INTELLECTUAL PROPERTY AND SPACE ACTIVITIES†

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As space activities enter their second quarter century, private sector activity will increase dramatically. Space communications, which has been a viable industry since the 1960's, will continue to grow and diversify. The space shuttle has demonstrated that space manufacturing has a bright future and holds the potential of a multi-billion dollar industry within the next two decades. Use of data remotely sensed from the Earth holds commercial promise for the coming decade. Other potential industries include space launch services and orbital services. The advent of the space station, with the increased orbital time it will provide for all space activities, will herald a blossoming of commercial space activities.

Although many issues remain to be resolved for the commercial potential of space to be achieved, protection of data and products and ideas and inventions will be crucial to industry. The law affecting space activities has evolved over the past two and a half decades primarily in response to governmental activities. With the shift toward private entrepreneurial space ventures foreseen for the next few decades, industry will be looking for, and the law will evolve toward, means to protect private creative endeavors in space.

Private entities investing in commercial space ventures will spend large amounts of money over long periods of time before a return on investment can be expected. Those entities will require assurance that they can protect the ideas and inventions (the intellectual property) resulting from their space station activities. Without strong protection for patents, trade secrets, and proprietary data and know-how, companies will not have the incentive to invest in developing the commercial potential of a space station.

Many nations have systems for protecting intellectual property on Earth. Protection of intellectual property in space will undoubtedly be based in part on the existing international space agreements and in part on extension of national law, practice and regulation. In addition, developing case law nationally and perhaps internationally will set precedents for resolution of intellectual

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†The opinions and conclusions expressed in this article are those of the authors and do not necessarily represent the views of the Department of Commerce or the Pharmaceutical Manufacturers Association.

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property issues in space.

Concern over protecting intellectual property in space is not new at either the national or international level. But those concerns have been more theoretical then real, at least until recently. Now, increased capabilities to use space in a variety of ways have brought such issues to the forefront of attention. To highlight examples of consideration of intellectual property protection in both the international and national arenas, this paper outlines international interest in selected copyright issues in space communication and remote sensing, sets forth the U.S. national policy on space commercialization, and briefly summarizes U.S. national involvement in intellectual property protection issues.

International Law Of Outer Space

The substantive law of outer space consists of the United Nations' treaties: the Outer Space Treaty,[1] the Astronaut Rescue Agreement,[2] the Liability Convention,[3] the Registration Convention,[4] and the Moon Treaty.[5] These treaties form the largest and most important body of international space law. Although they primarily address the space activities of sovereign states, they also contemplate non-governmental entities engaging in space activities. Thus, the existing law of outer space lays some restrictions and obligations on private endeavors in space. Article I of the 1967 Outer Space Treaty provides that, just as with governmental activities, private space activities are to be for peaceful purposes and carried out for the benefit of all countries. Further, private space activities under Article VI of the Treaty must be under the authorization and continuing supervision of the launching state, with that state bearing international responsibility for its activities, both private and governmental.

Existing international space law does not address protection of private

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[1]Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, commonly referred to as the Outer Space Treaty, *opened for signature*, Jan. 27, 1967, and *entered into force* Oct. 10, 1967.

[2]Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, *opened for signature* April 22, 1968, and *entered into force* Dec. 3, 1968.

[3]Convention on International Liability for Damage Caused by Space Objects, *opened for signature* March 29, 1972, and *entered into force* Oct. 9, 1973.

[4]Convention on the Registration of Objects Launched Into Outer Space, *opened for signature* Jan. 14, 1975, and *entered into force* Sept. 15, 1976.

[5]Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, commonly referred to as the Moon Treaty, *opened for signature* Dec. 5, 1979, and *entered into force* July 11, 1984. The United States is not a signatory to this treaty. The five states which have ratified the treaty are Chile, the Philippines, Austria, the Netherlands and Uruguay.

sector interests in general, much less private sector rights in intellectual property. One particular aspect of private sector rights, which has generated a great deal of discussion at the United Nations, is the question of the meaning of space activities carried out "for the benefit and interests of all countries" (Article I of the Outer Space Treaty). In practice, that phrase has been interpreted in the United States to mean that all countries should share in the benefits from space activities, but not that any country must share its proprietary technology or its profits.[6] Thus, this provision of the Outer Space Treaty has been interpreted as a philosophical guide.[7] Benefits of space activity do reach nations and people throughout the world, as the commercial use of satellites for worldwide instantaneous communication clearly demonstrates, even though profits may go to a particular corporation or organization which owns the satellite.

The Moon Treaty, which was entered into force this past July, though it has yet to be ratified by a major space power, may raise the theoretical question of whether the "common heritage of mankind" concept embodied in that treaty would extend to proprietary technology. In the authors' view it clearly would not. In any event, the United States does not adhere to the Moon Treaty nor to the idea that "common heritage" means common ownership of space resources and majority control over their disposition.[8] Without a reasonable opportunity to receive a return on investment, private industry would be unlikely to devote the resources to develop commercial space activities.[9]

Copyrights and Space Communication

As technology for satellite transmission and reception has progressed, the question of the protection of property rights in space transmission has become increasingly important. Protecting copyrighted works transmitted by satellite from unauthorized interception and use has been an international concern since the 1960's. International communications law, as embodied in the International Telecommunication Convention and the Radio Regulations of the International Telecommunication Union (ITU), does not appear to provide sufficient protection for copyrighted material transmitted by satellite.[10] Though

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[6]Pikus, *Law and Security in Outer Space: Private Sector Interests*, 11 J. SPACE L. 112-13 (1983).

[7]Trimble, *The International Law of Outer Space and its Effect on Commercial Space Activities*, 11 PEPPERDINE L. REV. 560 (1984).

[8]SENATE COMMITTEE ON COMMERCE, SCIENCE AND TRANSPORTATION, POLICY AND LEGAL ISSUES INVOLVED IN THE COMMERCIALIZATION OF PRT., S. DOC. NO. 98-102, 98th Cong., 1st Sess. 32 (1983).

[9]Hoover, *Law and Security in Outer Space From the Viewpoint of Private Industry*, 11 J. SPACE L. 123 (1983).

[10]International Telecommunications Convention (Malaga-Torremolinos 1973) (Nairobi 1982), as completed by the International Radio Regulations.

Article 22 of the Convention and Article 17 of the Regulations require member states to keep certain telecommunications secret, their relevance to interception of satellite signals is uncertain. Further, ITU sanctions may not be strong enough to make this an effective tool. Existing international copyright agreements such as the Universal Copyright Convention (UCC), to which the United States adheres, and the Berne Convention for the Protection of Literary and Artistic Works were not drafted to take into account unauthorized interception of satellite transmissions.[11] The protection either treaty might provide for broadcast material transmitted in space is unclear.

Because of the perceived deficiencies in international protection for material transmitted in space, various United Nations' agencies became active in the late 1960's in studying the copyright problems of satellite transmission.

In 1968, the United International Bureaus for Protection of Intellectual Property (BIRPI), the predecessor to the World Intellectual Property Organization (WIPO), convened a working group to study the problems which might arise for copyrights and neighboring rights in radio and TV program transmissions using communications satellites. The next year, UNESCO, together with BIRPI, started considering whether to amend existing international agreements or to negotiate a completely new multilateral convention.

A Committee of Governmental Experts met three times (1971, 1972 and 1973) to find appropriate solutions to copyright issues raised through increasing use of satellites for broadcast communication. WIPO and UNESCO jointly called a Diplomatic Conference in Brussels in May 1974 to draft a new international agreement. The resulting Convention Relating to the Distribution of Program-Carrying Signals Transmitted by Satellite (more commonly known as the Brussels Satellite Convention) was opened for signature on May 21, 1974.[12] Fifteen states, including the United States, signed the Convention at the end of the Conference. The Convention was entered into force on August 25, 1979, when the required five states had ratified the Convention.

The Brussels Satellite Convention deals with the signals and not the messages that those signals carry, i.e., the container and not the content. States party to the Convention pledge to take "adequate measures to prevent the distribution on or from its territory of any program-carrying signal by a distributor for whom the signal emitted to or passing through the satellite is not intended." The Convention leaves it to each contracting state to determine what those "adequate measures" are. That is, each state could use civil, commercial or regulatory measures, at its own discretion, to implement the treaty. Direct broadcast satellite signals are expressly excluded from the scope of the Convention. The Convention contains special provisions for developing coun-

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[11]Universal Copyright Convention (Paris 1971). Berne Convention for the Protection of Literary Works (Paris 1971).

[12]Convention Relating to the Distribution of Programme-Carrying Signals Transmitted by Satellite, commonly known as the Brussels Satellite Convention (Brussels 1974).

tries for educational or informational use of parts of programs, i.e., "fair use."

As the United States considered adherence to the Brussels Satellite Convention, questions arose as to whether existing U.S. law was adequate to meet the Government's obligations under the treaty. Recently, the U.S. Government concluded that existing U.S. law provides a sound legal basis for implementation of the Convention. On August 16, 1984, the President transmitted the treaty to the Senate for advice and consent to ratification. The Senate gave its advice and consent on October 12, 1984, and the United States deposited its instruments of ratification on December 7, 1984.[13]

The emergence of direct broadcast satellite technology also raises copyright issues. Direct broadcast satellites (DBS) can be used to broadcast directly into individual home receivers. In such broadcasting, the originating organization itself makes the distribution and, thus, carries out a broadcast in the conventional sense. On the Earth's surface, then, DBS broadcasts are clearly subject to existing copyright laws. The situation becomes complex, however, when tracing how the licensing of copyrighted material for use in different countries via a direct broadcast satellite will work. The distinction between who is the originator and who is conducting a simple transmission, and when a public performance of the protected work occurs, may blur. As direct broadcast satellite technology develops, further copyright protection issues will undoubtedly be raised. The World Intellectual Property Organization maintains an active interest in the effects of broadcasting technology on intellectual property rights. This March, WIPO and UNESCO will jointly sponsor a meeting on copyright problems of direct broadcast satellites.

In the United Nations, protection of property rights in intellectual property is intermingled with consideration of human rights and sovereign rights. Thus, transmission of data, whether terrestrially or by communications satellite, can present thorny issues to resolve. The main bodies in the United Nations which have dealt specifically with the intellectual property are UNESCO and WIPO. The UN Committee on the Peaceful Uses of Outer Space (COPUOS) has extensively considered satellite broadcasting technologies such as DBS, but not in terms of property rights in the transmission, but rather in terms of free flow of information versus some undefined "right" to restrict the flow of information.

Commercialization of Remote Sensing from Space

Recent remote sensing commercialization activities in the United States and internationally highlight unresolved intellectual property protection issues. The French Earth Observation Satellite (SPOT), scheduled for launch in 1985, raises a thorny copyright issue. SPOT data will be offered for sale as both standard data and value-added products. What rights the parent company,

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[13]To date, the following countries have ratified the Brussels Satellite Convention: the Federal Republic of Germany, Italy, Kenya, Mexico, Morocco, Austria, the United States of America and Yugoslavia. Nicaragua acceded to the treaty.

SPOT Image, may retain over remote sensing data enhanced by one of the distribution centers and sold as a derived product, a map for example, remains to be resolved.

Because copyright does not protect data but only its form of expression, further problems will have to be resolved to protect remote sensing data itself. Just where the boundaries are drawn, and what is the "protectible expression" of remote sensing data, remain to be worked out.

At present in the United States, unenhanced remote sensing data from LANDSAT is sold to all customers at cost and on a nondiscriminatory basis. The United States claims no copyright, or other proprietary interest, in its further distribution. Under this Administration's policy directive and newly enacted statute,[14] however, the United States is proceeding with privatization of the Government's remote sensing system, LANDSAT, through the competitive bid process. Title VI of Public Law 98-365, enacted this past summer, addresses the copyright-like rights that the private system operator will have in the data. The operator will have the exclusive right to sell all unenhanced data for a period not to exceed ten years from the date the data is sensed. After that period, the data comes into the public domain. Further, the unenhanced data may be sold by the system operator on the condition that such data will be sold on a nondiscriminatory basis to all potential users.

The statute defines the unenhanced remote sensing data sold by the private system operator as "unprocessed or minimally processed signals for film products collected from civil remote sensing space systems. It further defines minimal processing to include "rectification of distortions, registration with respect to features of the Earth, and calibration of spectral response." Minimal processing expressly excludes "conclusion, manipulations, or calculations derived from such signals or film products or combination of the signals or film products with other data or information." Thus, value-added data are not subject to the system operator's exclusive rights in the unenhanced data. Clearly, developing value-added data involves a creative process. How the expressions of this creative process, the value-added or enhanced data, will be protected remains to be seen. Copyright protection would appear to apply. In practice, the distinction between the system operator's exclusive rights to minimally processed data versus purchasers' rights to enhance the data using intellectual processes may need more precise definition. It seems likely that such distinctions will be made through case law as the United States gains experience with private sector operation of land remote sensing systems.

U.S. National Policy on Space Commercialization

As the United States moves toward commercialization of a range of space

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[14]Land Remote Sensing Commercialization Act of 1984, Pub. L. No. 98-365, 98 Stat. 451 (July 17, 1984). *See*, J.V. Byrne, Administrator of the National Oceanic and Atmospheric Administration, statement delivered at news conference, U.S. Department of Commerce (March 8, 1983).

activities, intellectual property protection in space is being considered at the highest levels of government. In the State of the Union Message to the American people last January, President Reagan called for development of space as the next frontier.[15] He labelled this as one of four great goals for the 1980's. The President directed NASA to develop a permanently manned space station within a decade, noting that "we will soon implement a number of executive initiatives, develop proposals to ease regulatory constraints, and, with NASA's help, promote private sector investment in space."[16]

Since that time, government and private industry have intensively studied issues relating to space commercialization and potential commercial space initiatives. On July 20, 1984, the President released the National Policy on the Commercial Use of Space.[17] This policy contains economic, legal and regulatory, and research and development initiatives, as well as initiatives to implement the new policy. Significantly, though the policy statement is brief, one of the specific initiatives is to provide additional protection of proprietary information through the NASA Act.[18] This initiative calls for an amendment to the NASA Act to provide for a limited exemption from Freedom of Information Act provisions for proprietary industry data submitted to NASA and relating to space commercialization.

This initiative demonstrates the Administration's sensitivity to industry's concerns in this key area. Lead times are very long in space programs generally, and space commercialization endeavors may not see a payback for 7 to 10 years, if then, rather than the 3 to 5 years industry usually relies on to receive a return on investment. The details of the implementation of the National Policy on Commercial Use of Space will be elaborated on by the Working Group on the Commercial Use of Space. This Working Group, also established under the new commercial space policy, reports to the Cabinet Council on Commerce and Trade and is chaired by a representative of the Department of Commerce, with a vice chairperson from NASA. Creation of this working group, which gives high-level, national focus to commercial space issues, shows the seriousness of the Administration's commitment to removing the barriers inhibiting commercial activities in space.

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[15]Message From the President of the United States Transmitting a Report on the State of the Union, H.R. Doc. No. 98-162, 98th Cong., 2d Sess. 5 (1984).

[16]President Ronald Reagan's Radio Address to the Nation, 20 WEEKLY COMP. PRES. Doc. 113 (Jan. 28, 1984).

[17]The White House, Office of the Press Secretary, National Policy on the Commercial Use of Space, Fact Sheet (July 20, 1984).

[18]National Aeronautics and Space Act of 1958, *as amended*, Pub. L. No. 85-568, 72 Stat. 426.

NASA and Protection of Intellectual Property

In resolving issues relating to protection of intellectual property in space, the Working Group will certainly be able to benefit from the precedents already established by NASA. Some believe that an amendment to the NASA Act to provide additional protection for proprietary information relating to commercial space activities may not be necessary; that is, that NASA's current authority to protect such information has been used successfully and can meet future requirements. Others believe that a specific amendment to the NASA Act must be sought in order to guarantee industry the security it requires to expend the funds necessary for development of commercial space activities. A final decision on this has yet to be made, but when it is, it will undoubtedly take into consideration the NASA experience.

Through the years, NASA has developed flexible intellectual property policies which have worked extremely well to protect proprietary interests and to encourage industrial participation in commercial space activities. These NASA policies are summarized below.[19]

Section 305 of the NASA Act sets forth the property rights in inventions made under NASA contract.[20] Though title to such inventions rests with the Government, NASA has a broad waiver policy, retaining only a nonexclusive, royalty-free license for government use and the right to "march-in" if the contractor is not developing the invention. Historically, NASA has granted most requests for waivers.

In addition, NASA has interpreted Section 305 as applying only to contracts which are for the performance of work of an inventive nature (or research and development) for NASA. As a result of its interpretation of the definition of a contract, NASA has been flexible and innovative in dealing with patent rights and the private sector.

On February 18, 1983, President Reagan signed a Memorandum on Government Patent Policy intended to foster commercialization of new technology.[21] The 1983 policy statement directs all U.S. Government agencies, to the extent permitted by law, to give contractors or grantees the first option to retain title, i.e., commercial rights to all inventions they make under government sponsorship. The Government retains a broad royalty-free license, and statutory "march-in rights." The President's statement basically reaffirmed what had been NASA's historical practice of using its patent policies to encourage

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[19]For more detailed discussions on NASA regulations and practice, see Mossinghoff, *Intellectual Property Rights in Space Ventures*, 10 J. SPACE L. 107 (1982), and G.J. Mossinghoff, *Protecting Intellectual Property in Space Activities*, in ENCOURAGING BUSINESS VENTURES IN SPACE TECHNOLOGIES, Appendix 5 (National Academy of Public Administration 1983).

[20]National Aeronautics and Space Act of 1958, *as amended*, Pub. L. No. 85-568, § 305, 72 Stat. 426, 440.

[21]1 PUB. PAPERS 248 (1983).

commercialization of technology developed under NASA funding. NASA is now specifically applying the criteria for the 1983 policy, in acting on requests for waiver of rights to inventions made in the performance of work under NASA contract.[22]

Rights to data, i.e., rights to valuable technical, commercial and financial information, may equal patents in importance to industry in developing commercial space activities. NASA has no express statutory requirements directing its use of data produced during the performance of a contract. Use of such data, however, must conform to Section 203(a)(3) of the NASA Act, which requires that NASA "provide for the widest practicable and appropriate dissemination of information concerning its activities and the results thereof."

Further, the provisions of the Freedom of Information Act (FOIA)[23] must be considered when developing policy on distribution and use of data. The Freedom of Information Act requires government agencies to release records upon request unless those records fall under nine specific exemptions. Exemption (b)(4) relates to trade secrets and confidential business information. In the last Congress, the Reagan Administration strongly supported S.774, a Freedom of Information Act reform bill, which would have, among other things, provided greater procedural protections for submitters of confidential information under Exemption (b)(4). Greater procedural protections would have been provided by allowing those submitters to participate in agency decisions on whether to release such information.[24] In this Congress, the question of additional protection for confidential business information is likely to be considered again.

NASA's policy on rights in technical data takes into account these two statutory provisions. For procurement contracts, NASA normally acquires the data produced in performance of the contract with "unlimited rights;" that is, without restriction regarding its publication, use or disclosure. NASA's policy is not to acquire "protectible" data unless there is a real need for it. If acquiring such data is necessary, however, NASA's policy is to acquire it with "restricted rights," i.e., under express agreement or understanding not to use or disclose it in any way which would compromise it as in intellectual property right.

This policy applies also to data furnished to NASA by companies competing for NASA contracts. For example, under the request for proposals for space station definition and design, NASA will have unlimited rights to all data contained in the proposals unless the offeror states specifically that such data constitutes a trade secret and/or information that is commercial, or financial and confidential, or privileged. All data to be furnished to NASA under the space station definition and design contract, or resulting from conduct of that con-

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[22]48 Fed. Reg. 22132-33 (1983).

[23]Pub. L. No. 89-554, 89 Stat. 383 (1966) *as amended. See* Pub. L. No. 94-409, 90 Stat. 1247 (1976).

[24]The Freedom of Information Reform Act, S.774, 98th Cong., 2d Sess. (1984).

tract, will be with unlimited rights. The only exception will be for contractor claims to copyright in scientific and technical articles based on data produced in performance of the space station contract and published in academic, technical and professional journals. This is the standard NASA policy for copyrights involved in data produced under NASA contracts.[25] Generally, a contractor must have permission from NASA to claim a copyright in data first produced under contract. NASA grants such permission automatically at the time of contracting.

Two recently enacted statutes demonstrate the importance to industry and the government of delineating who retains what rights to technical data when competing for government contracts. These two measures, P.L.98-525 and P.L.98-557, both require the Executive Branch to define by regulations the legitimate rights of the United States and of contractors and subcontractors in technical data.[26] Technological innovation in any field, as well as in space activities, can best be encouraged if contractors and the Government alike have a clear understanding of their respective rights in technical data. From industry's perspective, excessive restrictions on data could threaten product rights in commercial markets. Thus, these two measures, which seek a balance between excessive restrictions and the Government's legitimate interests in technical data, form part of the existing body of law affecting intellectual property.

Historically, NASA has tried not to acquire "protectible" data unless it is essential and then only acquire it with limited rights. This has been true for reimbursable launch services. Under reimbursable launch service agreements, the user will retain all patent and data rights. The user only has to supply NASA with data sufficient to verify peaceful purposes, i.e., ensure launch vehicle safety, and ensure Government compliance with existing laws and Government obligations.

A number of companies are now interested in developing their own launch vehicles, and other companies are interested in purchasing U.S. launch vehicles to operate them commercially. In February 1984, the President named the Department of Transportation as the lead agency for licensing private sector expendable launch vehicles.[27] The Department of Transportation must obtain, just as NASA has in launching private payloads, sufficient data from the owners of private launch vehicles to assure that launches will be for peaceful uses, that launches will meet safety requirements and that U.S. Government obligations will be met and existing laws complied with. As industry explores new areas of potential commercial application, such information may increasingly be seen by industry as sensitive. Some observers predict that what has worked well in the past, with NASA-required data for reimbursable launches, may not

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[25]48 C.F.R. §§ 18-52.227-74 (1984).

[26]Defense Procurement Reform Act of 1984, Pub. L. No. 98-525, Title XII, 98 Stat. 2492, and Small Business and Federal Procurement Competition Enhancement Act of 1984, Pub. L. No. 98-577, Titles I-IV, 98 Stat. 3066.

[27]Exec. Order No. 12465, 20 WEEKLY COMP. PRES. DOC. 263-64 (Feb. 24, 1984).

work as well for industry as it moves to use commercial expendable launch vehicles and to explore possible commercial products that could be manufactured in space. This is an area that the Department of Transportation is studying carefully to see how best U.S. oversight of commercial space launches may be carried out without requiring disclosure of commercially sensitive data. To this end, the Department of Transportation will shortly publish a Policy Statement and Advance Notice of Proposed Rulemaking on Licensing Procedures for Expendable LaunchVehicles.

Future space activities will provide greater opportunity for reimbursable commercial use than the shuttle now does. The question of who should hold rights in inventions made by reimbursable users on the space station, for example, is vital to potential users. NASA's current policy for reimbursable shuttle users has worked well and will probably be the basis for allocation of rights on the space station. This policy, as set forth in the regulations on shuttle reimbursement, is that the user should retain all patent and data rights.[28]

The policy states that "NASA will not acquire rights in inventions, patents, or proprietary data privately funded by a user, or arising out of activities for which a user has reimbursed NASA under the policies set forth herein." One important provision of the regulation states that for activities which may significantly affect public health, safety or welfare, NASA may obtain assurances that the results will be made available to the public. Such assurances, if determined necessary by the NASA Administrator, will be written into the agreement before it is entered into, not after an invention has been made. Under NASA's policy for reimbursable shuttle users, the only data the user is required to furnish to NASA are those sufficient to verify peaceful purposes, to ensure shuttle safety, and to ensure NASA's and the U.S. Government's continued compliance with existing laws and Government obligations. NASA has no plans to acquire proprietary data from shuttle users.

The space shuttle and the Spacelab have increased the opportunity for experimentation in space. Materials processing, particularly, holds great promise for the future. Through its ability to structure new arrangements with the private sector, NASA has been able to form joint endeavors with industry to explore promising areas with an eye toward commercialization.

Joint endeavors are usually arrangements between NASA and a private party to undertake a project of mutual benefit without any transfer of money or title to property. Joint endeavors can involve use of equipment, facilities, services, personnel or information made available by one party for the use of the other. Because such joint endeavors are not defined as "contracts" under Section 305(a) of the NASA Act, NASA has been able to negotiate intellectual property rights, including both patents and proprietary data rights, to encourage private participation in commercial activities in space. Though each such joint endeavor has been, and will continue to be, negotiated on an individual basis, in general the private party has been able to retain rights to inventions and proprietary data produced in carrying out its responsibilities

[28] 14 C.F.R. § 1214.104 (1981).

under the agreement. NASA has contingent rights to assure access to the technology should the private participant not carry out its responsibilities under the agreement. NASA also retains the right to a contingent royalty-free license to practice any such inventions in the space environment only for the Government. Also, the joint endeavor agreements generally take into consideration public needs in health, safety and welfare.

A very successful, and the best known, joint endeavor agreement is the 1980 agreement between NASA and McDonnell Douglas on using electrophoresis for drug processing in space.[29] To promote innovation in the technology covered by this agreement, NASA agreed not to fund or engage in another joint endeavor on this specific materials processing technology. NASA may, however, continue to work in related areas and may sell flight time on the shuttle, on a fully reimbursable basis, to other organizations involved in other space processing endeavors.

McDonnell Douglas believes that such process exclusivity is essential to its obtaining a return on its investment. By the early to mid-1990s, McDonnell Douglas predicts, space processing will generate $1 billion in annual sales for its initial drug product.[30] The McDonnell Douglas processor has been carried on several shuttle flights and has demonstrated the feasibility of the process. On Mission 41D this past August, the shuttle carried the McDonnell Douglas developmental electrophoresis machine and the company's engineer, Charles D. Walerk, to run the machine. The company targets 1987 for the first public sale of the drug, a full ten years since the initiation of the project in 1977. McDonnell Douglas expects to be processing up to ten new drugs by the late 1990s. To gain more processing time than is available during the week long shuttle missions, McDonnell Douglas is looking at renting Leasecraft satellites and even development of a special factory spacecraft.

The joint endeavor agreement clearly can be a very effective tool to interest the private sector in devoting the resources to develop potential commercial processes. NASA has signed three other joint endeavor agreements covering patent rights. These three agreements were signed with Microgravity Research Associates for production of gallium arsenide crystals in space, with Fairchild Industries for development of the Leasecraft Spacecraft, and with Spaceco, Ltd., for a shuttle payload bay monitoring instrument.

NASA also has technical exchange agreements under which NASA and a private party can exchange know-how, but only that which can be used without restriction. Exchange of any "protectible" information would only be as provided in the agreement and all such information would be maintained in confidence.

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[29]Agreement Between the National Aeronautics and Space Administration and McDonnell Douglas Astronautics Company for a Joint Endeavor in the Area of Materials Processing in Space, *signed* Jan. 25, 1980.

[30]*Medicine Sales Forecast at $1 Billion*, 120 AVIATION WEEK & SPACE TECH. 52 (1984).

With the prospect of an operating space station within a decade, protection of intellectual property rights will assume even greater importance as more industries, including nonaerospace industries, take advantage of the increasing opportunities for involvement in space. The American Institute of Aeronautics and Astronautics (AIAA) recently compiled a list of over 350 companies which are involved in various aspects of space commercialization.[31] Some of these companies were formed specifically to explore commercial space opportunities. Not all of them will be successful, but new ones will continue to take the place of those that fall by the wayside. During the process, being able to protect and commercialize new technology and data developed in space, on the shuttle, on free-flying laboratories and on the space station, will play a large role in fostering commercialization.

Though NASA policies, practices and procedures have been flexible and have met industry's need for security of proprietary interests, the space station may raise new issues and questions to be resolved, particularly in view of the fact that use of the station will almost certainly be international and development of it may well be. The countries and companies involved in the space station will require absolute protection for their proprietary interests in the hope of recovering the large front-end costs of space commercialization.

A prime question is whether intellectual property rights based on intellectual property law would remain valid in outer space which is, by definition in the Outer Space Treaty, nonnational territory. Does U.S. patent law, or any national patent law, have extra-territorial reach into space? Will a U.S. space station be considered American territory? What about a U.S. space station with privately or foreign owned plug-in manufacturing modules? Or a European space station used by U.S. companies? These are the kinds of issues that will need to be addressed as space station planning progresses. In the United States, NASA is studying the necessity for an amendment to the Space Act to clarify and provide certainty for jurisdictional issues relating to patent protection in space.

Another issue concerns whether an invention made in space can be proved to show first inventorship. The United States is one of only three countries in the world (Canada and the Philippines being the other two) which uses a first-to-invent system. All other countries use a first-to-file system. Thus, for U.S. patents, an inventor must be able to prove first invention on the space station, space shuttle or free-flying space laboratory. There is no case law on this yet. A sign of the maturing of commercial space activities will undoubtedly be when proving first inventorship in space becomes an issue.

It may well be that various governments with active space programs, especially those which are going to be involved in space station activities, will have to resolve jointly the status of patent protection in space, and protection of other intellectual property as well. As the members of the European Space Agency meet in Rome at the end of January to discuss participation in the

[31]List compiled by the American Institute of Aeronautics and Astronautics, 1633 Broadway, New York, NY 10019 (April 1, 1984).

U.S. space station, controls on the transfer of intellectual property will undoubtedly be on the agenda.

Industry, as well as government, will be interested in protecting proprietary information and products as they become increasingly involved in commercial space activities. Companies will need the incentives of strong intellectual property systems to continue to invest in the developmental programs which are the initial steps into space commercialization. Concern with strengthening intellectual property protection is international. Resolving the many unanswered questions and issues will undoubtedly require international involvement.

NASA has developed quite successful regulations, procedures and policies to handle intellectual property during the first quarter-century of the space age. It is likely that NASA's experience and practice will serve as a basis, or at least a starting point, for resolution of these issues as space commercialization activities continue to increase.