THE TRANSFER OF TECHNOLOGY AND UNCLOS III*

I. INTRODUCTION

On July 9, 1982, President Reagan indicated that the United States would not sign the treaty resulting from the Third United Nations Conference on the Law of the Sea (UNCLOS III). Although the treaty as a whole was acceptable to the United States, the United States objected to the section on deep seabed mining. The President's Statement indicated that the provisions on the transfer of technology were particularly inimical to United States interests and precluded United States acceptance. Prior to the President's Statement, however, the Conference had overwhelmingly adopted the United Nations Convention on the Law of the Sea (UNCLOS) over objections by the United States. Thus, after a decade of negotiation, a comprehensive legal regime for the oceans could emerge without further participation of one of its most significant developers and most vital users.

This paper will review the development of the transfer of technology (TOT) concept within the context of larger world tensions, trace the evolution of the TOT provisions in the UNCLOS III negotiations, and analyze the operation of the TOT provisions to consider whether they should be objectionable to countries seeking to protect private mining interests.

II. TECHNOLOGY TRANSFER

As an object for negotiation, TOT is not unique to UNCLOS III; it is part of a larger effort by developing countries to address many perceived inequities in the existing world economic and political

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*The author of this note would like to thank Professors Louis B. Sohn and Gabriel M. Wilner for advice and insight into this topic.


2 Id.


structure. International TOT has become a major issue of world debate within the last decade. Barriers to technology access, the increasing technological gap between nations, and the exigency of developing countries for appropriate technologies to meet the essential needs of their citizens have created pressures on states to generate international legal norms which facilitate TOT and control abusive practices in TOT transactions. The elements of this international debate, to varying extents, are applicable to the debate on TOT in UNCLOS III.

A major problem in the international debate is the definition of "technology" and of the nature of the TOT process. "Technology" can include virtually all information applicable to any process; for example, basket-weaving and slashburn agriculture are technologies. Industrial technologies, however, as major contributors to disparities among standards of living, have become the focus of debate. A combination of technological breakthroughs in critical areas increased access to natural resources important to the new technologies, and favorable societal structures began a pattern of industrialization for Britain which was later duplicated in other Western states. This pattern of industrialization underlies the present balance of industrial and financial power in the world today. As a result, developing countries now perceive access to technology as vital to their economic progress.

Within the context of the international debate, "technology" includes equipment and its modification, maintenance or improvement; process; patents and other proprietary rights; personnel

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6 In the 1750's, China, Russia, India, and Great Britain had similar technologies, but Great Britain, with the smaller domestic market, was the center of the Industrial Revolution. Macioti, Technology and Development: the Historical Experience, in INTEGRATED TECHNOLOGY TRANSFER 45 (J. Richardson ed. 1979). For a symposium on TOT, see Symposium: Transnational Technology Transfer: Current Problems and Solutions for the Corporate Practitioner, 14 VAND. J. TRANSNAT'L L. (1981).

6 The critical areas were cotton textiles, iron metallurgy, steam engines, transport, organization of work forces, and medicine. Id.

7 It has been argued, however, that historical accident and imperialistic exploitation are the basis of these disparities. Id.

8 Technology can also be deleterious to the economic health of developing countries. Rarely is technology beneficial to all the people it affects; often it satisfies the merely non-basic material needs of a relatively few people. UNCTAD, Development, Environment and Technology—Towards a Technology for Self-Reliance, U.N. Doc. TD.B/C.6/23/Rev. 1, at 1 (1979). The author of this UNCTAD study uses a conceptual framework wherein technology is a modifier of ecological cycles. Major inputs of technology cause socioeconomic upheavals and destroy existing support mechanisms in a society. At the bottom line there is no cost/benefit analysis that has the scope required to make an objective and realistic analysis. Id.
training; and know-how.‘"Transfer of technology" includes the sale of equipment and processes; training of personnel; licensing of patents, proprietary rights, and know-how; and any other agreements creating or extending the relationship of supplier and user.\textsuperscript{10} International TOT occurs when this relationship is transnational.

The more salient issue is the proprietary nature of most technology. The most desirable technologies are owned by relatively few companies and concentrated in the developed industrialized countries from which these companies operate.\textsuperscript{11} The imperfect market resulting from concentrated protected rights is exacerbated by non-competitive and oligopolistic markets in recipient countries.\textsuperscript{12}

\textsuperscript{9} "Technology" is defined by the UNCTAD Draft International Code of Conduct as "...systematic knowledge for the manufacture of a product, for the application of a process, or for rendering a service, including managerial and marketing technologies." U.N. Doc. TD/CODE TOT/14, Chapter 1, para. 1-2(2) [hereinafter cited as Draft Code]. Although an individual product can embody a technology, the mere sale or lease of goods is specifically excluded in the Draft Code. Id. Developing countries prefer to use the wording: "including associated managerial and marketing technologies." W. FIKENTSCHER, THE DRAFT INTERNATIONAL CODE OF CONDUCT ON THE TRANSFER OF TECHNOLOGY 50 (1980).

\textsuperscript{10} Draft Code, supra note 9, at chapter 1, para. 1-2(2). Goldscheider, who analogizes the technology transfer process to musical themes, ranks the variety of possible technological transfers by increasing order of supplier's commitment as: 1) sales of goods, 2) sales agencies, 3) distributorships, 4) assembly agreements, 5) straight royalty bearing licenses, 6) joint ventures, 7) subsidiaries, and 8) options. Goldscheider, The Technology Transfer Process: A Vehicle for Continuity and Change, 14 Vand. J. Transnat'l L. 225 (1981).

Technology can be purchased from suppliers who sell it embodied in their products, who use it in their own production, or who merely possess the information. According to UNCTAD there are three categories of transactions: "(i) simple direct transactions wherein single components are directly purchased;(ii) process-package transactions wherein complete systems are purchased, i.e., turnkey operations; (iii) project-package transactions wherein proprietary rights are acquired, i.e., licensing." UNCTAD, Handbook on the Acquisition of Technology by Developing Countries, U.N. Doc. UNCTAD/TT/AS5 5-7 (1978).

The methods of transfer enumerated above can be classified as direct transfers of technology. Indirect transfers could include participation in the building up of a nation's indigenous research and development capabilities or the training of researchers, scientists, and entrepreneurs at institutions in developed countries. The term "reverse transfer of technology" refers to the so-called "brain-drain" of developing countries—the loss of critical native technicians. See UNCTAD, The Reverse Transfer of Technology, U.N. Doc. TD/B/AC.11/25/Rev. 1 (1975); UNCTAD, The Reverse Transfer of Technology: A Survey of Its Main Features, Causes, and Policy Implications, U.N. Doc. TC/B/C.6/47 (1979).

"Know-how" refers to the formuli, blueprints, manuals, specs, schematics, and other recognized forms of notation for technology. Goldscheider, supra.

UNCLOS has a specific definition for TOT, see infra text accompanying note 100.

\textsuperscript{11} For tables showing the distribution and ownership of patents, see UNCTAD/WIPO, The Role of the Patent System in the Transfer of Technology to Developing Countries, U.N. Doc. TD/B/AC.11/19/Rev. 1 (1975). It is important to remember that licensing agreements are usually not just patents but often include trademarks, know-how, technical training and services. Id. at 80.

\textsuperscript{12} Contractor & Sagali-Nejad, International Technology Transfer: Major Issues and Pol-
Bargaining asymmetry occurs because of the relative dearth of producers or the scarcity of suppliers. Suppliers of technology can exploit this imbalance either by obtaining unusually high compensation or by retaining control over affiliates and other users through licensing agreements. The consequences of this type of relationship between suppliers and users include balance of payments problems, high consumer costs, and increased technological dependence, all of which inhibit economic growth in those countries that are dependent on the import of technology. These disadvantageous conditions make technology acquisition a major requirement for the economic development of most countries. Unfortunately, need alone is an insufficient incentive for suppliers to transfer technology to developing nations. The profit motive is the energizing force behind technology development and distribution.

A. International Legal Norm-Making on TOT

Any solution to the problems implicit in international TOT would have to eliminate restrictive transfer practices which are detrimental to a country's economy and provide sufficient incentives to encourage transfers of appropriate technology. The present state of the international framework concerning TOT, however,


See UNCTAD, Transfer of Technology—Its Implications for Development and Environment, U.N. Doc. TD/B/C.6/22 (1978). In addition, completely inappropriate technology, once purchased, can burden fragile economies and deplete the scarce resources of nascent industrial sectors which lack the capacity to absorb the technology. Id.

See id.

strongly favors and protects the exclusive, proprietary dimension of the TOT process. Various conventions establish universally recognized intellectual/industrial property rights, particularly in patents, trademarks, and copyrights. These conventions fail to meet the needs of developing states in TOT acquisition; therefore, these states have made a concerted effort to reform the international legal order.

At the international level, the movement to reform the system under which technology is owned and transferred is part of a larger effort to resolve imbalance within the world economic order. Developing countries expressed their dissatisfaction over this imbalance in a declaration of a New International Economic Order (NIEO) and in the Charter of Economic Rights and Duties of States.

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Antitrust and patent legislation is common to most countries and often equated with TOT laws. See UNCTAD, supra; but see Radway, Antitrust, Technology Transfers and Joint Ventures in Latin American Development, 15 LAW. AM. 47 (1983) (Radway argues that TOT laws were created because of balance of payments problems rather than free trade concerns). Some countries, particularly in Latin America, have specific TOT legislation that restrict TOT practices that are detrimental to the domestic economy. See TECHNOLOGY TRANSFER: LAWS AND PRACTICES IN LATIN AMERICA (B. Carl ed. 1978); Wilner, The Transfer of Technology to Latin America, 14 VAND. J. TRANSNAT'L L. 269 (1981). Legislation in developing countries usually establishes an administrative agency that is empowered to regulate transactions prospectively through a registration and/or evaluation and approval procedure. See id. at 272-74.


Both of these documents specifically address the TOT issue.\textsuperscript{22} Concurrently, the United Nations Conference on Trade and Development (UNCTAD), which is a forum on economic matters for the developing countries and an active participant in the NIEO,\textsuperscript{23} began working to reform the international legal regime for TOT. UNCTAD established the Permanent Committee on the Transfer of Technology to study the problem, initiated negotiations on an international code of conduct for TOT,\textsuperscript{24} and introduced similar activity to amend the various conventions on intellectual/industrial property rights so as to favor developing states.\textsuperscript{25}

The efforts of UNCTAD to implement a code of conduct have not been successful because of the competing interests of the principal negotiating groups: developing states, developed states, and communist bloc states. The Draft Code of Conduct on the Transfer of Technology\textsuperscript{26} represents a consensus among these groups on two basic tenets: to establish equitable standards on which to base the relationship between the parties to TOT transactions and to facilitate and increase the international flow of technology.\textsuperscript{27} In respect to these tenets, the Draft Code may reflect the political and moral

\textsuperscript{22} Declaration and Action Programme, supra note 20, art. IV. Transfer of technology was a major subject along with the recognition of the need to develop indigenous scientific capacities.

Charter of Economic Rights and Duties, supra note 21, art. 13. This article is designed to promote the transfer of technology to developing countries. According to paragraph 4, States should cooperate in evolving internationally accepted guidelines or regulations for the transfer of technology. Id. art. 13, para. 4.

Both declarations are consistent with the U.N. Charter Preamble which states that one of the purposes of the organization is "to promote social progress and better standards of life in larger freedom" and "to employ international machinery for the promotion of the economic and social advancement of all peoples." U.N. CHARTER preamble. Specific mandates are found in U.N. CHARTER arts. 55 and 59.


\textsuperscript{27} See generally P. NANYENYA-TAKIRAMBUDJE, TECHNOLOGY TRANSFER AND INTERNATIONAL LAW (1980).
commitments of most of the states, but there is little agreement as to the methods of implementing the Code's goals.

III. TRANSFER OF TECHNOLOGY IN UNCLOS III

Technology, UNCLOS III, and the NIEO are inextricably intertwined. Developing countries perceive technology as a major factor in economic and political disparity. Thus, access to technology is key to the development of a more equitable order. In turn, technological advances have contributed substantially to the demand for changes in the law of the sea.

The technology specifically at issue in UNCLOS III is used for the recovery and processing of manganese nodules which lie on the ocean floor. Technological advances in nodule recovery began in the 1960's with the development and testing of three recovery systems: the line-bucket lift, the conventional slurry pump, and the air lift. This technology and the techniques for its use are at an

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31 The composition of manganese nodules includes nickel, copper, cobalt, and manganese. The ratio of these metals varies according to the location of the deposits. Thus, even though nodules are located in most of the Earth's oceans at varying depths and distances from land, only nodules in the deep ocean have commercially acceptable ore content. The most productive area is the Pacific Ocean floor, 18,000 feet deep and 1000 miles east-southeast of Hawaii. Recovery and transportation present significant technological challenges. In addition, large quantities must be recovered to make an operation commercially viable. Once transported, the nodules are easily crushed and are amenable to several forms of hydrometallurgical processing. NYHART, A COST MODEL OF DEEP OCEAN MINING AND ASSOCIATED REGULATORY ISSUES ES1 (1978).
32 Members of the industry now consider the line-bucket system primitive and unreliable. The air lift system is the newest and still requires extensive testing. These lift systems are only part of an ocean mining system requiring one or more 800 foot custom vessels similar to deep water oil drillships; two-foot diameter, 20,000 foot long pipe-string weighted by a hydrodynamic depressor to hold the pipe-string vertically; a collecting device; a special power plant for the vessel; and special navigational and control equipment. In addition, a crew must be trained to properly operate and maintain the system. Id. See generally UNITED NATIONS, DEPARTMENT OF INTERNATIONAL ECONOMIC AND SOCIAL AFFAIRS, Sea-Bed Mineral Resource Development: Recent Activities of the International Consortia, U.N. Doc. ST/ESA/107 (1980).
early stage of development and most are owned by groups of multinational corporations known as "consortia."

Regardless of its nascency, technological advances in ocean mining and manganese nodule recovery prompted a speech before the United Nations General Assembly by Malta’s Ambassador Pardo. The speech inspired UNCLOS III negotiations concerning the creation of an international entity for the sole purpose of providing a more equitable distribution of the wealth recovered by this technology. Pardo’s comments, reinforcing earlier remarks by President Johnson, introduced the concept of “the common heritage of mankind” in reference to seabed resources. The international community soon reached a broad consensus on the principle of “the common heritage of mankind.” Nations agreed that the concept applies to resources in the ocean beyond the limits of national jurisdiction; however, disagreement still exists over the exact meaning of the principle.

The “common heritage of mankind” theme in Pardo’s speech then surfaced in the NIEO debate. Developing countries began to claim that technology is part of a universal human heritage and that all countries have a natural right to free access to technology

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88 G. Jenicke, E. Schanze, & W. Hauser, A JOINT VENTURE AGREEMENT FOR SEABED MINING 35 (1981). The authors observe that technology characterized by very few or no previous applications with a short elapsed time since development and limited diffusion is termed “leading-edge-technology.” Id.

89 See UNITED NATIONS, CENTRE FOR ECONOMICAL SOCIAL INFORMATION, DESI FACTS 79/1 (April 1979). The issue of ownership is very important because in this case it helps determine availability. Although United States companies have traditionally dominated the consortia, most consortia contracts provide that newly developed technology is common property of all the members. Hearings on S. 2053 Before the Subcomm. on Arms Control, Oceans and International Environment of the Committee on Foreign Relations, 95th Cong., 1st Sess. 205 (1978) (statement of A. Kaufman, counsel for Seldco, Inc.).


91 Remarks at the Commissioning of the New Research Ship, the “Oceanographer,” 2 WEEKLY COMP. PRES. Doc. 930 (July 13, 1966) [hereinafter cited as Remarks].

92 Maltese Delegation, Note Verbale, supra note 35. President Johnson said, “We must ensure that the deep seas and the ocean bottoms, are, and remain, the legacy of all human beings.” Remarks, supra note 36, at 930.


94 Id.

for improving standards of living for their people. This argument, at its extreme, completely ignores the costs and incentives that underlie the creation of technologies. The developed states perceive the common heritage argument in relation to TOT to be singularly self-serving and hypocritical since the developing countries are not offering free access to their own natural resources or technologies.

The fundamental issues of the NIEO permeated UNCLOS III negotiations from the beginning. The developing countries had challenged the Western industrialized countries' attempt to control the potentially economically strategic manganese nodules through technological advantage. They saw a properly instituted international seabed authority as a significant step toward a NIEO.

Ideological differences over the meaning and scope of the NIEO extended to the subject matter of UNCLOS III, quickly subverting the general agreement that there should be some revenue sharing of seabed resources. This conflict of ideologies became acutely apparent in the negotiations on the system of exploration and exploitation.

A. UNCLOS III Mining Technology Negotiations: General Obligations

The TOT issue in UNCLOS III negotiations consisted of two elements: the first precatory, the second mandatory. The early UNCLOS III negotiations contained only the precatory element, a general obligation of states to make good faith efforts in facilitating and promoting the transfer of marine technology, particularly to developing states. The general obligations, which do not specifically mandate the transfer of mining technology, now appear in Part XIV of the Convention, the provisions of which correspond to language in the NIEO. The specific obligation for the transfer of mining technology to the operating arm of the Authority (Enter-

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45 UNCLOS, supra note 4, Part XIV.
46 Declaration and Action Programme, supra note 20, para. 4.
prise) was not included initially, probably because the nature and function of the International Seabed Authority was unclear and unapproved. In addition, the consensus was that if the Authority itself wished to engage in mining operations it could do so through joint ventures or other contractual arrangements. In other words, the Authority did not require the technology; instead it would reach some agreement with those who already had the technology. Presumably, an authority with jurisdiction over deep seabed mining activities would have the bargaining power to obtain concessions from private miners.

From this point onward in the negotiations, the nature of the system for exploitation and exploration determined the extent of TOT obligations. The First Committee was entrusted with developing an acceptable system of deep seabed exploitation. The developing countries, negotiating in concert as the Group of 77 (G-77), supported a unitary system in which all mining would be controlled by the Authority alone or in joint ventures. Under the unitary system, the assumption that the Authority would have the bargaining power to obtain mining technology probably preempted discussion of TOT. Meanwhile, the Third Committee, which had jurisdiction over the general obligations of states to transfer marine technology, received a proposal that the Authority require private miners to train nationals of developing states and to make their patents available to developing states. The Third Committee initiated no action on the proposal which was outside its purview; however, this proposal foreshadowed the demand for the transfer of mining technology to developing countries.

At the Third Session of UNCLOS III, the desire of the developing countries to obtain deep seabed mining technology overshadowed the issue of technology transfer to the Authority. The Informal Single Negotiating Text (ISNT) produced at the end of the session incorporated a unitary system in which the Enterprise

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would conduct all activities in the international deep seabed area,\(^5\) (the "Area"), again presumably obtaining or controlling mining technology through contract or joint venture.\(^5\) The text also directed the Authority to regulate the transfer of this acquired or controlled mining technology to developing countries.\(^5\) By this point in the negotiations, the First Committee had received jurisdiction over TOT provisions with respect to the Authority and the Area, and had created a general obligation of states to facilitate access to this technology.\(^5\)

A Revised Single Negotiating Text (RSNT),\(^6\) produced at the end of the Fifth Session, reformulated the TOT provisions of the ISNT. The revisions limited the states' obligation to facilitate access to only "relevant" technology\(^6\) and deleted references to the transfer of "mineral processing" technology.\(^7\) The language of the provisions remained precatory and the proffered system for exploitation remained unitary.

Throughout the previous negotiations, the developed states objected to a powerful Authority in the context of a unitary system. U.S. Secretary of State, Henry Kissinger, broke the impasse with a proposal\(^8\) for a parallel system. In the Kissinger proposal, for every mine site developed by private miners or States, another mine site would be reserved for the exclusive use of the Enterprise. Logically, under a parallel system the Enterprise would require financing and technology in acting for the benefit of developing states. Kissinger committed the United States to help provide both\(^9\) in order to get the Enterprise into operation. By offering

\(^{51}\) Id. art. 22, para. 1.
\(^{52}\) Id. Part 1; Annex I, Part B, para. 4(d); Annex I, Part C, para. 5.
\(^{54}\) ISNT, supra note 50, art. 11(a).
\(^{56}\) Id. art. 11(a).
\(^{57}\) Id. Annex I, para. 12(a)(xii).
\(^{59}\) Kissinger said that "the United States would be prepared to agree to a means of financing the Enterprise" and would be prepared to negotiate "provisions for the transfer of
access to technology that it did not own, the United States Government unconsciously placed the burden of providing the relevant technology on private miners who sought access to the deep seabed, thus setting the stage for mandatory TOT.

B. **UNCLOS III Mining Technology Negotiations: Mandatory Provisions**

The Sixth Session proved pivotal with respect to TOT provisions under the auspices of the First Committee. In spite of the lack of either discussion or consensus for changing or expanding the TOT provisions contained in the Revised Single Negotiating Text, the Informal Composite Negotiating Text which emerged from the session contained an entirely new set of TOT provisions, making TOT a precondition to mining. The obligations of states with respect to TOT remained precatory and now appear in article 144 of the Convention.

Regardless of their ideological or practical origins, the mandatory TOT provisions caused considerable consternation and opposition. The United States delegation vowed to eliminate the provisions because they perceived them as merely ideological and unnecessary for the successful functioning of the Enterprise; technology so that the existing advantage of certain industrial states would be equalized over a period of time. Kissinger, supra note 58, at 398. Elliot Richardson negotiated for the removal of the TOT provisions until he was replaced by the new Administration. See Statement by Elliot L. Richardson, Ambassador at Large, Special Representative of the President for the Law of the Sea Conference (unpublished statement after the Seventh Session of UNCLOS III). See also Alternative Means for Financing the Enterprise, U.N. Doc. A/CONF.62/C.1/L.17, VI Official Records, supra note 58, at 156.

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60 Private miners would have to provide the technology unless the United States government purchased the right to transfer the technology itself.

61 RSNT, supra note 55.


63 UNCLOS, supra note 4, art. 144.

64 This shift to mandatory TOT by private miners could have its origin in both ideological and practical concerns. The Chairman of the First Committee, Paul Engo of Cameroon, was responsible for submitting the text. As a national of a developing state, he could have been influenced by G-77 activities in UNCTAD, in which the debate over a code of conduct for the international transfer of technology and the supportive rhetoric had reached a high point. Concurrently, Chairman Engo may have had serious practical reservations with respect to both the ability of the Enterprise to obtain the newest, most efficient deep seabed mining technology, and the willingness of the consortia of transnational corporations to supply this technology to what would be, in effect, a competitor. See infra note 116 and accompanying text.

65 Statement by Elliot L. Richardson, Ambassador at Large, Special Representative of the
however, the delegation's primary concern was the possible adverse effects the provisions might have on the progress of deep seabed mining. During the remainder of the UNCLOS III negotiations, with respect to TOT, the developed states attempted to limit the provisions, while the developing states attempted to tighten the provisions so that the consortia could not avoid them.

At the beginning of the Seventh Session, the First Committee split into seven negotiating groups. Negotiating Group One, chaired by Frank Njenga of Kenya, was the forum for discussion of the system of exploration and exploitation, including TOT to the Enterprise. Mr. Njenga's report, as incorporated in the report of the Chairman of the First Committee, contained proposed changes to the Informal Composite Negotiating Text. The proposed language inserted "commercial" before the phrase "terms and conditions" to ensure that consortia and other technology suppliers would receive compensation that was comparable to that available in the open market. A commercial arbitration clause was added to settle disputes as to what was commercially fair and reasonable, removing the question from the Sea-Beds Disputes Chamber.

The upper-tier developing countries continued to press for access to technology made available to the Enterprise and succeeded in inserting the so-called "Brazil Clause" in the proposed revisions. The Brazil Clause requires contractors to make technology availa-
ble to developing countries on the same basis as it is made available to the Enterprise. Extending the benefits of mandatory TOT to developing countries was a considerable ideological leap; moreover, only the most economically-sound countries, whether acting singly or jointly, could afford to engage in deep seabed mining activities.

The revised Informal Composite Negotiating Text that emerged from the Eighth Session incorporated most of the proposed revisions from the Seventh Session as well as the following important additions: "technology" was defined; a requirement that the Enterprise seek and purchase technology available on the open market before it required the contractor to provide its technology was added; and a rule that governments must provide the Enterprise with access to mineral processing technology was included.

Further refinements occurred in the Ninth Session. States now were obligated to ensure that the Enterprise had access to recovery technology. The technology that a contractor had to make available was limited to technology actually used in carrying out activities in the area under a contract approved by the Enterprise. The contractor would be required to obtain a legally binding and enforceable agreement from third party owners of technology, allowing the transfer of technology that the contractor would not otherwise be entitled to transfer. This provision was limited only to those licenses the contractor could obtain without substantial

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17 Id. para. 4(c)(ii quinte).
19 Id. Annex II, para. 4(bis)(a).
20 For the purpose of this paragraph, 'technology' means the equipment and technical know-how, including manuals, designs, operating instructions, training and technical advice and assistance necessary to assemble, maintain and operate a system for the exploration for and exploitation of the resources of the Area and the non-exclusive legal right to use these items for that purpose.
21 Id. An important aspect of this definition is that it emphasizes the critical element which is the knowledge to effectively operate means of production, or "technological mastery." See TECHNOLOGY TRANSFER: NEW ISSUES, NEW ANALYSIS 7 (A. Heston & H. Pack eds. 1981).
22 ICNT/Rev. 1, supra note 73, Annex II, para. 4(bis)(a)(iii).
23 Id. Annex II, para. 4(bis)(c).
24 Id. Annex III, art. 5(3)(a), (b), & (c).
25 Id. Annex III, art. 5(3)(c).
The contractor was given a forty-five day period in which to revise an offer in accordance with the decision of a commercial arbitration panel. Most importantly, a ten-year time limit, to commence from the moment the Enterprise begins commercial production, was placed on the TOT obligation of the contractor. With that amendment, G-77 announced that they considered all negotiations on TOT closed. With respect to TOT, the language of the revised text provided at the end of the Ninth Session, entitled "Draft Convention on the Law of the Sea," emerged relatively unscathed in the final Convention as Annex III, article 5, despite considerable opposition by the United States delegation.

C. UNCLOS III Mining Technology Negotiations: Final Efforts to Revise

The Reagan Administration took office prior to the commencement of the Tenth Session, and immediately pressed for review and change in the Draft Convention. The new administration considered the entire mining regime inimical to United States interests. Differing perceptions of the TOT issue were apparent in the change of administration.

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60 Id.
61 Id. Annex III, art. 5(4).
62 Id. Annex III, art. 5(7).
64 ICNT/Rev. 2, supra note 77.
65 UNCLOS, supra note 4, Annex III, art. 5. The general obligations of State Parties are found in art. 144 and Part XIV (arts. 226-278).
67 Compare the testimony of the Reagan administration's ambassador to UNCLOS III with that of the Carter Administration's ambassador. In testimony before the House, Ambassador Malone of the Reagan Administration said:

[T]hrough [TOT] provisions the Draft Convention compels the sale of proprietary information and technology now largely in U.S. hands. [W]ith certain restrictions, the Enterprise, through mandatory transfer, is guaranteed access on request to the seabed mining technology owned by private companies and also technology used by them but owned by others. The text further guarantees similar access by any developing country planning to go into seabed mining. We must also carefully consider how such provisions relate to security-related technology.


In contrast, Carter Administration's Ambassador Elliot L. Richardson had identified as
By the Eleventh Session, which was the final session, the United States had identified six objectives in revising the Draft Convention including the TOT provisions. The "Green Book" of United States proposals was rejected outright by G-77. To break the impasse, eleven western nations, excluding the United States, banded together and produced a package of amendments, including one that met United States objectives with respect to TOT. This effort resulted in no substantial changes in the accepted

frequent misstatements:

. . . that U.S. companies would be required to sell sensitive national security-related technology. On the contrary, the U.S. would deny an export license. In addition, the text of the Convention suspends obligations to supply information when disclosure is contrary to essential interests of security.

. . . that a company seeking a contract would be required to transfer its technology without adequate compensation. In fact, the Enterprise must seek technology on the open market and then must pay fair and reasonable commercial terms and conditions subject to binding commercial arbitration.


91 U.N. DOC. A/CONF.62/L.104 (1982), reprinted in Report, supra note 88, at Appendix C. The proposed language was as follows:

art. 5(3)(a) - the contractor must cooperate with the Authority in the acquisition of technology.

art. 5(3)(b) - the contractor should make available technology which he has made available or is willing to make available to third parties. This should be done by license under terms and conditions no less favorable than those available to third parties.

art. 5(3)(c) - the contractor should acquire, if possible without substantial cost, a right to transfer any other technology he uses that is not included in (b).

art. 5(3)(d) - the contractor should assist the Enterprise in obtaining technology on the free market.

art. 5(3)(e) - the contractor should take the same measures of subparagraphs (a)-(d) for the benefit of a developing state or group of developing states.

art. 5(4) - disputes between the contractor and the Authority and State Parties and the Authority shall be subject to Part XI as appropriate. 3(b) disputes shall go to commercial arbitration ("binding" deleted).

art. 5(5) - to comply with Part XI, States Parties that sponsor contractors will help the Enterprise by taking effective measures to implement paragraph 3 consistent with national laws to prevent concerted refusal of contractors to supply the Enterprise with technology on commercial terms and conditions. Id. (roughly paraphrased).
D. Post-Conference Assessment

In retrospect, it is ironic that the United States supported the convening of UNCLOS III\(^3\) and was aware from the beginning that the participants were negotiating a "package deal;"\(^4\) but once United States objectives were negotiated, the Reagan Administration refused to approve concessions in the exploitation of the deep seabed.\(^5\) It is natural, however, for a more conservative administration to reject the control of a supranational body over a United States economic activity.\(^6\) Mandatory TOT is only one of many provisions in the UNCLOS mining regime which is, on its face, incompatible with principles of a free market economy.\(^7\) Nevertheless, there is no record upon which to judge the effects of such provisions,\(^8\) and most commentators conclude the provisions will never be invoked.\(^9\) The uncertainty of the effect of these provisions is a slender reed on which to risk losing the many other favorable aspects of the treaty. The next section explores the potential problems in the application of the provisions.

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\(^3\) See Report of the Committee, supra note 47.

\(^4\) Id.


\(^6\) Id. at 1008. Any international organization which is going to discuss concepts of reasonableness, equity, and legality of business practices, and monitor preferential treatments or imbalances in the world marketplace must be "based upon at least some democratic legitimation" for all interested parties to have "trust and confidence . . . [in its activities]." "An organization of sovereign states is, by its very definition, no democratic organization of the citizens of these states." Such an organization, therefore, cannot meaningfully comprise a body that governs entities other than states unless those entities are represented and participate in the execution of legal norms. In addition, the international organization would require a staff of considerable expertise, including personnel who are experienced in international and domestic forms of contract and antitrust law, and persons who are familiar with specific technologies and world markets. W. FIKENTSCHER, supra note 9, at 133.


\(^9\) See infra note 172 and accompanying text. For a recent article with a political perspective on this topic, see Transfer of Seabed Mining Technology: A Stumbling Block to United States Ratification of the Law of the Sea Convention, 13 OCEAN DEV. & INT'L L. 427 (1984).
IV. TRANSFER OF MINING TECHNOLOGY: IMPLEMENTATION AND PROBLEMS

The provisions on the transfer of mining technology are codified as Annex III, article 5, in the United Nations Convention on the Law of the Sea (UNCLOS). The article defines "technology" as "the specialized equipment and technical know-how, including manuals, designs, operating instructions, training and technical advice and assistance, necessary to assemble, maintain and operate a viable [mining] system and the legal right to use these items for that purpose on a non-exclusive basis." Article 5 anticipates four possible categories of transfer: a TOT arranged by the Enterprise on the open market; a mandatory TOT from the contractor to the Enterprise; a mandatory TOT from the contractor to a developing state; and a contracted TOT under joint venture with the Enterprise.

A. TOT Arranged by the Enterprise on the Open Market

All entities that submit a plan of work to engage in mining activities in the Area are also required to submit a general description of the technology which they intend to use. The general description does not have to reveal proprietary information, but, presumably, it must contain enough information to adequately enlighten the Authority as to the nature of each item of equipment and its function. An adequate description will also inform the Authority of where such technology is available, and who owns or supplies the technology. Any substantial technological changes or innovations introduced after the submission of the general description must be reported to the Authority. The Enterprise must attempt to purchase the "same or equally efficient" technology on the open market if it wishes to obtain the technology for its own

99 UNCLOS, supra note 4, Annex III, art. 5.
100 Id. para. 8. But see supra notes 9 and 10 and accompanying text. See also supra note 74.
101 The "Area" refers to the portion of the deep seabed, ocean floor, and subsoil thereof, beyond national jurisdiction. UNCLOS, supra note 4, art. 1(1)(1) and Part XI.
102 UNCLOS, supra note 4, Annex III, art. 5(1): "When submitting a plan of work, every applicant shall make available to the Authority a general description of the equipment and methods to be used in carrying out activities in the Area, and other relevant nonproprietary information about the characteristics of such technology and information as to where such technology is available." Id.
103 Id. para. 2: "Every operator shall inform the Authority of revisions in the description and information made available pursuant to paragraph 1 whenever a substantial technological change or innovation is introduced." Id.
use, and the technology on the open market must be available on "fair and reasonable commercial terms and conditions."\(^{104}\)

Open market purchase under Annex III, article 5, raises two serious questions: will the technology be available on the open market, and, if so, will it be available on fair and reasonable commercial terms and conditions? Assuming that the Enterprise makes good faith efforts to obtain the technology on the open market,\(^{105}\) many firms that can supply the technology may not wish to do so. Such firms may believe that their exclusive use and ownership of the technology is a competitive advantage in their own activities; therefore, they would be unwilling to equip a potential competitor such as the Enterprise.\(^{106}\) In addition, a supplier may not feel that the proprietary nature of its technology will be adequately protected by the Enterprise.\(^{107}\) Conceivably, the Enterprise could transfer the technology to a third party without the consent of the owner who, in turn, has limited recourse against the Enterprise under the treaty.\(^{108}\) Presumably, the Enterprise would refrain from such an act by its desire to have good relations with actual and potential suppliers on the open market; however, such restraints

\(^{104}\) Id. para. 3(a): "[The obligation of the contractor to transfer technology to the Enterprise] may be invoked only if the Enterprise finds that it is unable to obtain the same or equally efficient and useful technology on the open market on fair and reasonable commercial terms and conditions. . . ." Id.

\(^{105}\) The Working Group of 21, formed as a more efficient body for reaching a consensus on tough First Committee issues, was in general agreement that the Enterprise was obligated to make such good faith efforts. See Report of the Coordinator of the Working Group of 21 to the First Committee, U.N. Doc. A/CONF.62/C.1/L.28, at 3 (1980).

\(^{106}\) Telephone interview with William Siapno, Executive with Deepsea Ventures, Inc. (Nov. 1983). Mr. Siapno opined that the Enterprise was more than a simple competitor because of its preferred political position. He compared the situation of the mining industry under the TOT provisions as "building a bear trap and then stepping in it." Id.

\(^{107}\) The Convention contains no provision under which the Enterprise is obligated to protect the confidentiality of the proprietary information. Annex III, art. 14(3) protects "data" which presumably refers to transferred data under Annex III, art. 14(1), rather than proprietary information. Individual staff members of the Authority may be subject to dismissal for disclosing proprietary information transferred to the Authority in accordance with Annex III, article 14. Parties recognized by the Convention can request that a proceeding take place before a tribunal to determine whether a violation has taken place. UNCLOS, supra note 4, art. 168(2) and (3).

\(^{108}\) If the Enterprise submits to the jurisdiction of a court of competent jurisdiction in a State Party under the conditions of Annex IV, art. 13(3), the owner could bring an action against the Enterprise, but assets of the Enterprise could not be seized in order to satisfy a judgment which the Enterprise determines it does not wish to pay. A contractor could bring such a dispute before the Sea-Bed Disputes Chamber under Article 187(c)(ii); however, if the illegal transfer took place under the auspices of the Authority in the exercise of its discretion, the jurisdiction of the Sea-Bed Disputes Chamber may be limited by article 189. See infra notes 145-47 and accompanying text.
may be illusory once the Enterprise achieves technological independence and no longer requires good will.

On the contrary, the Enterprise may have trouble choosing from the "many eagerly proffered systems."\textsuperscript{109} Consortia may want to recoup some of their investment by licensing the technology and spreading their research and development costs.\textsuperscript{110} The Enterprise, hypothetically armed with two to three times the money which all existing consortia have spent to date, not only could afford entire systems, but could contract for and build a system of its own.\textsuperscript{111} A study for the United States Department of Interior indicates that every component of a deep seabed mining system is available from a relatively large number of suppliers,\textsuperscript{112} and in spite of general resistance in the industry, some suppliers have expressed their willingness to sell technology to the Enterprise.\textsuperscript{113}

The principal weakness in the open market purchase is the virtually unchecked discretion of the Enterprise to determine that the "same or equally efficient and useful technology" is not available on the open market at fair and reasonable commercial terms and conditions. Such a determination will trigger the contractor's obligation to offer its technology to the Enterprise.

B. \textit{Mandatory TOT to the Enterprise}

An approved applicant that subsequently contracts with the Enterprise must provide its technology to the Enterprise on fair and reasonable commercial terms and conditions if the Authority so requests.\textsuperscript{114} The contractor is obligated to supply technology that he "uses in carrying out activities in the Area under the contract" and is "legally entitled to transfer," only if the Enterprise cannot ob-

\textsuperscript{110} \textit{Id.} at 91.
\textsuperscript{111} \textit{Id.}
\textsuperscript{113} According to Elliot Richardson, a number of companies have come forward to offer seabed mining systems to the Enterprise. Testimony of Elliot L. Richardson, House Foreign Affairs Comm., May 14, 1981, \textit{quoted in} Oxman, \textit{supra} note 86, at 11 n.27.
\textsuperscript{114} UNCLOS, \textit{supra} note 4, Annex III, art. 5(3)(a): "[Every contract for activities in the Area will obligate the contractor] to make available to the Enterprise on fair and reasonable commercial terms and conditions, whenever the Authority so requests, the technology which he uses in carrying out activities in the Area under the contract, which the contractor is legally entitled to transfer. . . ."
tain the technology on the open market. An instrument supplementing the previously granted contract would contain the negotiated terms of the transfer.

Subsequent provisions which require the contractor to obtain either written assurances or enforceable contracts guaranteeing technology transfer by third party owners of technology used by the contractor in the Area reinforce this compulsory licensing agreement. Under article 5, subparagraph 3(b), the contractor must obtain written assurance from a third party owner of technology used by the contractor that the third party will license the technology to the Enterprise if the Enterprise cannot purchase the technology on the open market. If the contractor cannot obtain the assurance, it cannot use the technology in question.

Under article 5, subparagraph 3(c), the Enterprise, after failing to obtain a technology on the open market, can request that the contractor acquire the legal right to transfer technology which is owned by third parties. The contractor must acquire the legal right to transfer technology to the Enterprise by means of an enforceable contract; however, the contractor is excused from this duty if acquisition entails substantial cost. If the contractor and the third party owners of the technology in question have a "substantial corporate relationship," failure to acquire the right to

118 Id. For the text of this part of art. 5(3)(a), see supra note 113.
116 UNCLOS, supra note 4, Annex III, art. 5(3)(a): "This shall be done by means of licen[ses] or other appropriate arrangements which the contractor shall negotiate with the Enterprise and which shall be set forth in a specific agreement supplementary to the contract. . . ."
117 Id. art. 5(3)(b):
[Every contract for activities in the area will obligate the contractor] to obtain a written assurance from the owner of any technology used in carrying out activities in the Area under the contract, which is not generally available on the open market and which is not covered by subparagraph (a), that the owner will, whenever the Authority so requests, make that technology available to the Enterprise under license or other appropriate arrangements and on fair and reasonable commercial terms and conditions, to the same extent as made available to the contractor.
118 Id. "If this assurance is not obtained, the technology in question shall not be used by the contractor in carrying out activities in the Area . . . ." Id.
119 Id. art. 5(3)(c):
[Every contract for activities in the area will obligate the contractor] to acquire from the owner by means of an enforceable contract, upon request of the Enterprise and if it is possible to do so without substantial cost to the contractor, the legal right to transfer to the Enterprise any technology used by the contractor, in carrying out activities in the Area under contract, which the contractor is otherwise not legally entitled to transfer and which is not generally available on the open market.
120 The Convention fails to indicate what constitutes "substantial cost."
transfer the technology may lead the Authority to conclude that the contractor did not make reasonable, good faith efforts or that the contractor is not qualified for future mining approval.\textsuperscript{121}

Mandatory TOT to the Enterprise poses considerable problems for the contractor. The TOT obligation is triggered when an unnamed organ of the Authority determines that the same or equally efficient technology is not available on the open market at fair and reasonable commercial terms and conditions. The contractor will exercise no influence in the designation of the organ which will decide to make the transfer request.\textsuperscript{122} The contractor can challenge the need for a transfer request only through the compulsory settlement procedures of Part XI.\textsuperscript{123} The mandatory transfer itself, by definition, does not resemble an ordinary commercial transaction. The contractor is required to reach contractual terms and conditions with an entity that is in a vastly superior bargaining position. The interpretation of "fair and reasonable commercial terms and conditions" will determine whether the terms and conditions will be commercially less advantageous to contractors.

Pursuant to article 5, paragraph 4, disputes as to whether the terms of transfer offered by the contractor are "within the range of fair and reasonable commercial terms and conditions" may be submitted by either party to binding commercial arbitration in accordance with the UNCITRAL Arbitration Rules.\textsuperscript{124} An arbitration panel must determine whether technology developers should receive the usual monopoly price or be limited to a cost-plus formula.\textsuperscript{125} In addition to price, a panel must consider whether a

\textsuperscript{121} UNCLOS, supra note 4, Annex III, art. 5(3)(c):
In cases where there is a substantial corporate relationship between the contractor and the owner of the technology, the closeness of this relationship and the degree of control or influence shall be relevant to the determination whether all feasible measures have been taken to acquire such a right. In cases where the contractor exercises effective control over the owner, failure to acquire from the owner the legal right shall be relevant to the contractor's qualification for any subsequent application for approval of a plan of work . . . .

\textsuperscript{122} References to the "Authority" in the provision are ambiguous and inconsistently used. The Authority can include or exclude the Enterprise. A Council role may be inferred from Art. 162(1) or (2)(a), but this is a weak conjecture. W. Hauser, The Legal Regime for Deep Seabed Mining Under the Law of the Sea Convention 99-100 (1983).

\textsuperscript{123} UNCLOS, supra note 4, Part XI, section 5. A contractor may not feel that a dispute settlement body dominated by representatives from developing countries will reach an equitable result. See id. Annex VI, art. 35.


\textsuperscript{125} "Monopoly price" refers to the highest price the market will bear, competition not
variety of other contractual terms and conditions are acceptable, including protection of confidential information, guarantees, warranties, use restrictions, grant-back clauses for technological improvements, and contractual penalties. Many contractual terms and conditions acceptable in ordinary commercial practice may not qualify under the laws of individual states or the provisions of UNCTAD's Draft Code of Conduct for TOT. The arbitration panel should refer to terms and conditions in comparable cases of contractual practice; however, the few comparable cases can only be found in litigation which involves the oil industry or land-based mining. If these cases prove to be inadequate models, contractual practice inimical to the contractor could influence the arbitration panel. Arguably, the continuing existence of fundamental differences of opinion in the larger world debate over acceptable TOT practices would influence the panel to act more conservatively on contested terms.

Under the UNCITRAL Arbitration Rules, each party must prove the facts on which it bases its request or decision. As a result of the contractor's greater access to the pertinent facts in this non-adversarial proceeding, the contractor will probably be required to carry a greater burden of proof and show why his offer is within the acceptable range of fair and reasonable commercial

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being a factor in price-setting when the developer of technology has exclusive rights to disseminating the technology. "Cost-plus formula" refers to a sales price limited to the cost of developing the technology plus a reasonable profit. See supra note 14.

126 W. HAUSER, supra note 122, at 101.

127 For examples of unacceptable contractual terms, see Draft International Code of Conduct on the Transfer of Technology, supra note 26.

128 W. HAUSER, supra note 122, at 103.

129 Hauser believes that UNCTAD negotiations have failed for the present and will have no effect. Id. at 105. The West German delegation to UNCLOS III, anticipating disagreement over what constitutes fair and reasonable commercial terms and conditions, proposed a definition of the expression for the record:

Fair and reasonable commercial terms and conditions are conditions of the kind actually agreed in practice in comparable cases. In the absence of any comparable case, the price agreed should be such as to make adequate contribution towards recouping development costs. This includes the cost of development work which has not been successful as well as the cost of work necessary to establish a basis of knowledge for carrying out a given project. The other terms should be such that they provide an incentive to further development effort.

Report of the Coordinator of the Working Group of 21, supra note 105, at 5. The possible applications of this definition have yet to be tested.

130 UNCITRAL, supra note 124, art. 24, cited in W. HAUSER, supra note 122, at 106 n.328.
terms and conditions.\textsuperscript{131} The uncertainty of a favorable outcome for the contractor significantly increases the risks and costs of seabed mining under the regime.

The provisions on technology owned by third parties exacerbate the problem. Most mining consortia have over one hundred suppliers which own 75-80\% of the technology used in mining systems.\textsuperscript{132} If the contractor cannot obtain written assurance that a supplier of a vital piece of technology will transfer it to the Enterprise, then the contractor may be unable to operate at all.\textsuperscript{133} In addition, the cost of obtaining written assurances from every supplier could be prohibitive.

Even if a contractor were able to obtain written assurances from all his suppliers, such assurances may be inadequate for the purposes of the Enterprise. Written assurances can range from non-binding statements of intent to legally binding and enforceable promises. The Convention provides no guidance concerning the degree of assurance which the contractor must obtain.\textsuperscript{134} The Authority has no jurisdiction over these third party suppliers; therefore, the legal nature of a written assurance must be determined by the applicable national legal order.\textsuperscript{135} If either the Enterprise or the contractor makes a claim in a national court, it could find that the form of assurance which a supplier has provided is not enforceable. The Convention does not provide for sanctions against third party suppliers;\textsuperscript{136} however, actions by third party suppliers could reflect unfavorably on a contractor, affecting future applications to work in the Area.

Similar problems emerge from the obligation of the contractor to acquire, by way of a legally enforceable contract, the right to transfer a technology to the Enterprise. Presumably, this obligation extends beyond the mere acquisition of equipment and applies to the acquisition of industrial property rights and know-how. Such rights are an economic asset, and potentially can be very costly for the contractor. The contractor is not obligated to incur substantial

\textsuperscript{131} Id. at 106.

\textsuperscript{132} NYHART, supra note 31.

\textsuperscript{133} W. HAUSER, supra note 122, at 106.

\textsuperscript{134} Id. at 107.

\textsuperscript{135} Id.

\textsuperscript{136} An earlier draft text contained a "black list" provision to provide sanctions against uncooperative third party suppliers, but this provision was deleted. See U.N. Doc. ICNT/Rev. 1, at Annex II, art. 5(1)(b) (1979). For all practical purposes, the Authority will view unfavorably an application by a previously uncooperative third party supplier.
costs. Nevertheless, problems may arise since the Convention provides no measure for "substantial cost" nor does the Convention address the potential problems inherent in an enforceable contract between the contractor and a third party supplier. The latter can impose terms and conditions on the contractor that the Enterprise might not want to accept. Conceivably, the Authority could pressure the contractor to pay whatever amount is required to obtain terms and conditions which are more amenable to the Enterprise.

Mandatory TOT to the Enterprise will undoubtedly burden contractors, particularly those whose primary business is mining, imposing added expenses in time, personnel, facilities, and money. Contractors may incur further costs by providing technical assistance and training for the Enterprise. Annex III, article 15 requires the contractor to establish training programs for the Authority and developing state personnel. Presently, the relationship between mandatory TOT and this provision is unclear; however, under Annex III, article 17, paragraph 1(b)(xi), the Authority can implement rules and regulations which could set parameters for training programs and impose the costs on the contractor.

The contractor is further obligated to facilitate TOT between third parties and the Enterprise. The contractor's efforts to fulfill this ambiguous obligation can only be judged on the "good faith" standard of Annex III, article 4, paragraph 6(c).

The mandatory TOT provisions of the Convention pose another even more costly problem for the contractor. The rationale behind proprietary rights is to provide a competitive advantage for devel-

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137 UNCLOS, supra note 4, Annex III, art. 5(3)(c); for text, see supra note 119.
138 W. Hauser, supra note 122, at 109.
139 Id.
140 Id. at 111. Presumably, this would burden less those consortia which form for the sole purpose of providing mining services.
141 UNCLOS, supra note 4, Annex III, art. 15: "The contractor shall draw up practical programmes for the training of personnel of the Authority and developing States, including the participation of such personnel in all activities in the Area which are covered by the contract . . . ."
142 Id. Annex III, art. 17(1)(b)(xi).
143 Id. Art. 5(3)(d):
[Every contract for activities in the area will obligate the contractor] to facilitate, upon the request of the Enterprise, the acquisition by the Enterprise of any technology covered by subparagraph (b), under license or other appropriate arrangements and on fair and reasonable commercial terms and conditions, if the Enterprise decides to negotiate directly with the owner of the technology . . . ."
144 Id. art. 4(6)(c); W. Hauser, supra note 122, at 111.
opers of new technology; however, when the contractor provides the Enterprise with technology, he is not only equipping a competitor but is also risking considerable erosion of his competitive advantage. This erosion would occur through the dissemination of the contractor’s technology by the Enterprise. Although the Enterprise is forbidden to pass on proprietary data received from contractors,\textsuperscript{146} no mechanism exists to discipline the Enterprise for transferring technology to third parties without the consent of the owner. In addition, the Enterprise has limited liability for damages arising from operations.\textsuperscript{146} Any decision made by the Sea-Bed Disputes Chamber or through commercial arbitration must be enforced either by states within their jurisdiction or through the Council’s power to issue directives to the Enterprise.\textsuperscript{147} The uncertain outcome of this procedure and the possibility of significant damage to the contractor’s proprietary rights and commercial advantage will create considerable disincentives for cooperation with the Enterprise. The threat to exclusivity of technology combined with the increased costs and risks inherent in mandatory TOT will inhibit innovation, efficiency, and investment.\textsuperscript{148}

C. Mandatory TOT to Developing States

Annex III, article 5, paragraph 3(e), requires the contractor to provide technology to developing countries that have applied to exploit a reserved site.\textsuperscript{149} The technology must be offered on the

\textsuperscript{146} UNCLOS, supra note 4, Article 168(2) and Annex III, art. 14(3).

\textsuperscript{146} Liability lies with the Authority. See id. at Annex III, art. 22; but see Annex IV, arts. 2(3), 13. Although the Enterprise is subject to the rules and regulations promulgated by the Authority, id. Art. 170(2) and Annex IV, art. 1(2), there is no mechanism for punishment.\textsuperscript{147} Id. at Annex VI, art. 39 and Arts. 162(2)(i), 170(2).

\textsuperscript{147} Id. at Annex VI, art. 39 and Arts. 162(2)(i), 170(2).

\textsuperscript{148} See W. HAUSER, supra note 122, at 111 n.352; Conrad Welling of Ocean Minerals Corporation said that it would be impossible to continue the development of ocean mining technology under the TOT provisions. The Washington Times, Oct. 20, 1982, at 4A, noted in Burke & Brokaw, supra note 97, at 53; Richard A. Letgatski, counsel to the National Ocean Industries Association, said that foreign consortia will not be able to operate efficiently because United States companies will refuse to do business with consortia subject to the TOT provisions. Id. But see Antrim & Sebenius, supra note 109, at 92 (The authors argue that the negative impact is not so great considering that the proprietary parts of mining technology represent less than one-third of capital cost); compare Antrim & Sebenius with NYHART, A Cost Model, supra note 132, at ES 3-4 (the baseline model estimates that research and development costs plus capital investment in technology comprises approximately one-fifth of total pre-recovery expenditures).


\textsuperscript{149} UNCLOS, supra note 4, Annex III, art. 5(3)(e):
same terms as to the Enterprise under the provisions for mandatory TOT to the Enterprise. The contractor is released from the obligation if the technology which the developing state requests has either been requested from or transferred to the Enterprise.\textsuperscript{150}

This provision, also known as the “Brazil Clause,” raises many of the same problems inherent in mandatory TOT to the Enterprise. The problem of protecting exclusive technology would be particularly acute. For example, if the developing states form a joint venture to perform the activity, the entire joint venture would have access to the technology. The technology could be used later by the individual countries in mining activities in their own Exclusive Economic Zones,\textsuperscript{151} resulting in more competition for the contractor. The contractor would have no redress for subsequent TOT by the developing state to third parties. In addition, the developing country can make the same determinations as the Enterprise when considering whether the same or equally efficient technology is available on the open market or whether the terms of transfer offered by the contractor are within the range of “fair and reasonable commercial terms and conditions.”

Considering the cost of seabed mining ventures, developing countries are unlikely to invoke the Brazil Clause.\textsuperscript{152} In this respect, the Brazil Clause is chiefly an ideological victory for the developing countries.\textsuperscript{153} Mandatory TOT in the case of the Enterprise can be distinguished as a special case because it is essential for the operation of a parallel system, but mandatory TOT to developing states is a precedent that runs contrary to the wishes of

\begin{footnotesize}
\begin{itemize}
\item [Every contract for activities in the area will obligate the contractor] to take the same measures as are prescribed in subparagraphs (a), (b), (c) and (d) for the benefit of a developing State or group of developing States which has applied for a contract under article 9 of this Annex, provided that these measures shall be limited to the exploitation of the part of the area proposed by the contractor which has been reserved pursuant to article 8 of this Annex and provided that activities under the contract sought by the developing State or group of developing States would not involve transfer of technology to a third State or nationals of a third State . . . .
\item Id. “The obligation under this provision shall apply with respect to any given contractor where technology has not been requested by the Enterprise or transferred by that contractor to the Enterprise.” Id.
\item Id. supra note 122, at 112.\textsuperscript{154}
\item The recognition of Exclusive Economic Zones under the treaty, UNCLOS, supra note 4, Part V, expanded coastal state jurisdiction over some of the most productive nodule deposits. See Pardo, An Opportunity Lost, in LAW OF THE SEA 19 (B. Oxman ed. 1983).
\item W. Hauser, supra note 122, at 112.
\item Id. at 113.
\end{itemize}
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the industrialized nations.

D. Mandatory TOT Dispute Settlement, Enforcement, and Related Provisions

Annex III, article 5, paragraph 4, prescribes the appropriate dispute resolution process and enforcement mechanism for issues arising under mandatory TOT both for the Enterprise and for developing states that invoke the Brazil Clause. The Authority may promulgate and impose arbitration rules in lieu of the UNCITRAL Arbitration Rules. If a finding by commercial arbitration is adverse to the contractor, he has forty-five days to revise his offer before the Authority takes enforcement action under Annex III, article 18. Other disputes concerning mandatory TOT are subject to compulsory settlement before the Sea-Bed Disputes Chamber pursuant to article 187(c)(ii), Part XV, and Annex VI. A finding adverse to the contractor can result in suspension or termination of the contract, or monetary penalties in accordance with Annex III, article 18.

If the Enterprise cannot obtain technology on fair and reasonable commercial terms and conditions, the Council or Assembly may then convene a group of signatory states which either have access to the technology or have sponsored contractors in the Area. This group must take “all feasible measures” within each state’s legal system to make the technology available. Unlike the other portions of article 5, this provision requires that the group of states ensure the availability of processing technology in addition to recovery technology. The “feasible measures” provision, in essence, obligates states to coerce owners of technology into providing technology to the Enterprise.

The obligation of contractors to provide the Enterprise with

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164 UNCLOS, supra note 4, Annex III, art. 5(4).
165 Id. See supra notes 124-31 and accompanying text. A commercial arbitral tribunal has no jurisdiction to decide a question of Convention interpretation. Such questions will result in referral to the Sea-Bed Disputes Chamber. UNCLOS, supra note 4, art. 188(2)(a).
166 UNCLOS, supra note 4, Annex III, art. 5(4).
167 Id. Annex III, art. 18.
168 Id. Art. 187(c)(ii) and Part XV and Annex VI.
169 Id. Annex III, art. 18.
170 Id.
171 Id. Annex III, art. 5(5).
172 Id.
technology expires ten years after the Enterprise begins commercial production. The Convention does not clarify whether the ten-year period would commence at commercial production of a joint venture with the Enterprise. The ten-year period is plainly viewed as adequate time for the Enterprise to become technologically self-sufficient; however, the prospect of such technological self-sufficiency raises concerns. Once the Enterprise is in control of technology, the developing countries may attempt to achieve their original goal of establishing exclusive mining rights for the Enterprise. By terminating the parallel system and replacing it with a unitary system, the developing countries could accomplish this goal. Adoption of the unitary system would require a three-fourths majority ratification or accession at the end of the Review Conference authorized by article 155.

E. Contractual TOT Under Joint Ventures with the Enterprise

The rules and procedures for mandatory TOT contained in Annex III, article 5 burden the contractor and contribute to uncertainty and risk. Concurrently, an inexperienced Enterprise will have difficulty in determining the most appropriate technology and in applying the technology efficiently and economically. A joint venture between the Enterprise and another public or private qualified party solves both of these problems. TOT in a joint venture can be negotiated independently from the Convention’s mandatory TOT provisions. This flexibility allows the miner to negotiate more favorable control over the dissemination of technology owned by himself and third parties, while the Enterprise can enjoy the benefits of an experienced and competent operation and its subsequent yield.

In negotiating provisions of a future joint venture regarding the use of technology, an important point is that the practical reason for the mandatory TOT in article 5 was to equip an Enterprise that would operate by itself. If the ideological reasons for mandatory TOT can be brushed aside, an Enterprise operating only in joint venture arrangements arguably would not require

163 Id. Annex III, art. 5(7).
164 Comment, supra note 42, at 106-07.
166 UNCLOS, supra note 4, Annex III, art 5(6).
mining technology.\textsuperscript{167} The "Operating Company" which the Enterprise and the qualified entity form would require access to the technology; therefore, the Enterprise would have access as a partner in the joint venture.\textsuperscript{168} In addition, personnel of the Enterprise would acquire familiarity with the technological processes used in seabed mining through their contact with the Operating Company.\textsuperscript{169} The joint venture contract could restrain the Enterprise from using any proprietary information, patents, and know-how in activities other than the joint venture.\textsuperscript{170} Transactional disputes can be handled by a wider variety of mechanisms than those provided in the treaty.\textsuperscript{171}

If the Enterprise engages in joint ventures, thereby making the mandatory TOT provisions inapplicable, it will generate a cooperative spirit with private industry and improve its subsequent ability to acquire technology on the open market. Enterprise personnel would also become familiar with the most efficient technology and technique for prospective Enterprise use. Overall, the joint venture alternative is the most advantageous for both parties.

F. Provision Implementation Summary

The application of the UNCLOS TOT provisions in their present form raises a number of problems. Some problems are notable. For example, the inability of a contractor to challenge the determination that the same or equally efficient technology is not available on the open market at fair and reasonable commercial terms and conditions is a clear weakness in the provisions. There are some provisions, however, such as the flexible joint venture alternative, that can be viewed optimistically. The negative impact of compulsory licensing, although contrary to principles of free enterprise, is substantially diminished by basing such a sale upon fair and reasonable commercial terms and conditions and by referring a dispute over those terms and conditions to commercial arbitration.

\textsuperscript{167} G. Jaenicke, E. Schanze, & W. Hauser, supra note 165, at 34.
\textsuperscript{168} Id.
\textsuperscript{169} Id. at 35.
\textsuperscript{170} Id.
Commentators view the TOT provisions of UNCLOS as being generally negative; however, most seem hopeful that the provisions will not be applied either because the Enterprise will resort to joint venture arrangements or will easily procure technology on the open market.\(^{172}\)

The Enterprise needs money to acquire technology; however, without United States support, the Authority might not receive the necessary financing to float a commercially viable Enterprise. Presently, the depressed metal markets preclude commercial feasibility; however, if enough market incentive exists to adequately finance the Enterprise, and if the Enterprise decides against joint venture, it must purchase the technology on the open market before invoking the mandatory TOT provisions.

Academic and industry views contrast sharply over the availability of technology to the Enterprise on the open market. Most scholarly commentaries conclude that the Enterprise will be able to purchase all necessary technology on the open market.\(^{173}\) The United States ocean mining industry, which apparently has concluded that it can operate outside the treaty,\(^{174}\) has determined that no one else can mine without United States technology and that United States companies will not do business with foreign consortia subject to the TOT provisions.\(^{175}\) This industry view ignores two basic facts. First, much technology is in the hands of non-United States interests either through independent development, equal access to technology through the consortium agreement, or transferred ownership.\(^{176}\) Second, many private United States developers of technology are either willing to sell to the En-

\(^{172}\) See W. Hauser, supra note 122, at 112; Burke & Brokaw, supra note 97, at 57; Antrim & Sebenius, supra note 109, at 92; G. Jaenicke, E. Schanze, & W. Hauser, supra note 165, at 36. See Jones, The International Seabed Authority Without U.S. Participation, 12 Ocean Dev. & Int'l L. 151 (1983).


\(^{175}\) Remarks of Richard A. Letgateski, counsel to the National Ocean Industries Association, noted in Burke & Brokaw, supra note 96, at 53.

\(^{176}\) See supra note 34.
Enterprises or have already put their technology on the open market to recoup development costs or to raise much needed capital. The Enterprise, if financed, probably will be able to obtain ocean mining technology on the open market. This conclusion weakens any practical objection to mandatory TOT; therefore, aside from their ideological content, the TOT provisions in UNCLOS, are an insufficient reason to reject the treaty as a whole.

CONCLUSION

The TOT provisions may be practically superfluous yet have considerable ideological significance. Developing countries have categorized technology under the general rubric of "the common heritage of mankind," and accordingly, have linked the issue of seabed exploitation to technology access. Mandatory TOT was an ideal rallying point for the G-77 in UNCLOS III. It had practical relevance to the negotiations at hand, and it tied those negotiations to ideological goals which unified the G-77 outside of the immediate issues. Proponents of the NIEO insist that the provisions have established a precedent for other economic and political negotiations.

Conversely, TOT became an ideological rallying point for the Reagan Administration. The mandatory TOT provisions, while probably threatening no practical adverse effects, were contrary to basic capitalist notions; therefore, their inclusion in the treaty helped justify the refusal of the United States to submit United States mining interests to supranational regulation. Opponents of the NIEO may feel that strong United States opposition to the UNCLOS mining regime effectively blocks any precedent for other economic and political areas.

If either side claims an ideological victory, it is a hollow victory. The polarization of UNCLOS III participants along the lines of the NIEO debate undermines the significance of an otherwise important contribution to international order. Future international negotiations cannot help but be tainted by the negative outcome of UNCLOS III.

Perhaps customary international law, and its subsequent codifications, remain flexible enough to meet the changing needs of nations with respect to the oceans. After all, the exigencies of today

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177 See Oxman, supra note 86, at 11 n.27.
178 Telephone interview with William Siapno, supra note 106.
are not necessarily those of tomorrow. Much of UNCLOS is or will become customary international law; however, the Convention itself as a codification will probably fail because of unique and perhaps overly ambitious provisions such as those on TOT, which attempt to codify a regime to manage the oceans. It may have been folly to attempt the imposition of such a codification on vast oceans and diverse nations, both of which continue to defy rational control. One of the many lessons that UNCLOS should teach us is that codifications of international law are unacceptable if static or immutable. The attempt, nevertheless, clarifies the conflicts between nations, hopefully leading to a broader understanding and a more flexible development of mutually beneficial common principles.

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