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## PROTECTING INTELLECTUAL PROPERTY IN SPACE

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Abstract

With the advent of the space shuttle and serious planning for a future space station, opportunities for profitable private sector activities in space are increasing. Many intellectual property protection issues--that is, issues concerning patent, copyright, and trade secret protection for the products of human creativity--will be raised by space commercialization activities. Space technology is often novel and the body of law protecting it, both nationally and internationally, is still developing. For example, developing technology for space communications raises a number of copyright issues, as does commercialization of remote sensing data. In the United States, protecting intellectual property is considered essential to providing incentives for commercial involvement in space. The National Aeronautics and Space Administration's flexible, effective intellectual property policies may be used as a starting point or model in resolving issues arising out of future space commercialization activities.

Introduction

Since the beginning of the space age less than three decades ago, incredible strides have been taken in understanding the space environment, in exploring it and in using it. Up to the present, those activities have been carried out predominantly--although not exclusively--by governmental agencies. We now stand on the threshold of a new era, one in which private sector activity in space will increase dramatically. For a long time, space communications has been a profitable industry. Other potential industries now on the horizon include remote sensing from space, manufacturing in space, direct broadcasting, and providing launch and other space vehicle services. Many factors will affect how these industries develop, or indeed, if they develop as commercially profitable ventures at all. But key among these factors is whether sufficient incentives exist for the private sector to undertake commercial space activities; that is, whether companies believe they can obtain a sufficient return on their investment.

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In developing and commercializing any new technology--on Earth or in space--protecting the results of one's creativity is vital to success. Many times creativity results in intangible--or intellectual--property, which includes patents, copyrights, trademarks, and trade secrets. The national laws and international agreements providing for intellectual property protection on Earth are well-known, and unresolved areas fairly well defined. However, in some emerging technologies, for example, semiconductor chip design, traditional forms of protection may not be adequate to protect intellectual property rights. In space, intellectual property protection is subject to greater unknowns. The technology is often novel and the law at best developing. The international law of outer space is based essentially on the interpretation and implementation of the United Nations' space treaties.<sup>1</sup> These treaties primarily address governmental activities in space, although they do not bar non-governmental ventures. The treaties do not specifically address intellectual property protection, which is very important to private sector commercial involvement in space activities, and thus they can serve only as the most general of guidelines in considering such issues. The recognition of the rights and responsibilities of non-governmental entities in space will evolve with increasing activity by such entities in the space environment.

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 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 than real, at least until recently. Now increased capabilities to use space in a variety of ways have brought such issues to the fore in both arenas. To highlight examples of intellectual property protection consideration in both the international and national arenas, this paper outlines international interest in selected copyright issues in space communication and remote sensing and briefly summarizes U.S. national involvement in intellectual property protection issues.

## 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 1960s. International communications law, as embodied in the International Telecommunications Convention and the Radio Regulations of the International Telecommunications Union, does not appear to provide sufficient protection for copyrighted material transmitted by satellite.<sup>2</sup> Though 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--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.<sup>3</sup> 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 1960s 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 Programme-Carrying Signals Transmitted by Satellite (more commonly known as the Brussels Satellite Convention) was opened for signature on May 21, 1974.<sup>4</sup> Fifteen states, including the United States, signed the Convention at the end of the Conference. The Convention 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 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 programme-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 countries 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 has concluded that existing U.S. law provides a sound legal basis for implementation of the Brussels Satellite Convention. On August 16, 1984, the President transmitted the treaty to the Senate for advice and consent to ratification. At this time, seven countries have ratified the treaty and one has acceded to it.<sup>5</sup>

Copyright issues are also raised by the emergence of direct broadcast satellite technology. 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. However, the situation becomes complex 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. For example, next year WIPO will sponsor jointly with UNESCO 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 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, not in terms of property rights in the transmissions, 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, SPOT Image, may retain over remote sensing data enhanced by one of the distribution centers and sold as a derived product--for example, a map--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. However, under this Administration's policy directive and newly enacted statute,<sup>6</sup> 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 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 10 years from the date the data are sensed. After that period, the data come into the public domain. Further, the unenhanced data may be sold by the system operator on the condition that such data will not be reproduced or disseminated by the purchaser. Data sold will be 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 commerciali-

zation of a range of space 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.<sup>7</sup> He labelled this as one of four great goals for the 1980s. 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."<sup>8</sup>

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.<sup>9</sup> 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 Space Act. This initiative calls for an amendment to the Space 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 7-10 years, if then, rather than the 3-5 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, will report to the Cabinet Council on Commerce and Trade and will be 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.

#### 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 Space 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 a flexible intellectual property policy which has worked extremely well to protect proprietary interests and encourage industrial participation in commercial space activities. These NASA policies are summarized below.<sup>10</sup>

Section 305 of the Space Act sets forth the property rights in inventions made under NASA contract.<sup>11</sup> 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.

Last year, President Reagan signed a Memorandum on Government Patent Policy intended to foster commercialization of new technology.<sup>12</sup> This policy directs all U.S. Government agencies, to the extent permitted by law, to give contractors or grantees the first option to retain title--that is, 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 policy statement basically reaffirmed what had been NASA's historical practice of using its patent policies to encourage commercialization of technology developed under NASA funding. NASA is now specifically applying the criteria of the 1983 policy in acting on requests for waiver of rights to inventions made in the performance of work under NASA contract.<sup>13</sup>

Rights to data 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. However, use of such data must be in conformance with Section 203(a)(3) of the Space 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)<sup>14</sup> must be considered when developing policy on distribution and use of data. In general, NASA tries not to acquire "protectible" data unless it is essential and then only acquire it with limited rights. NASA acquires data from the performance of a contract with unlimited rights.

For reimbursable launch services, NASA also does not want to acquire proprietary data from users. Under reimbursable launch service agreements, the user will retain all patent and data rights. The user only has to supply NASA with that data sufficient to verify peaceful purposes, ensure launch vehicle safety, and Government compliance with existing laws and Government obligations.

A number of companies are now interested in developing their own launch vehicle and other companies are interested in purchasing U.S. launch vehicles to operate them commercially. Last February, the President named the Department of Transportation as the lead agency for licensing private sector expendable launch vehicles.<sup>15</sup> 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 launches will be for peaceful uses, 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 work as well for industry as it moves to commercialize 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.

With the advent of the space shuttle and the Spacelab, the opportunity for experimentation in space is increased. 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 Space Act, NASA has been able to negotiate intellectual property rights--both patents and proprietary 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 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.

The best-known joint-endeavor agreement--and a very successful one--is the 1980 agreement between NASA and McDonnell Douglas on using electrophoresis for drug processing in space.<sup>16</sup> 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, but NASA may

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.<sup>17</sup> The McDonnell Douglas processor has been carried on five shuttle flights and 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. Walker, to run the machine. The intent is to obtain sufficient quantities of the material being processed to start human patient testing either this year or early next year. The company targets 1987 for first public sale of the drug, a full 10 years since the initiation of the project in 1977. McDonnell Douglas expects to be processing up to 10 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 Leasercraft 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 now signed three other joint-endeavor agreements covering patent rights: with Microgravity Research Associates for production of gallium arsenide crystals in space; with Fairchild Industries for development of the Leasercraft Spacecraft; and with Spaceco, Ltd., for a shuttle payload by 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.

From an overview of NASA's policies, practices, and procedures, it is clearly NASA's firm policy to provide incentives for the private sector to be involved in innovation for the commercial use of space. NASA has shown great creativity in fashioning agreements to encourage industry to develop its proprietary technology in space.

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.<sup>18</sup> 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, 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.

Among the unresolved issues which will affect protection of intellectual property in space is the question of whether there can be infringement of any patent in space. National patent laws clearly do not have extraterritorial reach. However, if a country has command and control of a spacecraft, arguably that spacecraft is analogous to a piece of that country's territory in space. In the United States, this issue has not been addressed by statute, and NASA is studying the necessity for an amendment to the Space Act to clarify and provide certainty for protection of intellectual property on space vehicles under the jurisdiction of the United States.

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, or 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.

#### Conclusion

Strong protection of intellectual property either used in space, transmitted in space, or resulting from space activities is vital to provide the private sector sufficient incentives to invest in activities leading to space commercialization. Concern with strengthening intellectual property protection is international, as the efforts to bring into force the Brussels Satellite Convention attest. Resolving the many unanswered questions and issues will undoubtedly require international involvement, particularly in view of the anticipated international participation in, and use of the U.S. space station. 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.

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; entered into force Oct. 10, 1967).  
  
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; entered into force Dec. 3, 1968).  
  
Convention on International Liability for Damage Caused by Space Objects (opened for signature March 29, 1972; entered into force Oct. 9, 1973).  
  
Convention on the Registration of Objects Launched into Outer Space (opened for signature Jan. 14, 1975; entered into force Sept. 15, 1976).  
  
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; entered into force July 11, 1984). Note: The United States is not a signatory to this treaty; five ratifications: Chile, Philippines, Austria, Netherlands, and Uruguay.
2. International Telecommunication Convention (Malaga-Torremolinos 1973) (Nairobi 1982), as completed by the International Radio Regulations.
3. Universal Copyright Convention (Paris 1971). Berne Convention for the Protection of Literary Works (Paris 1971).
4. Convention Relating to the Distribution of Programme-Carrying Signals Transmitted by Satellite, commonly known as the Brussels Satellite Convention, (Brussels 1974).
5. Countries ratifying the Brussels Satellite convention: Federal Republic of Germany, Italy, Kenya, Mexico, Morocco, Austria, and Yugoslavia; accession: Nicaragua.
6. Land Remote Sensing Commercialization Act of 1984, Public Law 98-365, 98 Stat. 451 (July 17, 1984). See also, J.V. Byrne, Administrator of the National Oceanic and Atmospheric Administration, Statement delivered at news conference, U.S. Department of Commerce (March 8, 1983).
7. Message from the President of the United States transmitting a Report on the State of the Union, House Document No. 98-162, 98th Con., 2d Sess., 5 (1984).
8. President Ronald Reagan Radio Address to the Nation (Jan. 28, 1984). 20 WEEKLY COMPILATION OF PRESIDENTIAL DOCUMENTS, 113 (1984).
9. The White House, Office of the Press Secretary, National Policy on the Commercial Use of Space, Fact Sheet (July 20, 1984) 2 pages.
10. For more detailed discussions on NASA regulations and practice, see G.J. Mossinghoff, Intellectual Property Rights in Space Ventures, 10 JOURNAL OF SPACE LAW, 107-138 (1982), and G.J. Mossinghoff, Protecting Intellectual Property in Space Activities, National Academy of Public Administration, ENCOURAGING BUSINESS VENTURES IN SPACE TECHNOLOGIES, Appendix 5 (May 1983).
11. National Aeronautics and Space Act of 1958, as amended, 72 Stat. 426.
12. 19 WEEKLY COMPILATION OF PRESIDENTIAL DOCUMENTS, 252-253 (Feb. 21, 1983).
13. 48 FEDERAL REGISTER, 22132-22133 (May 17, 1983).
14. Public Law 89-554, 80 Stat. 383 (1966), as amended; see especially P.L. 94-409, 90 Stat. 1247 (1976).
15. Ronald Reagan, Commercial Expendable Launch Vehicle Activities, Executive Order 12465. 20 WEEKLY COMPILATION OF PRESIDENTIAL DOCUMENTS, 263-264 (Feb. 24, 1984).
16. 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.
17. Medicine Sales Forecast at \$1 Billion, 120 AVIATION WEEK AND SPACE TECHNOLOGY, 52 (June 25, 1984).