antarctic Treaty, while limited in its objectives, is a highly successful multilateral agreement. The Treaty has fostered cooperative activity in Antarctica and has kept it demilitarized for the nearly 30 years since its inception in 1961. One of the Treaty's limitations (although it did not seem important at the conclusion of negotiations in 1959) is that it does not address the ownership or regulation of Antarctica's mineral resources. However, in the past ATCPs have been able to respond to issues when it has become important to do so, and, under the auspices of the Antarctic Treaty, have agreed on a number of additional measures regulating activity in Antarctica. For instance, environmental concerns were initially addressed in the 1964 Agreed Measures for the Conservation of Antarctic Fauna and Flora. These conservation measures prohibited the killing, capturing, or molesting of any mammal or bird native to Antarctica without a permit. They also established the basis for creating Specially Protected Areas.

Over the last 17 years, three additional conventions have been added to create what is now commonly known as the Antarctic Treaty System (ATS). In 1972 the Convention for the Conservation of Antarctic Seals, which sought to prevent the overexploitation of seals, was adopted. It entered into force in 1978. The Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR—see ch. 5) was adopted in 1980 and entered into force in 1982 as a means to foster conservation and prudent management of the living resources of the Southern Ocean, particularly Antarctic krill and finfish. The 1988 Minerals Convention is the most recently negotiated agreement. Unlike

[3]The seven claimant states are Argentina, Australia, Chile, France, New Zealand, Norway, and the United Kingdom. The claims of Argentina, Chic, and the United Kingdom overlap.

Figure I-l—Antarctica



Antarctica covers an area of about 5.4 million square miles, making it the fifth largest continent. About 98 percent of Antarctica is buried beneath a thick continental ice sheet.

SOURCE U S. Government, 1982

the Antarctic Treaty and CCAMLR, its decisionmaking procedures do not always rely on consensus.

The United States has four fundamental interests in Antarctica:

1. **maintaining the region as a zone of peace,**
2. **preserving freedom of scientific research,**
3. **preserving the Antarctic environment, and**
4. **providing an opportunity for U.S. private industry to exploit Antarctic resources if and when it becomes feasible and appropriate.**[4]

The United States has an interest in promoting political stability in the region, so the region does not become, in the words of the preamble to the Antarctic Treaty, ''the scene or object of international discord. There is, of course, some inherent tension among all these U.S. interests. Should minerals development commence, the tension between exploitation, environmental protection, and scientific research can be expected to increase. To further these interests during the past 30 years, the United States has striven to become an influential force in all elements of the Antarctic Treaty System.

Since 1965 U.S. Antarctic policy has been coordinated and managed by the Antarctic Policy Group (APG), an inter-agency task force established by a directive from President Johnson. It includes representatives of the Secretary of State (chairman), the Director of the National Science Foundation (NSF), the Secretary of Defense, and of other agencies as appropriate. On February 5, 1982, President Reagan issued a policy memorandum essentially reiterating long-standing U.S. policy that the U.S. Antarctic Program (administered by NSF's Division of Polar Programs) would be maintained "at a level providing an active and influential presence in Antarctica designed to support the range of U.S. Antarctic interests. ' Important means for realizing these interests have been promotion of international scientific cooperation and continued efforts to strengthen the Treaty System. This "presence '' includes the conduct of scientific research in major disciplines; year-round occupation of the South Pole and two coastal stations; and maintenance of a continent-wide logistics capability. The NSF has primary responsibility for budgeting, logistics, and support of scientific research. The National Oceanic and Atmospheric Administration (NOAA) was directed in 1984 (under the Antarctic Marine Living Resources Convention Act) to fund and conduct directed research projects related to the marine living resources of Antarctica.

THE CONVENTION ON THE REGULATION OF ANTARCTIC MINERAL RESOURCE ACTIVITIES

Why Was the Minerals Convention Negotiated?

Until relatively recently, there was little perceived need to establish rules for regulating the exploitation of nonliving resources in Antarctica. Antarctica is isolated and among the most difficult places in the world to operate. During the 1970s, however, a combination of scientific, technological, and political factors began to change perceptions of Antarctica's mineral resource potential and to increase Antarctic Treaty Consultative Parties sense of urgency about developing a minerals regime.

The ATCP's negotiated an agreement governing the possible future exploitation of Ant-

[4]U.S. Antarctic interests have been discussed in "The U.S. Antarctic Program," a report submitted by the Office of Management and Budget to the Committees on Appropriation of the U.S. Senate and House of Representatives, May 1983. See also, David A. Colson, Assistant Legal Adviser, Department of State, "The United States Position on Antarctica," *Cornell International Law Journal*, vol. 19, No. 2, Summer 1986, pp. 291-300, and *Antarctica, 1984*. Hearings before the Subcommittee on Science, Technology, and Space of the Senate Committee on Commerce, Science, and Transportation. 98th Cong., 2d sess. Statement of R. Tucker Scully, Director, Oceans and Polar Affairs, Department of State. pp. 7-9.

[5]White House Memorandum 6646, United States Antarctic Policy and Programs. Feb. 5, 1982.

Pbto credit. US Geological .%fV@y

McMurdo Station on Ross Island, the main U.S. research base in Antarctia Observation Hill is in the background.

arctic minerals for a number of interdependent reasons. The Antarctic Treaty itself is silent about regulation of mineral resource activities. This posed few problems in the first two decades of the Treaty's existence. However, scientific study of the continent has caused what was virtually terra incognita in 1959 to become geologically better known by the early 1980s. Occurrences of minerals have been found which, if discovered in large and rich deposits, could attract commercial interest. In addition, technology to exploit resources has improved. Although such technology has been developed for use in other regions, some of it could be adapted to recover offshore hydrocarbons or to mine Antarctic minerals.

As early as 1%9 several ATCP governments received inquiries from companies interested in geophysical oil prospecting offshore. Both the dramatic rise in oil prices in 1973 and scientific drilling in the Ross Sea stimulated further commercial interest. (The Ross Sea drilling did not necessarily indicate an oil or gas deposit.) No agreed procedures were in effect at the time to authorize prospecting, and the governments which were approached believed that if they allowed their nationals to prospect, they could upset the stability of the ATS. In 1977 the ATCPs adopted a recommendation urging voluntary restraint on ''exploration and exploitation' conditional on progress toward a minerals regime. Over the years both claimants and nonclaimants alike had developed a strong stake in the preservation of the ATS.

From 1972 on, Antarctic mineral resource discussions became a regular item on the agenda of ATCP meetings. At their eleventh meeting in Buenos Aires in 1981, the ATCPS formally decided to negotiate a minerals regime for Antarctica. As negotiations got underway in 1982, separate negotiations to establish the United Nations Convention on the Law of the Sea were winding down. Some in the United Nations questioned the legitimacy and effectiveness of the ATS and proposed that Antarctica be considered in a broader international forum as ocean issues had been. Because of their active involvement in Antarctic activities, ATCPs have long held that they possess special interests and responsibilities in Antarctica, and that they manage a legitimate international legal system for the continent. They have therefore resisted all attempts to transfer authority over Antarctica to the United Nations. Indeed, heightened U.N. interest in Antarctica provided the ATCPs additional motivation to conclude negotiations already underway.

How Does the Convention Work?

The Minerals Convention provides a framework for determining the acceptability of mineral resource activities and for regulating any activities determined to be acceptable. The 67 main articles and 12 annex articles of the Convention establish the general principles, specify the legal obligations of the Parties, and create the institutions and procedures necessary for decisionmaking. No **minerals activity is to take place except in accordance with the Convention and unless significant environmental impacts can be avoided.**[6]

[6]Arts. 3 and 4.

Of necessity, the Minerals Convention is a carefully crafted compromise agreement Negotiators had the difficult task of dealing with the reality of the differing juridical positions of claimant and nonclaimant countries. They also had to try to balance the interests of the developed and developing states among the group, of states with free market and centrally planned economies, and of states stressing environmental protection versus states stressing a regime that would facilitate minerals development activities. In addition, the value of Antarctica for other uses, such as science, tourism, wilderness, and the harvesting of marine living resources had to be given appropriate weight. Hence, the Minerals Convention is complicated, even though it provides only a framework and not a complete and detailed code for regulating mineral resource activities.

The Minerals Convention would establish five institutions: a Commission, Regulatory Committee(s), an Advisory Committee, a Special Meeting of Parties, and an Arbitral Tribunal, plus a Secretariat to serve all five. The Commission and any Regulatory Committees established are the only decisionmaking institutions.[7] The Commission includes ATCPs and any other Parties actively engaged in resource activities or related research. It has broad authority for determining whether and where mineral resource activities may take place and for establishing general rules and procedures applicable to all minerals activities. The details of regulating these activities will be worked out after entry into force of the Convention and when and if interest is expressed in such activities. The Commission is also charged with determining the composition of Regulatory Committees and may review some of their actions.

No **exploration or development would be allowed unless specifically authorized by the Commission.** One of the Commission's most consequential decisions will be to decide whether to allow consideration of exploration and development in specific areas. This threshold decision to ''identify"8 an area would trigger a process that could ultimately result in developing a deposit. **Such a decision would require a consensus of all (presently 22) Commission members and must be based on adequate data and information.** Reaching consensus among this many diverse parties on such an important decision may well be very difficult.

If the Commission decides to identify an area of Antarctica for exploration and development of a particular mineral resource, a Regulatory Committee for that area would be established. Regulatory Committees would be comprised of a total of four claimant states and six nonclaimant states, and would in all cases include the United States, the Soviet Union, and the relevant claimant(s) (if any) in the area identified. States conducting approved activities in the area would also become members. Regulatory Committees would be responsible for specifying detailed requirements for exploration and development of the area. These requirements would have to be consistent with any general guidelines established by the Commission, but the Regulatory Committees, and not the Commission, would be the primary managers of any development activities in their respective areas.

The Scientific, Technical, and Environmental Advisory Committee will give expert advice to the Commission and Regulatory Committees on all scientific, technical, and environmental aspects of minerals resource activities. One of the most important functions of the Advisory Committee is to evaluate environmental and technical assessments of proposals to 'identify" areas and of plans for exploration and development. Membership is open to all Parties to the Minerals Convention, but the Advisory Com-

[7] The Arbitral Tribunal can only render decisions for disputes referred to it.

[8] This is the term used in the Minerals Convention to refer to opening an area for possible exploration and development.

mittee has no independent decisionmaking power. Likewise, the Special Meeting of Parties, whose function is to advise the Commission on whether identification of an area for exploration and development is consistent with the provisions of the Minerals Convention, has no independent decisionmaking power.

Some groups are concerned about the relative power of the Commission and Regulatory Committees, as well as the lack of decisionmaking authority of the Advisory Committee. Groups opposed to development prefer that most power be vested in the Commission where more votes are required to take any action. They mistrust the smaller Regulatory Committees, which, they believe, would have a greater interest in accommodating development. Some countries (i.e., developing and nonconsultative parties) preferred vesting the Commission with more authority so that they could play more of a role in decisionmaking. Pro-development groups,[10] conversely are concerned that the Commission has too much power. Also, the claimant states preferred that Regulatory Committees be allocated substantial decisionmaking power. **The checks and balances built into the institutions, including their composition and voting procedures, as well as the authority of each, reflect the compromises that were necessary to achieve a mutually acceptable agreement in a complex, multilateral setting.** The United States and the Soviet Union will be represented on all Regulatory Committees as well as on the Commission.

Resource activities are divided into three distinct phases in the Minerals Convention: prospecting, exploration, and development. To engage in any of these activities, a potential developer (an 'Operator' in Convention terms) must be sponsored by one of the Parties to the Convention. Sponsors must evaluate and certify the fitness of Operators and oversee their activities to ensure their compliance with the Convention. Sponsors that fail to ensure that their Operators are able to meet Convention obligations could incur liability for damages. Sponsoring States must also support and defend the interests of their Operators in institution meetings. If the United States decides to sponsor minerals activities, it must prepare to regulate Operators that may apply.

Prospecting is subject to the same standards as exploration and development, but oversight of prospecting is primarily the responsibility of the Sponsoring State. Prospecting as defined in the Convention is not normally expected to have a significant or long-lasting impact on the environment. Exploration and development-if allowed in specific areas—would be regulated in accordance with detailed prescriptions and more extensive oversight by the institutions, in addition to that by the Sponsoring State.

Once an area is "identified' and the Regulatory Committee established for that area determines specific application requirements, an Operator would be required to obtain an exploration permit. Permission to explore must be based on information adequate to enable informed judgments to be made by the institutions. The permit is granted if two-thirds of the Committee members (which must include majorities of both claimants and nonclaimants on the Committee) approve the application. Successful applicants are granted exclusive rights to explore for a specific resource, subject to specific terms and conditions of a Management Scheme (i.e., contract). The Operator is also granted an exclusive right to develop any deposits found, but this right is subject to review after the development application (which requires a complete description of development plans) is submitted. Modifications to the development plan may or may not be requested by the Committee. There are conflicting interpreta-

[9]For example, the Antarctic and Southern Coalition, an environmental umbrella group

[10]For example, the American Mining Congress and the American Petroleum Institute.

tions as to whether development is automatically approved if the requisite majority in the Committee cannot agree about what modifications are necessary or if there must be positive agreement on modifications before development may proceed. The details of this process are described and evaluated in chapter 3.

Before it can enter into force, the Minerals Convention must be ratified by **16 of the 20** founding ATCPs.[11] Moreover, before any exploration and development can take place, a number of conditions must be met. Significantly, the details of a liability system must first be negotiated and ratified in a separate protocol (see page 33). In addition to the sufficiency of information requirements noted above, the environmental **standards** must be met and technology and procedures must be available for safe operations and for compliance with environmental regulations. There must also exist a capacity to monitor key environmental parameters and ecosystem components and to respond effectively to accidents.

RATIFICATION CONSIDERATIONS

The United States Constitution states that the President "shall have Power, by and with the Advice and Consent of the Senate, to make Treaties, provided two-thirds of the Senators present concur. . . '' Thus, the Senate must pass judgment on whether completed treaties should be ratified by, and become binding on, the United States.[12]

U.S. ratification of the Minerals Convention involves consideration of many questions, but they seem to boil down to 4 basic concerns:

1. Is the United States better off with or without this agreement?
2. Does the agreement advance U.S. interests?
3. Are there different types of agreements that would be better than the Minerals Convention?
4. Can the provisions of the existing agreement be made more satisfactory if we choose not to ratify it in its present form?

Is the United States Better Off With the Minerals Convention or Without It?

The consequences of not ratifying the Minerals Convention depend in part on whether an oil or mineral deposit that is, or could become, economically exploitable is found in Antarctica. If none is discovered, failure to ratify the Minerals Convention probably will not have significant economic or environmental implications. Political implications, however, **could** still be significant because the inability to reach agreement would portend a weakening of the ATS.

Despite their varying attitudes about the desirability of developing Antarctic minerals, ATCPs have concluded a framework regime to make later decisions as to whether any part of Antarctica shall be opened for exploration or development. Hence, although some environmental groups have sought to ban any minerals activities, ATCPs declined to take such action.

If the Convention does not enter into force and countries have not otherwise prohibited all resource development in Antarctica, the unclear legal status of Antarctic minerals may deter potential investors from risking large sums of money on exploration and development. Hence, a significant discovery may be less likely if the Convention is not in force. However, scientists could make a major discovery in the course of their research there. So could other parties engaged in prospecting thinly veiled as research. If a major deposit is discovered and the Conven-

11 See ch. 3 for details, table 3-1, p. 60.

12 Congressional Research Service, Library of Congress, ''Treaties and Other International Agreements: The Role of the United States Senate, '' a study prepared for the Committee on Foreign Relations, United States Senate (Washington, DC: U.S. Government Printing Office, 1984).

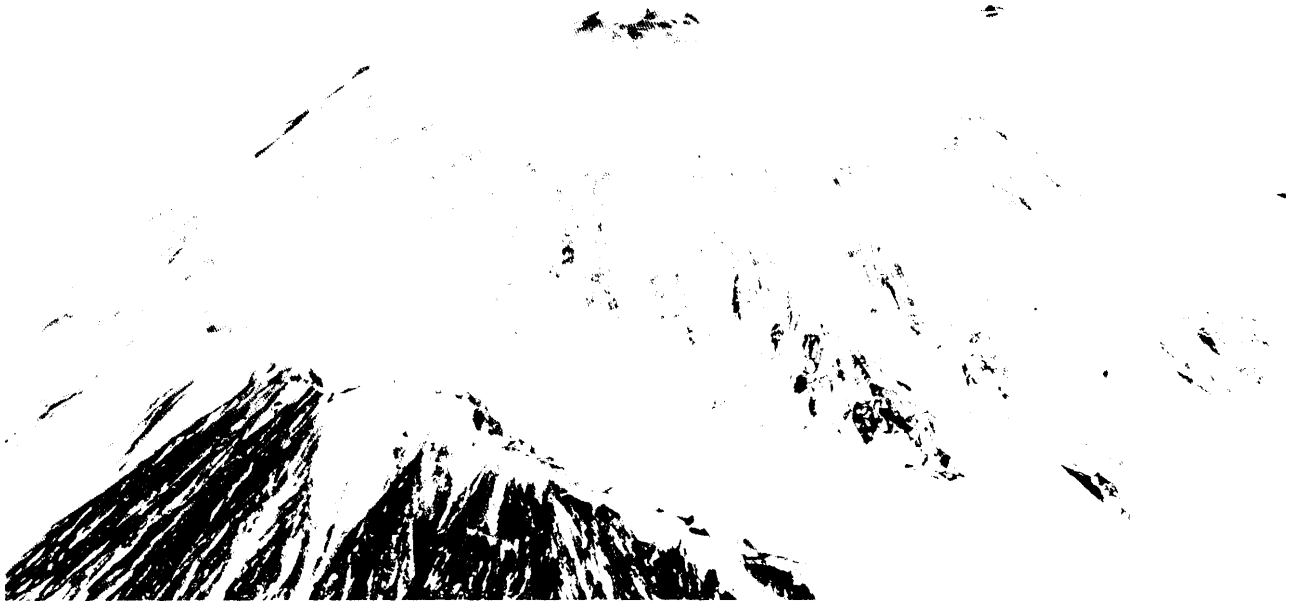


Photo credit US. Geological Survey

Mt. Erebus, the 12,447-foot volcano forming the apex of Ross Island. McMurdo Station is a tiny speck at the tip of the snow and ice-covered peninsula to the right of the volcano's summit.

tion has not entered into force, ATCPS may feel they are no longer bound by the "voluntary restraint' policy in effect since 1977.

Most of the parties involved in the Convention negotiations believe that a major discovery made in the absence of the Convention could initiate an unregulated "gold rush," which could lead to the unraveling of the entire Antarctic Treaty System. The Parties decided they needed an agreement *prior* to a major minerals discovery, because it would be harder to reach an agreement afterwards. An agreement concluded after a major discovery is made might have fewer environmental safeguards or be less balanced between nonclaimant and claimant interests.

In the absence of an agreed multilateral legal framework, exploitation might be subject only to the laws of the country sponsoring it or to conditions agreed bilaterally between a Sponsoring State and a claimant state. In either case the rules would not necessarily be designed to protect the Antarctic environment. Moreover, whatever regulations were deemed to apply may not be in the interests of the other countries that contend they also have a stake in Antarctica's resources. Friction could result if any state decided to act unilaterally or with one other, ignoring others' interests in the region. The potential for friction is especially great *in the* Antarctic Peninsula, the continent most hospitable area. The Peninsula is claimed by three states: Chile, Argentina, and the United King-

dom. The 1982 Falkland Islands war is a reminder that military conflict can occur in the region.

If the Convention is not ratified and an important mineral deposit is found, claimant states could conclude they have much to lose by compromise with others. Dormant claims could be reasserted by a claimant willing to risk good relations among fellow ATCP members for the sake of exclusive benefits from resources in ‘ ‘its’ area. Likewise, nonclaimants that attempt resource exploitation in a claimed area would risk the hostility of other ATCP members and of the relevant claimant(s). Even unregulated exploitation of the single unclaimed “slice” of Antarctica could potentially undermine or destroy the ATS.

The United States is a prime architect and supporter of the ATS. Consistent with this interest, it took a lead role in negotiating the Convention to strengthen the System by filling a large gap. Even though the Minerals Convention does not address all details of how minerals development shall be regulated, it is a key evolutionary step, without which the ATS would be incomplete.

Since there is potential for breakup of the ATS if a major discovery were made in the absence of the Convention, the Parties are better off with regulations than without them. An important consideration in whether the required number of ATCPs will ratify the Convention is how fairly they perceive they have been treated on the claims issue. Protection of the juridical positions of both claimant and nonclaimant countries is an essential element in this and other agreements of the ATS. The Minerals Convention does not resolve the claims issue, but skirts it like other ATS agreements. Conceivably, some nonclaimant states could reject the Convention because they believe it goes too far in recognizing special interests of claimants. Conversely, some claimant countries may consider rejecting it because ratification would mean recognition that claimants do not have exclusive mineral rights in areas they claim. To reach an agreement, ATCPs have had to compromise on issues related to claims; negotiators for both claimant and nonclaimant states appear to have recognized that doing so is in their mutual interest.

If the Convention is ratified, ATCPs may then be able to devote more attention to other pressing Antarctic issues, including the present problematic rise of tourism in the region, and-in light of the recent vessel accidents in Antarctic waters—improved vessel safety and pollution control and a general liability regime to cover pollution incidents. Even if no exploration and development occur, the Convention at least provides a clearer regime for prospecting.

Does the Agreement Advance U.S. Interests?

As mentioned, the United States has a strong interest in strengthening the ATS as a means of keeping the region peaceful. The Convention advances this interest by keeping the territorial dispute frozen and by addressing the long-standing gap in the ATS on mineral resources. The United States was key in negotiating the Antarctic Treaty in order to prevent Antarctica from becoming ‘‘the scene or object of international discord. ’ The Treaty prohibits any measures of a military nature, including establishment of military bases, carrying out of military maneuvers, or testing of any weapons. [13] The Treaty also ensures that the United States benefits from its sizable past investment in Antarctica and current expensive year-round presence there. It enables freedom of access to the entire region. The United States has been a strong leader in the development of the Antarctic Treaty System. The United States can ensure that its leadership role continues through ratification of the Convention and continued participation in elaborating it.

By carefully prescribing conditions under which activities could take place, the Miner-

[13] Antarctic Treaty, Art. I.

als Convention advances the U.S. interest in preserving the Antarctic environment. In terms of environmental protection, the Convention may be one of the strongest international agreements negotiated to date.[14] If minerals exploration and/or development goes forward, there could nevertheless be serious environmental consequences. The Convention does not detail all elements of the environmental protection program. Moreover, how compliance and enforcement would work and how strong the regime would be in practice is uncertain at this stage. Nevertheless, prospecting, exploration, and development will have to meet stringent and binding environmental standards and be subject to rigorous impact assessment procedures. **While the Convention makes development possible under certain circumstances, it does not presume that any development will take place.**

The United States also has an interest in providing an opportunity for U.S. private industry to develop Antarctic resources if and when such development is feasible and appropriate. The regime established by the Convention is not intended to promote Antarctic minerals development. In fact, it contains some stringent controls on development. The hurdles that a potential developer would have to clear before proposed minerals development could proceed are demanding. **On balance, the Convention appears to be weighted more toward restricting development than assisting it.** Potential developers are concerned about environmental protection requirements and also about having to satisfy the concerns of many different countries before being allowed to proceed with a project. Like environmentalists, they worry that elements of the regime are ambiguous.[15] Some have argued that the Minerals Convention discriminates against private entrepreneurs and favors state-controlled enterprises that receive government funds, but this conclusion is difficult to prove.

Despite these concerns, U.S. private companies who have studied it generally support ratification of the Convention, if somewhat unenthusiastically. The current Convention is preferable to no agreement, they argue. U.S. companies already are used to complying with stringent regulations in the United States and abroad, so they should be able to do so in Antarctica if the potential economic gain is adequate. U.S. companies would not be interested in Antarctica's minerals resources in the absence of an established legal regime.

Achieving an appropriate and workable balance between environmental protection and resource development is difficult in any context. In the Antarctic, both must be weighed against the primary U.S. interest of strengthening the ATS and its underlying principles. **In the long run, issues of concern to both commercial and environmental interests may be secondary, so long as these underlying principles, which assure the political stability of the region, are maintained.**

Are There Different Types of Agreements That Would Be Better Than the Minerals Convention?

The most discussed alternative is banning all mineral resource activities in Antarctica, possibly by designating the entire continent as a world park or ATCP-administered wilderness reserve. Several ATCPs have indicated opposition to mining in Antarctica and stated that they would prefer a "full protection option" if the Minerals Convention is not ratified.[16] The Antarctic and Southern Ocean Coalition, which

[14] Letter from Lee Kimball, International Institute for Environment and Development—North America, to Jacques-Yves Cousteau, the Cousteau Society, Sept. 19, 1988.

[15] See, for example, the discussion about the appropriate interpretation of Art. 54, in ch. 3, p. 80.

[16] As of August 1989 two claimant countries, France and Australia, had not signed the Convention. Each has stated that it has concerns about the environmental impacts of mineral resource activities. Signature indicates an intent to ratify but is not required for ratification or accession. Six 'Australia Advocates 'Wilderness' Status for Antarctica," *Christian Science Monitor,* May 24, 1989, p. 4.

represents a number of environmental organizations, has recently urged adoption of an Antarctic Conservation Convention instead of the Minerals Convention.[17] A ban on development would eliminate controversy over minerals activities and would advance U.S. environmental interests. But unanimous support among the ATCPs for an outright ban would be difficult to achieve. Certain states, including the United States, also wish to assure access to the continent's resources, with the proviso that no significant harm should be inflicted on its environment. This option has no chance of success unless all states with policies of maintaining national access to Antarctic minerals can be persuaded to change them.

Even if some resource development is allowed, the vast majority of Antarctica, including most of the 2 percent that is ice-free, is likely to remain essentially undeveloped. In addition, the Minerals Convention effectively bans mineral resource activities absent a consensus decision to allow them in a specific area. Even then, a separate consensus decision is required to open each area considered.

Other theoretical alternatives include:

1. scrapping the present Antarctic Treaty System in favor of a regime managed by the United Nations,
2. recognizing the claims and treating Antarctica as no different from any other area under sovereign control,
3. convincing claimants to exchange their exclusive claims for a condominium in which all ATCPs would jointly own Antarctica's resources, or
4. doing nothing, hoping that the status quo would not be challenged by a major resource discovery.

For different reasons, it does not appear that an international consensus could be reached for any of these potential alternatives. Regarding the first alternative, ATCPs have strongly opposed involving the United Nations in the past and believe only those countries with demonstrated special interests in Antarctica should be fully entitled to participate in establishing and operating a regime for the continent. They also realize their own influence would be diluted in the broader U.N. forum.

On possible recognition of claims, alternative 2, neither the United States, which reserves the right to make a claim of its own, nor other nonclaimants have been willing to seriously consider changing long-held claims policies. In the case of the overlapping claims of Chile, Argentina, and the United Kingdom, which claim should be accepted? And if the United States or Soviet Union should ever decide to make claims, the situation would become even more difficult. Likewise, alternative 3, canceling claims in favor of a condominium, has always been rejected by the claimants. It also becomes more problematic as the number of ATCPs continues to increase. **In general, given the history of the claims, the multilateral nature of the negotiation, the conflicting interests at stake, and the unique juridical status of Antarctica, it is unlikely that a fundamentally different regime could have been negotiated.**

Can Provisions of the Existing Agreement Be Made More Satisfactory If We Choose Not To Ratify It in Its Present Form?

The provisions of the Minerals Convention were negotiated as a package, and compromise was the price of an agreement. The Convention cannot be amended until 10 years after it enters into force. The Convention must either be ratified or accepted as is or rejected. **The United States, with its veto, as well as each of the seven claimant states and the Soviet Union, can unilaterally prevent the Convention from entering into force.** A veto would carry no

[17] Antarctic and Southern Ocean Coalition, "Permanent Protection for Antarctica: A Conservation Convention is Urgently Needed," ASOC Information Paper No. 2, May 11, 1989.

assurance that the parties would try to negotiate a different accord. **If the Convention does enter into force, the United States or any other Commission member could prevent exploration and development later by exercising its veto at the area identification stage.**

Ratification of the Minerals Convention would advance important U.S. interests in Antarctica, including securing nondiscriminatory access to Antarctica's mineral resources and protecting the environment, as well as in maintaining the peace and strengthening the ATS. There are no compelling reasons for the United States to reject the Minerals Convention. As a member of all the regime's institutions, the United States could be influential in the continuing evolution of the Minerals Convention, as well as in protecting U.S. interests. Moreover, implementing legislation required to enable domestic agencies to carry out resource-related responsibilities in Antarctica provides an opportunity for Congress to define environmental and development interests and to clarify U.S. interpretations of ambiguous elements of the regime.

THE RESOURCE POTENTIAL OF ANTARCTICA

Although several countries are conducting geologic research in Antarctica and interest in prospecting is growing, little is currently known about its actual mineral resources. There are no known mineral deposits of commercial interest. The limited knowledge about Antarctica's mineral resources has been gained through fieldwork by geologists and geophysicists, mostly in the 2 percent of the continent that is not covered by ice or on the surrounding continental shelves. Some insight into the possible prospects for ore mineralization or petroleum accumulation in Antarctica has been gained through knowledge of the deposits that have been found on the surrounding continents in related geological environments. This has been possible because Antarctica is thought once to have been part of a larger continent called Gondwana that, before breakup, included South America, Africa, southern India, and Australia.

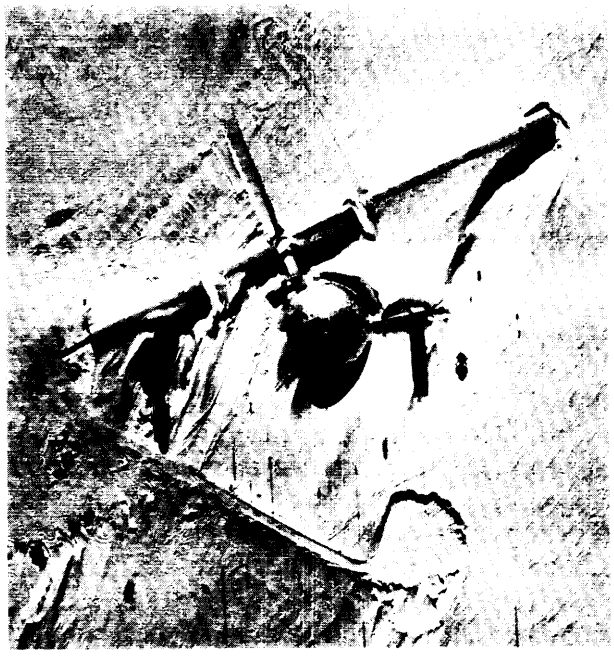


Photo credit ***U S Geo/ogca/ survey***

Aerial view of the U.S. South Pole Station.

The best prospects for petroleum exploration are the offshore sedimentary basins surrounding Antarctica. Sedimentary basins on the continent are covered by the thick ice cap, and thus, in the absence of significant technological developments, are inaccessible for exploitation. Based on what is currently known about the thickness, organic content, age, and thermal history of sediments in offshore basins, the most interesting areas are the Weddell and Ross embayments in West Antarctica, and Prydz Bay and the Wilkes Land margin in East Antarctica.

Until detailed exploration in these sedimentary basins is carried out, including extensive seismic surveys and exploratory drilling, meaningful estimates of resource potential cannot be made. Past estimates of Antarctica's oil potential have been based on virtually no data and may be very misleading.

While some Antarctic basins may ultimately attract commercial interest, the sedimentary basins in the surrounding continents that have counterparts in Antarctica are not, for the most part, major petroleum producing areas. The U.S. Geological Survey estimates that a general reconnaissance program for all of Antarctica could cost about $250 million over a 10-year period, the largest cost element being logistical Support (See ch. 4).

Scientists have discovered small amounts, termed occurrences, of many different types of metallic and nonmetallic minerals in Antarctica. However the only known substantial mineral accumulations, or deposits, in Antarctica are iron ore and coal. Low-value, high-volume deposits such as these, which are plentiful elsewhere in the world, would not be of economic interest in Antarctica. It is highly unlikely that an export market for Antarctic coal or iron ore would develop.

The Antarctic Peninsula presents the best opportunity for finding hard mineral deposits on the continent, in part because of the greater proportion of exposed rock there. Based on the geology of the Peninsula, the best prospects for discovery are base metal (copper, lead, and zinc) and precious metal (gold and silver) deposits. Outside the Antarctic Peninsula, the chances of finding mineral deposits in exposed areas are small. One exception could be the Dufek Intrusion in the northern Pensacola Mountains 300 miles from the coast, although little of it is exposed. This intrusion has a possible analog in the mineral-rich Bushveld Complex in southern Africa, and thus, could host platinum group metals, chromium, copper, cobalt, and/or nickel. Virtually all of the potentially economic minerals known to occur in Antarctica are currently abundant in other, more accessible areas of the world.

The prospects for finding placer deposits or deposits enriched by weathering are also low throughout Antarctica. The required near-surface weathering processes and significant particle transport by running water have not occurred in Antarctica since the onset of glaciation 35 to 40 million years ago. Furthermore, these types of deposits tend to be found in lowland areas rather than on mountain tops, which comprise most of the exposed rock in Antarctica.

ENVIRONMENTAL CONSIDERATIONS

The potential for minerals development in Antarctica raises concerns about the impacts that minerals activities could have on the area's terrestrial and marine ecosystems and atmosphere. The Minerals Convention includes binding general standards and procedures designed to 'ensure that any resource development that does take place occurs in an environmentally sound manner. However, the Convention does not provide detailed environmental regulations. The key to minimizing and mitigating adverse environmental impacts will be future elaboration of more detailed criteria and regulations to interpret and apply the general standards, guidelines, and procedures. United States implementing legislation may provide a measure of the environmental protection regulations and programs that eventually will be developed collectively by the Parties. In addition, much more environmental data and information will be needed before decisions about the acceptability of minerals activities can be made.

The Minerals Convention contains important compliance and enforcement provisions. However, there are important questions about how well these provisions will work in practice. Strong enforcement provisions have been difficult to agree on in the Antarctic context because they are interpreted by claimants as bearing on their rights to police their national territory. Any issues that touch on claims may not be treated as thoroughly as those in which sovereign rights are not an issue.

Local impacts from any minerals development that does take place will be unavoidable. Mere construction of facilities, for instance, not to mention land-based mining itself, will have significant but probably only very local impacts. Siting of facilities in any case may be difficult: facilities will likely be constructed on solid ground, and good facility sites are rare and potentially already occupied by wildlife or scientific bases. It is doubtful that resource activities will be allowed in environmentally sensitive areas or in areas important to science.

A major oil spill from a tanker accident, such as the recent *Exxon Valdez* accident in Alaska, or a well blowout, although rare events, would be two of the more significant unintentional impacts associated with development and would have regional as well as local impacts. In particular, such a spill in a coastal area could have substantial and long-lasting effects on large numbers of birds and/or marine mammals; a similar spill in the open ocean would be of less concern. **As illustrated by the recent oil spill by the Argentine supply and tourist vessel Bahia Paraiso, the Antarctic Treaty Consultative Parties are not now adequately prepared to contain and clean up offshore oil spills in Antarctica.** (To its credit, however, the U.S. National Science Foundation mounted its response effort quickly). Improvements in technology and response capability could—and undoubtedly will—be made prior to any Antarctic oil development; however, oil spill equipment and countermeasures for use in harsh environments are limited at present. Although it is essential to be as prepared as possible, it is unlikely that significant amounts of oil **could be** recovered from a major accident in any harsh operating environment, including Antarctica, using today's best recovery technology.

Environmental impacts from past activities in Antarctica would probably be considered by most people to be insignificant. Most impacts (e.g., disposal of wastes generated by normal human activities) have been restricted to the terrestrial and nearshore marine environments in the immediate vicinity of the 48 year-round and 19 summer research stations operated by 18 nations. Undoubtedly, the most significant past impacts have been caused in offshore areas by overharvesting fur seals, whales, and fish. However, human activity has been increasing in Antarctica and is likely to continue to grow. Future impacts can be expected to increase as well. Minerals development per se is not ex - pected to be an immediate concern. Of more importance in the near-term will be activities related to science, tourism, harvesting of living resources, and perhaps minerals prospecting. Environmental impacts associated with geological and geophysical prospecting are likely to be insignificant and no different from those associated with similar science activities, unless done on a large scale by many countries.

Mineral resource development in Antarctica, and especially accidents resulting from exploration or development, could adversely impact some research projects and the value of Antarctica as a science laboratory. Projects dealing with biological processes or ecosystem dynamics would likely be most affected by nearby development activities or oil spills. However, most Antarctic research would probably not be adversely impacted by resource activities. Understanding of oceanography, marine ecology, meteorology, and cold-region engineering could be improved by the research needed to prepare for resource recovery.

TECHNOLOGY AND ECONOMIC CONSIDERATIONS FOR OIL DEVELOPMENT

Whether oil companies will have the technical capabilities to develop any large fields found in Antarctica depends on both the specific environmental and geological conditions where the field is located and on the status of' technology. Whether they will have the incentive to develop a field depends on profitability and risk, both political and financial. Considering eco-

nomic and political constraints, as well as the long lead times that would be required to produce oil in Antarctica, OTA does not expect that any oil production would take place in Antarctica sooner than the next 30 years, if ever.

It is unlikely that anything smaller than a world-class giant (500 million to 5 billion barrels of recoverable oil) or super-giant (over 5 billion barrels) field with high productivity will ever be economic to develop in Antarctica (see ch. 4 and app. A). Probably only a handful of such large, high-quality fields are left to be found in the entire world, so a discovery in Antarctica would be likely to attract commercial interest.

The rigorous environment of Antarctica is such that oil production there will probably be more difficult than production thus far anywhere else in the world. Most of Antarctica is colder, stormier, and more isolated than other challenging areas in which the oil industry has operated, and it has a continental shelf three to six times deeper than the global mean. Even so, **required technologies for some types of Antarctic development will probably not be substantially different from those now used, or contemplated for use, by major firms in other harsh operating areas.** Offshore technologies have evolved in discrete, incremental steps over the last 20 years, as industry has moved into ever more difficult areas. Exploration is currently underway, for instance, in the relatively shallow but seasonally ice-covered Beaufort and Chukchi Seas offshore Alaska and Canada; the iceberg-prone region between Greenland and eastern Canada; and the North Sea, North Atlantic, and Norwegian Sea. To date, the most significant production experience in harsh environments has been in the North Sea, but production in very deep water has begun in such areas as the Gulf of Mexico and offshore Brazil.

The easiest type of offshore development that **can be** contemplated-and likely the first type of development that would be tried in Antarctica—would be one in an area relatively free of icebergs. For this type of development, most of the technology is available, although a complete system would require combining technologies developed for ice-covered areas and for deep water. The industry does not yet have much experience operating in environments characterized by both deep water and seasonal sea ice and/or icebergs.

In areas where icebergs are likely to be a problem, additional technology development, some of which is underway now in other hostile areas, will be needed. Since long lead times and appropriate economic incentives will be needed in any case to bring a field into production in Antarctica, the required technology is likely to be available by the earliest credible date a project could be brought on stream. Technologies for use in other hostile areas (e.g., the iceberg-prone Labrador Sea) are likely to continue to be improved, and these would be available for use in Antarctica.

It will likely be technically possible to produce oil from under Antarctica's ice shelves and moving ice cap some day; however, new technology will be needed to develop any fields found in these areas.

OTA constructed several hypothetical scenarios (see app. A) to illustrate likely technology requirements for offshore oil development in Antarctica and to gain some insight into the economics of producing oil there. This modeling exercise, although fraught with uncertainty, indicates at least a doubling of current world oil prices would be required to develop a very large oil deposit on a commercial basis in Antarctica. OTA assumed very favorable circumstances in its scenarios: first, that a world-class giant field is discovered in an area in which production is technically feasible; second, that the timing of development is far enough in the future so that all pre-production activities can be accomplished and all needed technology is available;

and third, that the Parties determine that development in the area in which the field is located is consistent with the standards of the Minerals Convention and that they assure the developer rights to produce the field. If these assumptions are not realized, an Antarctic development prospect probably would not go forward.

OTA also examined briefly the potential for producing Antarctic oil in the context of future world liquid fuels supply and demand. Given the many uncertainties involved in projecting what may occur 30 years or more from now, definitive statements are not possible. There appear to be enough proven reserves of conventional oil on hand to satisfy world oil demand at least through 2020. Also, many alternatives to the use of conventional oil exist--ego unconventional heavy oil, tar sands, and oil shale-which given higher prices could ultimately contribute significant amounts of energy to the world supply. Conservation and the greater use of alternatives to liquid fuels may become more important as the price of oil rises. Global warming could induce countries to decrease **the** use of fossil fuels. All these factors would tend to delay or deter serious consideration of Antarctic oil. Even so, the discovery of a large oil field anywhere in the world, including Antarctica, will attract commercial interest. If such a field is found in Antarctica and could be developed at a profit, chances are high that someone will wish to do so.

TECHNOLOGY AND ECONOMIC CONSIDERATIONS FOR HARD MINERALS DEVELOPMENT

Some insight into the technical feasibility of developing a hard minerals mine in Antarctica can be gained from the experience of mining in the High Arctic. Mining has been conducted in severe winter climates north of the Arctic Circle for more than 30 years, and technologies for both open pit and underground mining have evolved to cope with the attendant difficult operating conditions. The costs to develop Arctic mines are much higher than those for mines in more temperate climates. Thus, only world-class deposits in relatively accessible areas, like the Polaris lead-zinc mine located along the coast of Little Comwallis Island in northern Canada, have been economic to develop. Such deposits typically contain in situ ore valued at more than $200 per ton.

In general, mining operations in most of Antarctica will be even more difficult and costly than operations in the Arctic, given Antarctica's greater isolation and more severe climate. Mines would have to be located on land masses generally free of snow and ice. Transportation of fuel and concentrates would be difficult and costly tasks. Port facilities would be expensive and hard to locate, build, and maintain. However, **world-class deposits of equal or greater size and quality to those now being mined in the Arctic could probably be mined economically in the reasonably accessible parts of Antarctica, such as coastal locations on the Antarctic Peninsula.** Existing mining, processing, and transportation technology could be adapted for use in these areas. In place ore values of from $200 to $400 per ton, depending on the location, would probably be required.

The hard mineral deposits with the best prospects for economic recovery in Antarctica would be low-volume, high-value deposits such as gold, particularly if found on the Antarctic Peninsula. A reasonably accessible, high-grade gold deposit would be a relatively good economic prospect because the gold product would not be as costly to transport as bulkier ore concentrates. **The likelihood of economic exploitation of hard minerals outside the Antarctic Peninsula is low, especially in the relatively inaccessible inland areas.** Developing a mine in the interior of Antarctica would be extremely difficult, and it is unlikely that mining

Photo credit U.S Geological Survey

USGS field camp at Lake Vanda in Dry Valley area near McMurdo.

initially would be conducted year round in harsh interior areas. The transportation system for interior operations also would be very expensive.

It is not obvious whether a hard mineral deposit or an oil field would be the first to be exploited in Antarctica if resources are discovered and exploration is allowed. Either **would be** of interest if it were of world-class quality. it is clear, however, that before any adequate assessment of resources can be made, much more knowledge about the geology and mineral potential of Antarctica will need to be assembled; furthermore, before any deposit could be exploited, temporal data about the operating environment will be needed, and detailed and expensive exploration of specific sites would have to be undertaken. Although one study has been optimistic about the feasibility of developing mineral resources in Antarctica's interior, OTA has concluded that this study has underestimated the costs and difficulties of Antarctic mining. [18]

[18]M. Magee, ' 'Assessment of Mining and Process Technology for Antarctic Mineral Development, " OTA Contractor report, Nov. 1988. See also D.K. Beike, "An Engineering Evaluation of Mining m Antarctica: A Case Study of Platinum,'' Master's Thesis, University of' Texas at Austin, May 1988.

IMPLEMENTATION OPTIONS

Introduction

The Senate must give its advice and consent to U.S. ratification of the Minerals Convention. If the Convention is ratified and enters into force, both Houses will have to approve implementing legislation so the Federal Government can meet at least its minimal obligations as a party to the Convention (e.g., designating representatives to the Commission, Regulatory Committee(s), etc.).

The minerals negotiations have been the driving force in the recent evolution of the Antarctic Treaty System. The United States, through the policies, programs, and institutional arrangements it chooses now, can influence the evolution of the Antarctic regime and help assure that Antarctica remains a zone of peace. Congress has an opportunity, beyond meeting minimal legal requirements, to guide U.S. Antarctic policy through the implementing legislation it adopts.

At one level, implementation requires that the broad foreign policy, political, and national security interests of the United States are fulfilled. At a second level, domestic regulatory, operational, and scientific needs related to any minerals activities the United States may choose to sponsor need to be considered. These needs would vary, depending on the scope of minerals activities the United States decides to undertake or promote. The more involved the United States becomes (or plans to become) in Antarctic resource development, the larger the required Federal effort may need to be.

This section begins with a brief discussion of the steps that should be taken in implementing legislation to ensure that the foreign policy interests of the United States are safeguarded. The primary requirement is to designate Federal agency representatives to the institutions established by the Minerals Convention.

Ratification of the Minerals Convention does not require or presume that the United States will itself become involved in minerals prospecting, exploration, or development, or even that it engage in minerals-related research. Other countries may undertake minerals activities, however, even if the United States does not; thus, the United States must have some capability to evaluate proposed activities of others. If the United States decides to sponsor prospecting itself, it must establish the added capability to evaluate and regulate Operators it may sponsor. A U.S. decision to sponsor exploration and development in the future would require an even broader capability. An important aspect of implementing legislation will be to establish a regulatory and institutional structure for managing any minerals activities the United States may sponsor in Antarctica. The second part of this section considers general regulatory needs and evaluates four possible lead agencies for Antarctic minerals affairs. A fifth alternative, creation of a United States Antarctic Agency, is considered as a future possibility if general U.S. activities in Antarctica increase significantly.

Data and information needs are likely to grow in proportion to the level of U.S. involvement in Antarctic minerals activities. These needs are discussed in the third part of this section in relation to the type and timing of minerals activities the United States could undertake.

Since a separate protocol on liability is required to be negotiated and ratified before any exploration or development in Antarctica may be allowed, the Senate may wish to consider the implications of ratifying the Minerals Convention before this protocol has been negotiated and of delaying ratification until after a protocol has been concluded. A discussion of this issue is presented in the last part of this section.

Advancing the Foreign Policy Goals of the United States

The most important justification for ratifying the Minerals Convention is to safeguard and promote the foreign policy and political objectives of the United States-that is, to protect the ATS and preserve Antarctica as a zone of peace. If the Convention is ratified, the United States can advance these objectives and maintain a continuing leadership role among the ATCPs by actively participating in it. **At a minimum then, the United States will have to decide which agency or agencies will represent it in the Convention institutions and participate in relevant policy determinations.** The United States is entitled to be represented in all institutions created by the Minerals Convention.

The interagency Antarctic Policy Group (APG) determines U.S. Antarctic policy. All U.S. representatives to the institutions of the Convention would be bound by the policies established by this group. As Chairman of the APG and lead negotiator on Antarctic policy issues, the Department of State currently represents the United States at all ATS meetings. Other Federal agencies and private sector organizations are represented on U.S. delegations to these meetings. The U.S. representative to the Minerals Convention Commission and to the Special Meeting of Parties must have the authority to represent the broad spectrum of specific U.S. interests in Antarctica. Hence, the Department of State is the most appropriate candidate to represent the United States at meetings of these institutions; other U.S. agencies could be included in the delegation as appropriate. Because the Department of State represents the United States at other ATS meetings, it is also the Federal agency best qualified to coordinate responsibilities under the Minerals Convention with other ATS responsibilities.

The Convention establishes an Advisory Committee responsible for providing advice to the other institutions on the full range of scientific, environmental, and technical issues. Each Party's representative must have suitable scientific, technical, or environmental competence or be accompanied by experts and advisors. Either the State Department, as overall coordinator of U.S. Antarctic policy, or a technically qualified U.S. expert could represent the United States on the Advisory Committee. In any case, it will be essential to draw on the expertise available in the National Science Foundation, the Department of the Interior, the National Oceanic and Atmospheric Administration, the Environmental Protection Agency, the Marine Mammal Commission, the academic community, and industry. Wide-ranging exper-

Photo credif U S Geological Survey

All directions point north from the South Pole. The geodesic dome at the U.S. South Pole Station is in the background.

tise will also be required to make the decisions assigned to the Regulatory Committees, if and when they are established.

Establishing a Regulatory and Institutional Structure

At the present time, little or no interest exists in resource development per se, but several nations appear to be interested in prospecting. A major policy issue for the United States is to decide whether to sponsor prospecting. Even if it does not become a sponsor, other countries are likely to do so. Thus, if the United States wishes to be actively and responsibly involved in the institutions of the Minerals Convention and, specifically, in ensuring that others comply with the Convention's environmental and other provisions, it will need to establish some capability for evaluating the prospecting (and potentially also the exploration and development) activities of Operators sponsored by other countries.

If the United States decides to sponsor prospecting itself, a basic obligation would be to ensure that the Operators it sponsors act in a manner consistent with the principles of the Minerals Convention. In this case, implementing legislation would need to address how to regulate the Operators it sponsors, what information is required to make informed judgments about prospecting (and how to obtain it), and which agency or agencies will be in charge of any program established to carry out these activities.

The agency assigned to handle sponsorship of prospecting would need to have the capability to guide preparation of the prospecting notification to the Commission, to evaluate and possibly prepare environmental impact assessments, and to monitor the activities of Operators. Implementing legislation might include procedures and information requirements for sponsoring, evaluating, and certifying U.S. Operators seeking to undertake Antarctic mineral resource activities; procedures for meeting environmental impact assessment requirements; procedures and criteria for determining that an operator has and maintains the necessary substantial and genuine link with the United States; procedures and criteria for determining the financial and technical qualifications of operators; procedures and criteria for suspending or terminating sponsorship; provisions to make violations of the Convention violations of U.S. law; and provisions establishing at least an interim liability regime for prospecting pending entry into force of the liability protocol.

Initially, there may actually be little that a Federal entity responsible for prospecting would be required to do. The data and information requirements to demonstrate consistency with Minerals Convention standards will be relatively small compared to what would be required for exploration and development, and the impacts associated with prospecting are expected to be negligible. In addition, the amount of activity likely to take place in the near term is not likely to be great. Hence, new responsibilities could probably be accomplished by a small staff. A similarly small program would be indicated if the United States decides not to sponsor prospecting itself **but** only to establish the capability to evaluate and monitor Operators from other countries. In designing a program and assigning responsibility for evaluating and overseeing prospecting, Congress and the Administration may want to keep in mind that the same entity may be called on later to consider and regulate exploration and development.

Currently, no existing agency has the full range of experience and capabilities to implement a prospecting program (and potentially an exploration and development program as well). Beyond its major role in coordinating and advancing U.S. Antarctic policy, the Department of State is not equipped to play a major role in regulating minerals activities. It does not have the experience, the mandate, or the technical expertise to evaluate and regulate operators or to manage any directed research. Indeed, **only three executive agencies approximate the**

legislative mandate and experience required to meet the major demands of the Minerals Convention: the National Science Foundation, the Department of the Interior, and the National Oceanic and Atmospheric Administration in the Department of Commerce.

The National Science Foundation (NSF)

The National Science Foundation has been active in Antarctica since 1957 and responsible for U.S. research activities there since 1971. The Foundation's United States Antarctic Program is responsible for research, operations, and logistics. The Program's budget requests are made and defended by NSF. Unless there is a major change in U.S. Antarctic policy, NSF will continue to play a major role on the continent.

There are four reasons why NSF might be chosen to administer a mineral resource program. First, the Foundation's support for Antarctic research has provided a sound basis for addressing the environmental and resource information needs required if prospecting, exploration, and development are undertaken. Second, any effort in Antarctica must depend on reliable logistics, experience, and capability. The National Science Foundation, in close cooperation with the U.S. Navy, has developed the necessary skills and has the specialized equipment required for working in the continent's hostile environment. It could provide useful advice to commercial operators in Antarctica. Third, NSF has established strong ties to the relatively small community of academic researchers and program managers whose expertise will be critical for addressing the resource and environmental assessment issues central to the Convention. Finally, successive administrations have charged the Foundation with responsibility for a wide range of U.S. Antarctic activities; thus, NSF has an established legitimacy domestically and internationally.

There are, however, limits to an expanded NSF role. The National Science Foundation's overall mandate is to be the primary Federal patron for basic academic research. One consequence has been a deep reluctance to support in any sustained fashion the environmental monitoring, survey, or baseline activities anticipated by the Minerals Convention and typically performed by mission-oriented agencies, and a similar reluctance to support directed research aimed at determining the resource potential of Antarctica.[19] Although NSF has been responsive to proposals generated by academic scientists, it has not assumed leadership for development of the kinds of resource assessment programs of increasing interest to other government agencies, environmentalists, or commercial interests. For example, the Foundation **did** not play a prominent role in the negotiation of the marine living resources treaty (CCAMLR) or the Minerals Convention. Even with additional funds, NSF's academic constituency would be reserved in its enthusiasm for such an expanded role, particularly since it could mean that funds for basic research would be diverted to support the applied work needed to support U.S. minerals activities. However, NSF could acquire the capability to undertake long-term monitoring in Antarctica if directed to do so.

More generally, NSF has expressed little interest in developing long-range policies for the U.S. Antarctic Program outside the continued support for basic research and logistics. For example, it does not support a separate policy and planning staff that addresses issues such as tourism and resource development except as

[19] The potential for conflict with mission agencies was suggested by the U.S. Geological Survey, which argued that t-he "directed short-term research" called for in President Reagan's 1982 policy statement did not meet long-term needs in earth sciences. Furthermore, the charge to NSF to support university and Federal agency research in Antarctica put federal agencies m competition with academic institutions for funds, rather than establishing funding opportunities that would nurture complementary agency and university programs. *The Role of the National* Science *Foundation in Polar Regions*—A Report to the National Science Board (NSB-87-128), p. 8.

they affect NSF's basic science mission.[20] Moreover, the Foundation has no natural resource management experience or responsibilities. To assign NSF the responsibility for implementing the Minerals Convention would require additional staff experienced in the administrative, procedural, technical, and economic dimensions of resource management, and would mark a significant departure from the Foundation's traditional basic research mission.

The National Oceanic and Atmospheric Administration (NOAA)

The National Oceanic and Atmospheric Administration includes among its missions responsibility for directed and applied research to support marine resource management. Its areas of direct responsibility include fisheries, marine mammals (in conjunction with the Fish and Wildlife Service), marine and estuarine pollution, and the implementation of the 1980 Deep Seabed Hard Mineral Resources Act, including assessment of the environmental impacts of deep seabed minerals development. The National Oceanic and Atmospheric Administration is generally perceived as more responsive than other resource management agencies to the concerns of environmental interests, and has also received the support of the deep ocean mining industry for its responsiveness to the special requirements of that industry.

Although NOAA's field experience in Antarctica is limited relative to NSF's, NOAA scientists have conducted research in the Southern Ocean. The y have also conducted research in the Arctic in support of the U.S. Alaskan Outer Continental Shelf leasing program.[21] The National Oceanic and Atmospheric Administration also has extensive environmental data archiving capabilities. For example, the National Environmental Satellite Data and Information Service compiles and maintains a variety of Antarctic data sets. In response to the requirements of the Antarctic Marine Living Resources Convention Act of 1984 (Public Law 98-623), NOAA has been given responsibility for directed research on the living marine resources of Antarctica. The information generated by this program will be essential for environmental impact assessments of proposed oil and gas activities on the Antarctic continental margin.

The National Oceanic and Atmospheric Administration also has research and management responsibilities for deep seabed hard minerals. The Deep Seabed Hard Minerals Resources Act of 1980 (Public Law 96-283) mandated that NOAA establish procedures for the orderly exploration and commercial recovery of manganese nodules from the deep seafloor. The act is relevant to the Antarctic Minerals Convention because it provides a regulatory framework for the management of mineral resources beyond the limits of U.S. jurisdiction. The absence of territorial control required that the United States base its jurisdictional claims on the power of the United States to regulate activities of its citizens outside its territory.

The National Oceanic and Atmospheric Administration grants licenses for exploration and permits for commercial recovery for areas of the deep **seabed** selected by an applicant who must prove financial and technological capability to conduct the proposed work. The agency is also required to prepare an environmental impact

[20] A comprehensive review of NSF's role in polar regions indirectly acknowledged that the Foundation had not played a prominent role in policy issues when it recommended that it become more active in policy analysis and decision-making on Arctic and Antarctic policy issues through evaluation of potential policy issues and options. *The Role of the National Science Foundation in Polar Regions*, ibid., p. 52.

[21] Without pressing similarities too far, the experience in the arctic is instructive. Prior to 1973, there was little information available with which to assess the impact of oil and gas development, particularly along the Alaskan margin. Because the Department of Interior's Bureau of Land Management (BLM) lacked the inhouse capabilities to work on the Alaskan shelf, it contracted with NOAA in 1974 to design and manage an environmental studies program, the Outer Continental Shelf Environmental Assessment Program (OCSEAP) for Alaskan Studies. The program has since become one of the most comprehensive programs of its kind for the collation and assessment of arctic environmental information. NOAA contracted with the U.S. Geological Survey for much of the geology and geophysical work conducted. *Oil and Gas Technologies for the Arctic and Deepwater*. (Washington, DC: U.S. Congress, Office of Technology Assessment, OTA-0-270, May 1985), p. 165.

statement before granting a license or permit, both of which are contingent on steps to protect environmental quality and to conserve the mineral resource. Although commercial deep ocean mining has yet to occur, NOAA has established a framework to accommodate these activities once they become economically attractive. The National Oceanic and Atmospheric Administration also has a fleet of vessels capable of conducting and supporting research in Antarctica.

However, NOAA has much less experience in Antarctica than NSF. Moreover, it has had no legal mandate, research experience, or management responsibility for onshore minerals.[22] While NOAA has developed a scheme to manage deep ocean mining, it has so far no experience in managing development of these resources. More generally, assignment of sole responsibility to NOAA for both scientific and minerals management responsibilities could undermine NOAA's identity in the environmental community as a resource conservation agency.

The Department of the Interior

Interior has a clear legislative responsibility as well as broad experience on a wide range of mineral and environmental resources in the United States and U.S. Exclusive Economic Zone (EEZ). Interior's activities are pursued through several agencies in the department, in particular, the Minerals Management Service (MMS), the Bureau of Land Management (BLM), the U.S. Geological Survey (USGS), and the Bureau of Mines (BOM).

Minerals Management Service-MMS is responsible for offshore minerals leasing and lease management under provisions of the Outer Continental Shelf Lands Act. The Minerals Management Service has programs to:

. manage the leasing of oil and gas and other minerals in offshore areas under the jurisdiction of the United States (including U.S. Arctic areas),
- supervise mineral exploration, development, production, and operations in accord with permits and leases issued by the department,
- collect and distribute revenue due the Federal Government from onshore and offshore mineral leases, and
- assess environmental impacts associated with minerals development in offshore areas subject to U.S. jurisdiction.

In 1973, Interior initiated the Environmental Studies Program to gather information for accelerated leasing on the U.S. outer continental shelf (OCS). First located in BLM, and then moved to the MMS when it was established in 1982, the program generates environmental information used by the Secretary of the Interior and by the environmental assessment and leasing management divisions of MMS to meet their responsibilities under the National Environmental Policy Act and the OCS Lands Act. Most of the work of this program is contracted to university researchers.

Bureau of Land Management—The Bureau is responsible for conducting programs for the conservation, development and management of both surface and mineral resources on the nation's public lands (including U.S. Arctic areas). The Bureau's main task is to manage these holdings and their resources from a multiple use perspective by seeking the best mix of uses that an area can sustain to provide the greatest public benefit. Specific energy and mineral programs include resource evaluation, leasing, and supervision of Federal and Indian coal, oil and gas, geothermal resources, oil shale, tar sands, and nonenergy minerals. In addition, BLM prepares environmental impact assessments of proposed minerals development, implements measures to mitigate negative envi-

= the other hand, Antarctica's onshore minerals are not, according to the U.S. view, within our national jurisdiction, and in this sense they are similar to deep seabed minerals. NOAA argues that it should be in charge of all resources beyond national jurisdiction, whether on land or at *sea*

ronmental effects, and administers laws governing mining on public lands and the sale of minerals.

U.S. Geological Survey-The Survey is charged with enlarging the Nation's knowledge about the extent, distribution, and character of water and other natural resources, and the geological processes, structures, and hazards that affect the development and use of the land. It pursues this mandate through a program of mapping, geological research, and mineral and energy resource assessments on land and in the EEZ. Specifically, USGS researchers produce geophysical, geological, and geochemical maps and analyses which show the distribution, age, composition, structure, and physical properties of the rocks and mineral deposits at and beneath the Earth's surface. It also provides information on geologic hazards such as earthquakes, volcanoes, landslides, and land subsidence that affect human safety, urban development, and engineering design of sensitive structures. More generally, USGS provides data and analysis for use by other Federal and State agencies in the management of public lands, wilderness studies, and multiple use planning, and in national policy determinations including energy development and mineral resource availability. Several USGS scientists have experience doing geological and geophysical research in Antarctica.

Under the National Mineral Resources Assessment Program (NAMRAP), USGS has conducted systematic regional assessments of mineral resource potential in the United States. The assessments have been used for land use decisions as well as by private industry exploring for specific deposits. Based on NAMRAP experience and related geological studies and subject to congressional appropriations, the Survey could conduct a two-part program for Antarctica if the Convention enters into force: first, a regional resource assessment of the entire continent; and second, a more detailed study of areas that could have deposits of economic value.

Bureau of Mines—The Bureau of Mines is the principal Federal agency responsible for conducting research on mineral reserves and the production, consumption, and recycling of mineral materials. The Bureau's mission is to help assure that the United States has the mineral supplies necessary to maintain national security and economic growth at low social and environmental costs. The Bureau also fosters and encourages minerals production by the private sector so that national needs can be supplied by domestic sources.

If emphasis is to be on the management aspects of Antarctic minerals prospecting, exploration, and development, then assigning a major role to Interior would be a reasonable choice, given the experience of the domestic oil, gas, and minerals industry with the procedures and regulatory requirements of the various Interior agencies. Such an orientation would also be compatible with the historical emphasis on resource development in the Department of the Interior. Together, USGS, MMS, BLM, and BOM have the experience and expertise to conduct exploratory studies, establish realistic terms and conditions for minerals activities in both onshore and offshore areas of Antarctica, and to establish the regulatory requirements associated with these efforts.

Despite this experience with environmental and resource assessment, Interior has had little experience managing resource activities outside the continental United States. Were it to be assigned major responsibility for Antarctic mineral affairs, it would need to choose a lead agency within Interior. Otherwise. responsibility and visibility for Antarctic affairs would be diffuse and fragmented.

A New, Independent Commission—Rather than assigning regulatory responsibility to an existing Federal agency, a new institution could be created, such as a small commission. It could

resemble the Marine Mammal Commission,[23] for instance. An Antarctic Minerals Commission could be given responsibility to monitor interest and trends in Antarctic minerals activities, initially tracking and evaluating proposals of other countries. The new agency could be designed to grow and take on additional responsibilities as the need arises. If the United States decides to sponsor prospecting, for instance, the commission could become the focal point for evaluating and regulating U.S. operators. With an appropriate budget, environmental and resource information needs could be contracted to the appropriate Federal agencies and/or to universities or private contractors.

One advantage of a new institution is that turf battles among present agency responsibilities could be set aside. It could also coordinate the activities of several interested Federal agencies. A disadvantage could be its likely low visibility; it also may have little to do in the near term. Without the protection of a cabinet department, it could be vulnerable to budget cuts. Also, because it would be small, it would succeed or fail on the strength or weakness of only a few individuals.

Additional Considerations Should the United States Decide to Sponsor Exploration and Development— Most experts would agree that there is no urgency to develop details of the larger Federal effort that would be required if at some future date the United States decides to sponsor exploration and development. These activities are unlikely to attract interest for *at least* several decades. If the United States eventually decides to sponsor exploration and development, the institutional structure we may establish to oversee prospecting could be expanded to handle the additional responsibilities that sponsorship of exploration and development would entail. Any of the four agencies discussed could be assigned added responsibilities. On the other hand, U.S. involvement in development activities would signal a much higher level of U.S. activity of all kinds in Antarctica than exists today or is likely in the near future. When the level of U.S. activity does increase significantly, however, it may be useful to meld all or most U.S. Antarctic activities into one organization. The United Kingdom and the Soviet Union have already done so.

Creating a U.S. Antarctic Agency (USAA), an independent agency with responsibility for the full range of U.S. interests on the continent, would be a major departure in the management of Antarctic policy. The essential features of such an agency would be its independent status and comprehensive responsibility for planning, implementing, and managing *all* U.S. activities in Antarctica, including logistics. Establishment of such an agency would be premised on the assumption that U.S. activities in Antarctica will increase in the future; that realization of U.S. security, environmental, economic, and scientific interests will require increased involvement in these activities; and that present Federal institutional arrangements are ill-prepared to respond to these needs.

The United States Antarctic Agency could be charged with responsibility for resource and environmental assessments and management, for support of scientific research, and for maintaining the infrastructure required to continue the national presence in Antarctica, including logistics. Technical responsibilities could be funded by the USAA but performed by other agencies. For example, NSF could continue to fund basic research projects without being encumbered by pressure to conduct directed research or to provide and manage logistics. The National Oceanic and Atmospheric Administration could continue to conduct assessments and research on marine living resources. The Geological Survey could conduct studies on geological resources and natural hazards. Although some funding might come from agency budgets,

[23] The Marine Mammal Commission is a small, independent executive branch agency with responsibility for developing, reviewing, and making recommendations on actions and policies for all Federal agencies with respect to marine mammal protection and conservation,

most could be allocated to the USAA and directed according to a long-range plan to whichever agency was most appropriate to carry out a specific task.

Such an agency would provide a clear political, administrative, and managerial focus for Antarctic affairs in the United States and meet the need for greater coordination among agencies with Antarctic responsibilities. Because it would be charged with comprehensive responsibilities, it would be in a good position to contend with the interrelationship of issues. Accountability for U.S. Antarctic policy would be clearly defined, both for political oversight and international collaboration. The Agency could have the ability to integrate plans, priorities, and national interests with budgets, and hence be in a strong position to pursue the full range of U.S. interests within funding constraints.

Efforts to establish an independent agency for Antarctica could be challenged on several grounds. First, there is an innate resistance to increasing the number of government agencies. A number of simpler institutional alternatives for implementing Antarctic policy already exist. Second, creation of an independent agency would elevate Antarctic affairs to a level of visibility that is arguably not warranted at this time. The issue-by-issue approach which has characterized U.S. involvement over the past decade has seemed to provide an adequate response to realizing international obligations and national interests on the continent. Third, the APG now plays a significant interagency coordinating role and may resist creation of a new agency that would diminish its authority. Fourth, development of a comprehensive, coordinated Antarctic program, implicit in the creation of an independent agency, implies a much higher level of funding than may be acceptable politically at present. Finally, a new institution may threaten the resources devoted to basic research in Antarctica.

Data and Information Needs

The United States is not obligated to undertake any basic or directed research as a consequence of ratifying the Minerals Convention. Data and information requirements at the prospecting stage will be relatively minor, but requirements for exploration and especially for development—if they occur—will be substantial. Available information about the Antarctic environment is not now sufficient for making informed decisions about opening parts of Antarctica for exploration and development (or for regulating activities in areas once they are opened).

Two categories of information will be especially important:

- baseline environmental information with which to assess the significance of changes in the ecosystem likely to result from minerals activities, and
- information about the basic geological, geophysical, and geochemical characteristics of Antarctica.

To date, there has been virtually no effort to plan or to support the long-term commitment of funds for long-term environmental monitoring.[24] As for **geological** survey and assessment, an important implementation issue is the extent to which the government will contribute to resource assessments to assist domestic minerals companies in identifying those areas worthy of more detailed evaluation and possibly development.

A program to acquire data and information should be tailored to the level of resource activity anticipated. A first step in meeting information needs could be to compile relevant databases and information on research programs and agency plans and then identify priority research needs, logistics requirements, and *fund*ing estimates. As for directed environmental

[24] An exception has been the CCAMLR Ecosystem Monitoring Program, realized in the United States through the U.S Antarctic Marine Living Resources Program administered by NOAA.

research, the United States might wish, at a minimum, to begin compiling environmental baseline data. Such data would be essential for evaluating potential impacts if the United States decides to become involved in mineral resource activities and/or to evaluate the impacts of plans of other countries that may decide to sponsor activities. The United States does have a small program to gather some oceanographic data pursuant to its responsibilities under the Convention on the Conservation of Antarctic Marine Living Resources, even though it does not now fish in Antarctic waters and is unlikely to do so in the near future.

As far as decisionmaking in the institutions of the Minerals Convention is concerned, there would be little need for the results of minerals-related research in Antarctica until an area is under consideration to be opened for exploration and development. Considering the current low level of industry interest in Antarctica and the high probability that Antarctic resource development is three or more decades away, **there does not appear to be a compelling need at this time for a major Federal effort to assess Antarctica's resources A modest reconnaissance program may be justified if the United States wishes to promote long-term U.S. commercial interests in Antarctica and/or to acquire additional influence in institution meetings.** Some U.S. researchers want to establish a more aggressive minerals assessment program. Several countries have acquired more offshore geophysical data than the United States, so a U.S. program could help the United States remain competitive with other interested countries. Specific requirements for reconnaissance data are discussed in chapter 4. In general, industry presumably will be responsible for assessing resource potential beyond basic reconnaissance and for obtaining information needed for environmental impact assessments for specific areas.

The lead agency designated for managing Antarctic minerals activities will most likely be assigned responsibility for defining data and information needs even if other agencies, academic institutions, and/or the private sector are contracted to carry out some of the work. The agency designated to handle data and information might initially be assigned the relatively simple responsibility for verifying information provided by applicants (including non-U.S. applicants) for prospecting, and, ultimately, for exploration and development. It could also be given responsibility for obtaining information needed to predict and detect impacts. If desired, broader authority could be assigned the agency to assess resource potential as well. Alternatively, responsibility for acquiring environmental and resource data could be delegated to several agencies. Capabilities for acquiring and evaluating environmental and resource information could be an important consideration when designating a lead agency. As noted, no single agency currently has all the capabilities required.

A model for a directed research program is the plan implementing CCAMLR. After ratifying CCAMLR in 1982, the United States established the Antarctic Marine Living Resources Program to provide information for conservation and management of marine living resources in the oceans surrounding Antarctica. The National Science Foundation was directed to continue supporting basic research of Antarctic marine ecosystems while NOAA was directed to design an applied research program to provide information needed to detect, monitor, and predict the effects of fishing and associated activities on target, dependent, and related species and populations. The National Oceanic and Atmospheric Administration's plan describes priority research needs for the implementation of the Convention, identifies which of those needs are to be fulfilled by the United States, and specifies the design of the directed research and funds, personnel, and facilities required for the research.

An important consideration in designing a research program will be its cost. Conceivably, NSF could be directed to allocate more of its existing basic research budget to minerals-related activities. However, funding for minerals research within a fixed budget could only be accomplished at the expense of other research. Currently, applied research does not appear more important or timely than basic research that may have to be sacrificed. Given the present slight interest in minerals development, modest funding for data acquisition seems acceptable. If interest increases, a larger effort would be justified.

Cooperative projects among the Parties to the Minerals Convention would help reduce the high costs of basic and applied research. United States' backing of joint research would further its longstanding goal of international cooperation in Antarctica. Joint research also would avoid unnecessary duplication and assure all participants equal access to data. The National Science Foundation's Deep Sea Drilling Program and its successor, the Ocean Drilling Program, should be considered as models. As for prospecting, under certain conditions (e.g., when efforts would otherwise be duplicated) "group shoots" could be considered, in which companies pool their resources to conduct initial seismic exploration in frontier areas. Finally, ATCPs should be encouraged to make their seismic and other scientific data freely available as intended under the terms of the Antarctic Treaty. Countries which have not been as diligent as the United States in releasing seismic data should be encouraged to do so.

The *Liability Protocol*

Liability issues are covered in Article 8 of the Minerals Convention. However, the Convention does not treat liability issues in detail. The Parties agreed that before any minerals exploration and development can occur, a protocol specifying the details of a system of liability for environmental damage related to minerals activities must be negotiated and ratified in the same manner as the Minerals Convention.[25] It may include limits on liability, how unmet liability will be satisfied, and what means to use to assess and adjudicate liability claims.[26]

If the Minerals Convention is ratified before the liability protocol is ratified, prospecting (but not exploration and development) may begin, subject to the general provisions of Article 8 and other specified interim measures. During this period, Parties are to ensure that recourse will be available in their national courts for adjudicating liability claims, including possible claims by the Commission itself, against any Operator(s) they may sponsor. However, domestic legislation and/or agency regulations will have to interpret the Article 8 guidelines for prospecting; the liability regime for prospecting cannot be articulated solely through judicial proceedings.

The specific provisions of the liability protocol—and, in particular, those relating to limits on liability--could have an important impact on future minerals activities in Antarctica. **Should the United States Senate give its advice and consent to ratification of the Minerals Convention before the liability protocol is negotiated or wait until after it has been negotiated?**

Several arguments favor ratification of the Convention prior to negotiating and/or ratifying the liability protocol:

- Even without additional liability measures, ratification of the Convention would strengthen the ATS.
- Exploration and development may not proceed under any circumstances until the liability protocol has been ratified. Interim liability measures need only be considered for prospecting, and impacts associated

[25] See ch. 3, p, 86, for details.

[26] Negotiations for the Liability Protocol have not commenced as of September 1989, but could begin before the end of the year.

with prospecting are not expected to be significantly different from those associated with similar research activities already taking place.

- It may take several years to negotiate and ratify the liability protocol. In the meantime, a resource discovery could be made---a situation the Parties would like to avoid in the absence of a regulatory framework.
- The representatives from the countries that negotiated the Minerals Convention are, for the most part, still active and involved in Antarctic affairs. They constitute an institutional memory of how and why the minerals regime was negotiated. In several years these participants may be doing other things. Unless the Convention is ratified in the next few years, this institutional memory may be lost, and with it, the best opportunity for ratifying the Convention.
- The United States could set an early standard for effective implementation of the Minerals Convention. A domestic liability regime included as part of implementing legislation could be used to strengthen the U.S. position in negotiating the protocol as long as it did not unduly tie its delegation's hands. Thus, Congress and the Executive Branch would be the arbiters of the competing interests asserted by domestic industry and environmental groups on the liability question.

Two arguments favor waiting to ratify the Minerals Convention until the liability protocol has been negotiated.

- The remaining unnegotiated aspects of liability are potentially important. For instance, what will be the requirements for a backup source of liability if an Operator cannot pay or if limits on liability are exceeded?
- The U.S. may have more leverage over the content of the liability protocol if it makes ratification of the Minerals Convention contingent on negotiating satisfactory terms for the protocol. This strategy is available to other countries as well, however, and, if many countries pursue it, may be counterproductive. Special interest groups, in particular, may favor negotiating the protocol before ratifying the Convention: industry is concerned about the protocol because it fears the limits on liability may be set too high, thereby making economic operations much more costly, if not impossible. Some environmental groups, correspondingly, fear that limits to liability may be set too low.