From the deliberations in recent years in the above mentioned organizations, the trend seems to be that a number of countries have favored the view that proper arrangement should be made of the use of geostationary orbit on the basis of equity and fairness within the framework of the Outer Space Treaty. The equatorial states, while claiming sovereign rights in general over segments of the geostationary orbit above their territories, have been stressing that in formulating the definition and delimitation of outer space, the special interests of the equatorial states must be taken into account. The representative of Colombia stated what Colombia were opposed to was the placing of any object at a fixed position at any height above its territory without its prior consent.[7] Colombia, Brazil and Kenya[8] all expressed their willingness to consider the altitude of 90 or 100 kilometers as the lower boundary of outer space, provided the issue of geostationary orbit would also be solved, taking due account of their special interest in this orbit. Among the developing countries, Egypt expressed the view that "a serious consideration of the allocation of the geostationary orbit is required, instead of the present system of 'first come, first served' ".[9] India stated that "[A]ccess to the geostationary orbit must be based on equity and justice and on due regard for the geographical position, population and special needs of each country".[10] The Philippines added that "a legal regime of a *sui generis* character should be established for the geostationary orbit that not only would safeguard its use, but would also ensure its utilization for the benefit of all countries, in particular the developing countries."[11] Finally, Brazil stated that "Appropriate criteria must be found for guaranteeing positions on the geostationary orbit, with the interests of the Equatorial States receiving due weight."[12]

As to the relation between the definition of outer space and the issue of the geostationary orbit of the earth, the Soviet Union at the 1981 Session of the Legal Sub-Committee suggested[13] that the two questions be divided into two agenda items, or into two sub-items under one agenda item for consideration, with the item on the definition and/or delimitation of outer space receiving priority consideration in a working group set up in the Sub-Committee. The United States, United Kingdom, and some other states gave good response to the former suggestion but dissented from the view of setting up a working group to give priority consideration to the problem of definition and/or delimitation of outer space. The equatorial countries also proposed that a working group be established to give priority consideration to this agenda item as existed, but were opposed to the suggestion to divide the existing agenda item into two

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[7]U.N. Doc. A/AC. 105/C. 2/SR. 355, p. 6.

[8]U.N. Doc. A/AC. 105/C. 2/SR. 356, p. 4; SR. 355, pp. 5 and 10.

[9]U.N. Doc. A/AC. 105/PV 219, p. 68.

[10]U.N. Doc. A/AC. 105/C. 2/SR. 356, p. 3.

[11]U.N. Doc. A/AC. 105/PV. 221, p. 5.

[12]U.N. Doc. A/AC. 105/C. 2/SR. 355, p. 5.

[13]U.N. Doc. A/AC. 105/C. 2/SR. 354, pp. 2-3.

agenda items or two sub-items, stressing that without a solution to the question of the geostationary orbit, there could be no definition and/or delimitation of outer space.

V.

A consideration of the documents of the sessions of the COPUOS and the Legal Sub-Committee makes it possible to identify three groups of views put forward by member states of the Committee:

1. Those favoring the "spatial approach" insist that the concept of outer space has to be defined and that airspace and outer space have to be distinguished by establishing a spatial demarcation boundary line.

2. Those preferring the "functional approach" insist that the legal regimes in space can only be associated with the character of activities under regulation; if it is a spacecraft carrying on space activities, then outer space law should be applied; on the other hand, an aircraft carrying on air activities should be subject to air law. The entire space is an inalienable whole, and it is undesirable to delimit outer space and airspace.

3. Time is still not ripe to define outer space and determining its boundary and the question needs further study along with the development of space technology.

Developments in recent years show that a growing number of spatialists have tended to accept the lowest height of the artificial satellite orbit flight as the lower boundary of outer space. At the 1975 Session of COPUOS, Italy proposed[14] the altitude of 90 kilometers above sea level as the upper limit of airspace. In 1976, Argentina, Belgium and Italy[15] lent support to a demarcation line of 100 kilometers. After the equatorial states claimed sovereign rights over the segments of the geostationary orbit above their respective territories, this trend has become even stronger. At the 1979 Session of the Legal Sub-Committee, the Soviet Union submitted a working paper,[16] proposing that the region above 100-110 kilometers altitude from sea level of the earth is outer space, and that this definition should be established in a treaty form, while the space objects of states should retain the right to pass through the airspace of other states when their purpose is to reach orbit or return to earth in the territory of the launching state. However, the above view has met with objections from some other states, mainly the United States, United Kingdom, and Japan. They regard the proposal of 100-110 kilometers as a demarcation line as arbitrary and request not to push for a definition that might later be found inappropriate.

In view of the controversy over the definition and delimitation of outer space, there seems to be little possibility in the near future to reach consensus on the proper solution to this issue. Nevertheless, it is generally recognized that outer space and airspace are two different concepts, and distinction should be drawn between them in theory. To stress that the entire space constitutes an inalianable whole without making distinction between airspace and outer space would lead to the denial of the principle of state sovereignty over airspace. On the other hand, it would seem still premature to establish

[14] 29 Yb. of the United Nations 1975, p. 87.

[15] 30 *id.* 1976, p. 65.

[16] U.N. Doc. A/AC.105/C.2/L.121.

a clear demarcation line between them. In a statement made at the 1981 Session of the Legal Sub-Committee, the Chinese delegate made the following remarks on this problem:

> "The Chinese Delegation favored the formulation of a definition of outer space which would be acceptable to all, so that the legal status of outer space could then be distinguished from that of airspace. A definition would help greatly towards the safeguarding the territorial air sovereignty of states and promoting the further development of outer space law. However, the choice of a suitable altitude for the boundary not only raised complex scientific and technological questions, but was also a highly political and legal issue involving the sovereignty and security of states. Due regard had to be paid to the latter two factors, particularly as far as the developing countries were concerned, also to the present state of outer space technology and activities, the physical features of the space above the earth and the reasonable needs of outer space exploration. Serious studies and patient consultations were needed. Any hurried decision would be unhelpful."[17]

VI.

To sum up, the problem of definition and delimitation of outer space is a complicated one involving scientific, technological, security, political and legal questions. In the development of the past thirty years, the legal regime of outer space has taken shape. The principles that the exploration and use of outer space shall be carried out for the benefit and in the interests of all countries and that outer space shall be free for explorations and use by all states and not subject to national appropriation are laid down in the Outer Space Treaty. Although agreement has not yet been reached on the definition and delimitation of outer space, more and more countries are inclined to the view that this important issue must be duly solved in order to define the scope of the legal regime of outer space. In seeking a solution to the question of definition and delimitation of outer space, the use of the geostationary orbit of the earth should also be considered, so that proper arrangement could be made on the basis of equity and justice to guarantee the legitimate rights of all states and in particular the developing countries and equatorial countries.

[17]U.N. Doc. A/AC. 105/C. 2/SR. 355, p. 3.

ASTRONAUTS AND SEAMEN—A LEGAL COMPARISON

*Hamilton DeSaussure**

In many respects, the astronauts of today are the modern equivalent of the ancient mariners. Like the mariners of old, they live in a cooped-up environment for significant periods of time, isolated from land-based communities, totally dependent upon the cooperation and assistance of fellow crewmen, and constantly under the shadow of tragedy from an essentially hostile environment. On the other hand, the airman, although his occupation is a hazardous one, does not actually live on-board his aircraft but spends the larger part of each day within the framework of normal community living. How the law will develop as to the legal characterization of astronauts depends largely upon whether the courts, legislatures, and, international conferences cast them in the role of a special breed of employees, as seamen have been treated, or merely as ordinary employees working in a new environment, as airmen generally have been treated.

This article briefly reviews how seamen are treated in maritime law, why they are so treated, and to what degree the same justification for their special treatment might extend to the astronaut. First, it is necessary to consider who is an astronaut, who is a seaman, and, for that matter, who is an airman, even though he has no special status.

At present, there is no precise legal meaning for the word "astronaut." It is not defined in the Outer Space Treaty (1967),[1] the Astronaut Agreement (1968),[2] the Liability Convention (1973),[3] or the Registration Convention (1976).[4]

Unfortunately, the four principal space treaties do not make a clear distinction between an astronaut and other persons on board. It can be inferred that, as a minimum, an astronaut must be one who has a mission to perform in space. The Outer Space Treaty refers alternatively to astronauts, personnel of a space object, and state representatives on the moon.[5] The title and preamble to the Astronaut Agreement uses the term "astronauts," but the operative portions of the agreement refer only to

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[1]Treaty on Principles Governing Activities of States in The Exploration and Use of Outer Space, Including the Moon and Celestial Bodies, Jan. 27, 1967, 18 U.S.T. 2410, T.I.A.S. No. 6347, Article V [hereinafter cited as Outer Space Treaty].

[2]Agreement on the Rescue of Astronauts, the Return of Astronauts and The Return of Objects Launched into Outer Space, April 22, 1968, 19 U.S.T. 7570, T.I.A.S. No. 6599 [hereinafter cited as Astronaut Agreement].

[3]International Liability for Damage Caused by Space Objects, March 29, 1972, 24 U.S.T. 2389, T.I.A.S. No. 7762 [hereinafter cited as Liability Convention].

[4]Registration of Objects Launched into Outer Space, January 14, 1975, 28 U.S.T. 695, T.I.A.S. No. 8480 [hereinafter cited as Registration Convention].

[5]Outer Space Treaty, *supra* note 1.

spacecraft personnel.[6] The Liability Convention never once refers to astronauts, only to persons on board and to foreign nationals participating in the operation of the spacecraft. The recent Moon Treaty, not yet in force in any state, generally uses the terms "personnel of a spacecraft," "persons," or "astronauts" when referring to human activity in relation to the moon.[7] For the purpose of safeguarding life and health, however, all persons on the moon are regarded as astronauts within the meaning of Article V of the Outer Space Treaty and as personnel of a spacecraft within the meaning of the Astronaut Agreement.

Legal writers are not in agreement as to how broadly the term "astronaut" should be construed. "Astronaut" is not defined in the latest edition of *Black's Law Dicctionary,* and there is no case law as to its meaning.[8] Manfred Lachs, member of the International Court of Justice, has written that all persons on board the space vehicle should share a common legal status as astronauts regardless of the functions that they may perform. He added, however, that when the day arrives when passengers are carried, greater clarification will be necessary.[9] Dr. V.S. Vereshchetin, Vice President of Intercosmos, Moscow, agrees that international space law should provide an equal status to all persons on board, whether servicemen or civilians, regardless of their specific function.When regular space journeys occur, Dr. Vereshchetin believes that there might be a need to create a special legal status for passengers.[10] Dr. Stephen Gorove, Director of Graduate Studies, University of Mississippi, takes a similar view. He believes that the term "astronaut" includes all personnel of a spacecraft, *i.e.* all persons assigned to and accompanying the spacecraft, such as scientists and physicians.[11]

The NASA Act of 1958 as amended does not define the term "astronaut."[12] Also, the term is not given specific meaning in either the implementing regulations of NASA or in Space Transportation System User Handbook published by NASA.[13] NASA regulations, however, do define who is a mission specialist and who is a payload specialist. A *mission specialist* is a career NASA astronaut who is skilled in the operations of STS systems related to payload operations and who is thoroughly familiar with the operational requirements and objectives of the payload with which the mission

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[6]Astronaut Agreement, *supra* note 2.

[7]Senate Committee on Commerce, Science and Transportation, Agreement Governing the Activities of the States on the Moon and Other Celestial Bodies, Comm. Print, 96th Cong. 2d. Sess. (1980) [hereinafter cited as Moon Treaty].

[8]*Black's Law Dictionary* (5th. ed. 1979).

[9]M. Lachs, *The Law of Outer Space* 71 (1972).

[10]Vereshchetin, *Legal Status of International Space Crews,* 3 *Annals of Air and Space L.* 559 (1978).

[11]S. Gorove, *Studies in Space Law: Its Challenges and Prospects* 98 (1977).

[12]National Aeronautic and Space Act of 1958, 42 U.S.C. § 2451-77 (1976).

[13]N.A.S.A., Space Transportation System User Handbook (1977) [hereinafter cited as STS Handbook].

specialist will fly.[14] A *payload specialist* is an individual selected to operate assigned payload elements on a specific STS flight or mission.[15] A payload specialist may or may not be an astronaut. The STS Handbook lists the commander, the pilot, the mission specialist, and the payload specialist as part of the flight crew complement of the Space Shuttle Orbiter.[16] Commanders, pilots, and mission specialists, but not payload specialists, must be flight qualified.

From its regulation, it is clear that NASA does not consider payload specialists as a class to be astronauts, although mission specialists who are astronauts may be used in this category. Payload specialists can be non-flight qualified private employees of companies entering contractual arrangements with NASA. This makes the astronaut class a very restricted one indeed. It is not likely that either the courts, legislatures, or diplomats themselves will be so restrictive in defining who is an astronaut or in considering what are an astronaut's rights and duties. Astronauts will not always be individuals employed by NASA, the Defense Department, or some other United States Government agency; moreover, astronauts will not always be flight qualified. It is likely that the courts and Congress will seek out parallels to seamen and to airmen in working out a definition of who is an astronaut.

The right to seaman status is broadly determined. Although the determination of who qualifies as a seaman will ultimately depend on the particular convention, statute, or regulation that is being considered, the trend has been toward enlarging rather than restricting the scope of the term. The Shipowner's Liability Convention applies to all persons employed on board any vessel, other than a ship of war, registered in a territory for which the Convention is in force and ordinarily engaged in maritime navigation.[17] The general definition of a seaman contained in the United States Code is a person who is employed or engaged to serve in any capacity on board a vessel.[18] Some judicial decisions have also stressed the employment relationship of the persons serving on board, extending the seaman classification even to on-board fish packers:

> As presently employed, a seaman is not a mariner in the full sense of the word, a person who can "hand, reef and steer." Changing conditions and necessities for changes extended the term to include all persons employed in a vessel to assist in the main purpose of the voyage. Clearly the main purpose of the voyage was to pack and salt fish.[19]

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[14] *Id.* at 4-23; 14 CFR § 1214.301(e).

[15] STS Handbook at 4-23, 24; 14 CFR § 1214,301(a).

[16] STS Handbook at 4-23.

[17] Shipowner's Liability (Sick and Injured) Convention, October 24, 1936, 54 Stat. 1693, T.S. 951 Art. I [hereinafter cited as Shipowner's Liability Convention].

[18] 46 U.S.C. § 713 (1976).

[19] The Z-R-3, 18 F. 2d 122, 123 (W.D. Wash. 1927).

In granting seaman status, other courts have required only that a person has been employed to serve in some capacity on board a vessel and has so served,[20] and that his duties have been maritime in character and have been rendered on a vessel in commerce in navigable waters. Cooks, clerks, bartenders, musicians, hairdressers—all those employees with shipboard duties have been held to be seamen under the Jones Act.[21] Considering the normal seaman to be one who performs services on board ship in commerce in navigable waters, the comparison to astronaut status becomes more comprehensible. Under this comparison, an astronaut would be a person who is employed on a spacecraft in navigation underway and who is serving some purpose in aid of the voyage. A scientist, geologist, or astronomer who was placed on board to discharge one of the basic purposes for orbiting the spacecraft would be considered an astronaut. On the contrary, a journalist, commentator, perhaps even a congressman, or any ordinary passenger would be a person on board but not an astronaut.

Most astronauts are pilots and all are flight qualified. The space shuttle commander and pilot need to be aircraft operators because of the shuttle characteristics.[22] On its return from orbit, it flies back through the airspace and lands in a manner similar to a large commercial jet aircraft. Many persons besides pilots, however, are considered to be airmen under FAA rules. The FAA rules provide that an airman is:

> any individual who engages as the person in command or as pilot, mechanic or member of the crew in the navigation of an aircraft while underway; and any individual who is directly in charge of the inspection, maintenance, overhauling or repair of aircraft, and any aircraft dispatcher or air traffic control tower operator.[23]

If the definition stopped after the words "while underway," it could be adopted as a definition for current astronauts by changing the word aircraft to spacecraft. By adding ground personnel—inspectors, repairmen, air traffic controllers, the definition becomes too broad. Spacecraft maintenance crews and mission controllers are normally not astronauts.

FAA rules define a flight crew member as a pilot, flight engineer, or flight navigator assigned to duty in an aircraft in flight.[24] It is flight crews, therefore, no airmen in general, who resemble astronauts in the nature of their duties. Flight crews, and all airmen, enjoy no special status in the eyes of the law. Their relation to their employer is governed by either the workers' compensation laws or the normal common law principles of master and servant. Off duty, the airman, like any land-based worker, is not the responsibility of his supervisor; the employer is liable to the airman only for injuries or sickness sustained on duty, and only when these result from the employer's own negligence or his agent's negligence. In any suit by the airman-employee, the

[20]Antus v. Interocean S. S. Co., 108 F. 2d 185, 187 (6th Cir. 1939).

[21]G. Robinson, *Handbook of Admiralty Law in the United States* 280 (1939).

[22]14 C.F.R. § 1214.703 (1981) defines "commander" and "pilot." The pilot is second in command.

[23]49 U.S.C. § 1301(7) (1976).

[24]14 C.F.R. § 1.1(1981).

employer has the normal common law defenses of contributory negligence, assumption of the risk, or the fellow-servant rule. In most instances, however, the workers' compensation laws, enacted by every state, have provided an administrative substitute for normal tort liability. Although the employer's liability under the workers' compensation laws is absolute for on-duty injuries, the compensation under such laws is far more modest than what a victim might receive under normal tort law. Also, there is no liability under the workers' compensation laws for off-the-job accidents or for illness.

The seaman has a far more intimate relation with his ship than does the airman to his aircraft; his ship is his home for the duration of the trip. The fine distinctions between on and off duty and the determination of what is in the course of employment have little relevance in maritime law. Maritime law has recognized the necessity to depart from the normal rules governing master and servant relations and to provide the seaman with a unique status with regard to his health and welfare. The astronauts, as crewman, will resemble the aircraft crewmembers only during the brief transition phase from outer space to earth landing. While in orbit or in navigation to another planet, the astronaut's life will revolve around his spacecraft just as a seaman's does around his ship.

The status of astronauts as envoys of mankind was first officially declared in UN Resolution 1962, approved by the General Assembly on December 13, 1963. The last paragraph of that resolution provides:

> States shall regard astronauts as envoys of mankind in outer space, and shall render to them all possible assistance in the event of accident, distress, or emergency landing on the territory of a foreign state or on the high seas. Astronauts who make such a landing shall be safely and promptly returned to the State of registry of the space vehicle.[25]

This same language with certain minor drafting changes became the first paragraph of Article V of the Outer Space Treaty of 1967. Other than the right of all possible assistance in the event of accident, distress, or emergency landing, what legal benefits flow from being designated envoys of mankind have yet to unfold. The probability remains that not all space voyagers, but only astronauts in particular, were meant to receive preferential treatment. Although the precise status of astronauts will be determined by the courts and the legislatures, this study reflects how seamen, as the nearest counterparts to astronauts, have been the recipients of special protection.

As wards of the admiralty, seamen have always been regarded with parental concern. Two quite distinct reasons are given by the courts to justify this preferential treatment. One reason stems from the concept that seamen are uneducated, irresponsible, and naive. The second reason is based on the precarious nature of their work and on the need to promote their welfare to achieve national security and economic health.

Nearly one hundred and sixty years ago, Justice Story, one of the most respected admiralty judges of all time, referred to seamen as "generally poor and friendless, with

[25]. "Declaration of Legal Principles Governing Activities of States in the Exploration and use of Outer Space," submitted by Committee on Peaceful Uses of Outer Space Resolution 1962 (XVIII) adopted by the General Assembly on December 13, 1963 (1280th meeting), as recommended by First Committee A/5656, draft resolution I.

habits of gross indulgence, carelessness, and improvidence, who, as a class, were remarkable for their rashness, thoughtlessness and improvidence." He further wrote: "Seamen combine, in a singular manner the apparent anomalies of gallantry, extravagance, profusion in expenditure, indifference to the future, credulity, which is easily won, and confidence which is readily surprised."[26] Obviously, this type of characterization is not descriptive of the modern astronaut. It has been noted, however, that neither do modern seamen, at least United States seamen, fit this ancient description of the modern astronaut. The average United States seamen is now well-educated, well-paid, and well- represented by a powerful union. Yet his status as a ward of the admiralty is unchanged.[27]

The second line of reasoning underpinning the wardship theory for the seaman relates more significantly to the astronaut and to the development of a special status for the astronaut:

> There is the great public policy of preserving this important class of citizens for the commercial service and maritime defense of the nation. Every act of legislation which secures their healths, increase their comforts, and administers to their infirmities; binds them more strongly to their country; and the parental law, which relieves them in sickness by fastening their interest to the ship is as wise a policy as it is just an obligation.[28]

Special protection, wrote Justice Story, encouraged persons to take up the call of the sea and to engage in perilous voyages with more energy and at lower wages.

There are, as of August 31, 1981, seventy-nine qualified astronauts on duty with NASA.[29] The need to encourage astronaut applications by promising special benefits is not likely to arise until a space journey becomes as ordinary and as commonplace as a sea voyage. Certainly by the middle of the next century, in the lifetime of those already born, space journeys should be as common as air flights and sea voyages are today. As the population of spacefarers grows, so will the number of spaceflight crews or astronauts who will be needed to routinely transport personnel and cargo. Astronauts as a class will perform the same duties relating to the carriage of goods and personnel to, from, and in space that seamen now perform on the navigable waters of the world.

Since seamen are confined to their ships over long voyages, their health and welfare are closely linked to the operation and management of the ship. When seamen become sick, their duties must be performed by others. Sick seamen must be cared for as part of the ship's complement until port is reached, unless, of course, medical evacuation by air or by sea is possible. A strong body of maritime law has developed to protect the seaman who becomes disabled; it has no counterpart in the shore-based common law and falls under the heading "maintenance and cure." The Supreme Court has described

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[26]Brown v. Lull, 4 F. Cas. 407, 409 (C.C.D. Mass. 1836) (No. 2,018).

[27]H. Baer, *Admiralty Law of the Supreme Court* 105-06 (3d ed., 1979).

[28]Harden v. Gordon, 11 F. Cas. 480, 483 (C.C.D. Me. 1823) (No. 6,047).

[29]115-1 *Av. Week & Space Tech.* 11 (1981).

maintenance and cure as one of the most pervasive incidents or responsibility anciently imposed on shipowners for the well-being of their crews. It was first recognized in a Supreme Court decision in 1902. Justice Brown wrote: The law was settled that the vessel and her owners are liable in case a seaman falls sick or is wounded in the service of the ship to the extent of his maintenance and cure and to his wages, at least so long as the voyage is continued.[30]

Maintenance and cure has sometimes been compared to shore-based workers' compensation laws because it places a liability on the ship owner for the welfare of the seaman without regard to any fault on the ship owner's part and is based solely on the seaman's employment relationship. While workers' compensation is the exclusive land remedy against an employer, maintenance and cure is not the exclusive maritime remedy against an employer. The seaman may also sue his employer for negligence under the Jones Act or for breach of duty for failing to provide a seaworthy vessel. Additionally, the right to maintenance and cure is a charge on the vessel as well as on the employer himself. The seaman can assert a maritime lien of the highest priority against the vessel by a suit in rem while still suing the shipowner in personam.

Maintenance and cure is a product of the maritime law of all nations. The Shipowners' Liability Convention provides that the shipowner shall be liable for the sickness, injury, and death resulting therefrom of all persons employed on board any vessel, but not a warship, ordinarily engaged in maritime navigation.[31] By national law, however states may exempt the shipowner from liability for injury incurred that is not *in the service of the ship* or that is due to the willful misbehavior or intentional concealment of illness by the seaman. The Convention also provides that the shipowner is liable for the expenses of medical care and support until the sick or injured seaman reaches maximum cure.[32] The Supreme Court has held that the seaman who is injured while on shore leave or while returning to or leaving the ship is in the ship's service and is entitled to maintenance and cure. Justice Rutledge has said, "It is the ship's business which subjects the seaman to the risk attending hours of relaxation in strange surroundings."[33] The seaman's right to maintenance and cure is absolute, unless it can be shown that he intentionally concealed a disability or illness at the time he signed on. In a case where a seaman was discovered to have active tuberculosis, the Supreme Court discussed the duration of the obligation of the shipowner: Maintenance and cure is designed to provide a seaman with food and lodging when he becomes sick or injured in the ship's service; and it extends beyond the period when he is incapacitated to do a seaman's work and continues until he reaches maximum recovery.[34]

[30]The Osceola, 189 U.S. 158, 175 (1903).

[31]Shipowner's Liability Convention, *supra* note 17.

[32]*Id.*, Art. 4(1).

[33]Aguilar v. Standard Oil Co., 318 U.S. 724, 734 (1943).

[34]Vaugh v. Atkinson, 369 U.S. 527, 531 (1962).

Seamen employed by the United States Government are not given the broad remedies that are given seamen employed by private shipowners. The government seaman is restricted to those rights held by a shore-based government employee. In reviewing the statutory history regarding United States Government seamen, Chief Justice Warren wrote: Congress thought of these employees more as Government employees who happened to be seamen than seamen who by chance worked for the Government.[35] There was a strong dissent to this position by Justice Harlan who stated that, normally, government seamen, in general, would be better off under general maritime law than they would be under the rules and regulations for ordinary government employees.[36]

This raises the question whether there is any reason to consider as possible precedent the maritime rule of maintenance and cure as long as astronauts remain government employees. Certainly when seamen employed by the United States have no maritime remedies, NASA astronauts will fare no better. The space frontier will not long be the exclusive domain of astronauts in the military and civil service however. As industrialization takes place and private enterprise brings its personnel and material into this new environment, the number of astronauts who are not government employees will measurably outdistance those who are, particularly if a broad scope is attached to the meaning of "astronaut." The doctrine of maintenance and cure should apply equally in space, where isolation and perils will be as prevalent as at sea.

The concept of providing for the welfare and health of those crews who regularly sojourn in space and who live on-board spacecraft or space stations for considerable periods of time justifies the need for a protective law on health and welfare. A simple rule based upon the maritime analogy of placing the absolute duty of care and support on the spacecraft owner and operator has many advantages. Such a rule could place at the federal level all United States law on the subject and would abolish any common law defenses of spacecraft owners and operators, such as assumption of risk, contributory negligence, and the fellow-servant rule. A ruled based upon maritime principles would also aid in providing a unified federal rule in place of the piecemeal legislation by the various states and would also promote uniformity among sovereign spacefaring nations. Additionally, it would place the risks on the party most able to bear them, the owner and operator, and would allow insurance premiums to be calculated on the basis of each space flight, rather than on the astronaut himself or his employer. Space travel will be hazardous, voyages long and hardships endured, for the most part, as yet unimaginable. Justice Story's remarks concerning seamen, in 1823, when referring to "the real public policy of preserving this important class of citizens for the commercial service in maritime defense of the nation", seem just as relevant to space crews.

Whether or not it was intended to give astronauts special protection by addressing them as envoys of mankind or to equate them to seamen who deserve special considerations, there is merit in providing astronauts with the right to a spaceborne maintenance and cure remedy.

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[35] Amell v. United States, 384 U.S. 158, 163 (1966).

[36] Id. at 172-74 (Harlan, J., dissenting).

The seaman is the beneficiary of another remedy that is peculiar to maritime law: the right to sue the shipowner if the seaman is injured because his ship is unseaworthy. The obligation of the shipowner to furnish a seaworthy vessel for the crew extends not only to the fitness of the ship itself, but to the appliances and equipment on board and to the competence of the crewmembers.[37] The shipowner's duty is an absolute one; the seaman does not have to prove any negligence on the shipowner's part in order to recover.[38] This contrasts with the duty to provide an airworthy aircraft. No special body of tort law has developed concerning airworthiness. The final responsibility for airworthiness lies jointly with the FAA, which issues the Airworthiness certificate, and the owners and operators, who must comply with the FAA rules.[39] The aircraft owner's obligations, however, do not reach as far as the shipowner's. The aircraft owner's liability for injuries resulting from the operation of an unsafe aircraft is predicated on negligence, not on strict liability.[40] As long as the owner has taken all reasonable measures, including pre-flight checks, to insure that his aircraft is airworthy, and has secured the appropriate certification, neither the pilot nor the owner bear responsibility for accidents that might occur because of defects in the aircraft.

In addition, the shipowner's duty to the crew to furnish a vessel seaworthy in all respects is nondelegable.[41] He cannot, by chartering the ship to another or by giving a portion of the trip over to the control of stevedores, escape the ultimate responsibility for maintaining a safe vessel.[42] The fact that another seaman may have noticed the unsafe condition on board the vessel but failed to correct it, or even that another seaman may have created the unsafe condition, will not operate to relieve the shipowner of this responsibility.[43] Even a temporary unseaworthy condition, one that developed after the vessel left port, can make the shipowner liable for any damage that ensues. Nor can the seaman be held to have assumed the risk when he uses some patently defective equipment or attempts to do some obviously risky task. It has been held that his duty to obey orders overrides the consent ordinarily implied from the knowledge of the danger.[44]

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[37]*G. Gilmore & C. Black, The Law of Admiralty* 65 (2d. ed. 1976) [hereinafter cited as *Gilmore & Black*].

[38]2 M. Norris, *The Law of the Seaman* § 622, 625 (1970) [hereinafter cited as *Norris*]; see also, Carlisle Packing Co. v. Sandanger, 259 U.S. 255, 259 (1922) (boat held unseaworthy where not provided with life preservers).

[39]As to the pilot's responsibility, see 14 C.F.R. § 91.29 (1981).

[40]See Wilson v. Colonial Air Transport 180 N.E. 212, 214 Mass. (1932) (for common carriers); *see also* 1 *L. Kreindler, Aviation Accident Law* § 4.01 (rev. ed. 1981) (for discourse on private carriers).

[41]*Norris, supra* note 38, at § 622.

[42]*Id.*

[43]*Id.*

[44]Mahnich v. Southern S. S. Co., 321 U.S. 96, 103 (1944).

The liability of the shipowner can be mitigated, but not defeated, by showing that the seaman-claimant was negligent in the manner in which he performed his duties or handled ship equipment. In most jurisdictions, an aircrewman's own negligence that contributed to or caused his injuries would rule out any tort recovery from his employer or the pilot.

Why the duty for seaworthiness is imposed on the shipowner rather than on the shipmaster is explained by Judge Augustus N. Hand: "A ship is an instrumentality full of internal hazards, aggravated, if not created, by the uses to which she is put. It seems to us that everything is to be said for holding her absolutely liable to her crew for injuries arising from defects in her hull and equipment."[45]

The shipmaster is not comparable to the aircraft pilot, who has the personal duty to insure the safe condition of his aircraft before he takes it off the ground. Even though the modern aircraft has become a complex machine, the pilot still must inspect it, run through a pre-flight checklist, and conduct a warm-up before he is cleared to take off. The shipmaster, however, must rely on the expertise of many different categories of experts, including engineers, firemen, electricians, marine architects, surveyors, and inspectors to certify that the vessel is ready for launch or departure. The vessel inspection laws of the United States have been described by Chief Justice Hughes as a maze of legislation; without professional expertise on the various laws regarding this subject, it would be extremely difficult for any person, regardless of competence, to be the sole responsible officer for issuing final clearance.[46]

The complexity of the space shuttle is indicative of how future space transport craft will be constructed, equipped, and operated. The shuttle, in diversity and sophistication, seems more comparable to large ocean-going vessels than to the less complex transport aircraft. The dependence of the shuttle on computers and pre-flight programing as well as the state of its propulsion and life support systems requires a variety of expertise no single commander could possibly possess.

Therefore, it seems that the responsibilities of the spacecraft commander resemble more closely those of the ship captain than those of the aircraft commander. It will be the spacecraft owner or charterer rather than the commander who plans the mission, establishes its duration and routes, decides on the go or no-go launch mission, determines the fitness of the craft for its intended mission, and determines the overall safety of the flight. The commander will be responsible primarily for the operation, navigation, and management of his spacecraft during the voyage. The internal hazards to which Judge Hand referred will be ever present on space voyages, and it is the spacecraft owner, like the shipowner, who should have the undeviating duty to maintain his craft fit, tight, and staunch in all respects. Spaceworthiness, like seaworthiness, should be an absolute, nondelegable duty upon the owner, a duty not to be defeated by the common law defenses of assumption of risk, contributory negligence, or the fellow-servant rule. Maritime law rather than aviation law charts the better course for developing rules as to owner and operator liability and responsibility in space operations.

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[45]The A. H. A. Scandrett, 87 F. 2d 708, 711 (2d cir. 1937).

[46]F. Pat Kelly v. Washington, 302 U.S. 1, 4 (1937).

The rights to maintenance and cure and to an indemnity for an unseaworthy vessel are not the only remedies available to a seaman against his employer. In 1920, Congress passed an amendment to the Seamans Act of 1915 to provide the seaman with a common law remedy based on the negligence of his employer.[47] This amendment known as the Jones Act, gave the seaman the same rights against his employer as the railway employee had against his employer. The amendment also provided the seaman with a right to jury trial at his election. The railroad employee is covered by the Federal Employers' Liability Act, so the provisions of that Act were made applicable to the seaman.[48] It is beyond the purview of this study to go into the Jones Act or the Federal Employers' Liability Act in detail; however, the effect of the Jones Act was to give the seaman or his representative a third ground on which to base a remedy against the negligent shipowner if the seaman was injured or killed.

Setting aside the issue of governmental immunity, the injured astronaut could benefit from an extension of the Jones Act to cover astronauts as well as seamen. Alternatively, separate legislation to give space crews essentially the same rights against their employer as are given by the Federal Employers' Liability Act to railroad employees would accomplish the same purpose. The astronaut, as mankind's envoy, could then have the same favorable status granted to the seaman: the right to comprehensive health and medical benefits (maintenance and cure), the right to a vehicle that is spaceworthy (seaworthiness), and the right to hold his own employer-spacecraft owner liable for negligence (Jones Act).

The STS Handbook provides that the spacecraft commander is responsible for the safety of personnel on board and has the authority to deviate from the flight plan to preserve crew safety.[49] When a person on board, and more particularly, for the purposes of this section, a crewmember, becomes sick or injured, it will be the commander's duty to determine what arrangements to make for his well-being. The question of adequate medical care may present two distinct issues. The first concerns the amount of medical provisions that should be kept on board a space transport. The second concerns the threshold at which a commander, in the interest of his disabled crewman, should abort the mission and return the disabled spaceman to earth or request an intra-vehicular space rescue.

With the advent of space travel over a period of weeks or more, rules for the protection of merchant seamen are important precedents for the determination of rules for the protection of spacemen. Maritime law has never required the presence of a licensed physician on board every oceangoing vessel, but, as a matter of practice, most pleasure liners do carry a doctor as part of the ship's complement.[50] Aircraft flight attendants are trained in emergency medical procedures.[51]

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[47] 46 U.S.C. § 688 (1976).

[48] 45 U.S.C. §§ 51, 53, 54, 56, 59 (1976).

[49] STS Handbook, *supra* note 13, at 4-23.

[50] *Norris, supra* note 38, at § 539.

[51] 14 C.F.R. § 121.417 (1981).

Merchant vessels undertaking prolonged voyages are required by statute to carry medicine chests, and failure to have one on board subjects the shipmaster or owner to a $500 fine.[52] Although no similar law exists as to spacecrafts, a spacecraft owner would be negligent for failing to make corresponding medical supplies available.

When a mission in space should be aborted for the health and safety of a crewmember, it poses a dilemma where an extended voyage is under way. Early mission termination could involve the loss of millions of dollars in time and equipment. In the early phases of spaceflight, the final decision to abort might rest either with the launch authority at Kennedy or with Mission Control at Johnson. Once the manned spacecraft voyage extends beyond low earth orbit, the shuttle commander's recommendation as to the dangers involved and to the costs of an early return will be decisive. Here, maritime decisions on unscheduled port call have precedential value.

As a general rule, a shipmaster has a duty to put into the nearest port when he has a seriously injured or sick seaman on board. Justice Brown wrote that while the duty to provide proper medical treatment for seamen falling ill in the service of the ship is imposed on the shipowners by all maritime nations, each case depends on its own facts:

> [A]ll that can be demanded of the master is the exercise of reasonable judgement. . . . He is not absolutely bound to put into such port if the cargo be such as would be seriously injured by the delay. Even the claims of humanity must be weighed in balance with the loss that would probably occur to the owners of the ship and cargo. A seafaring life is a dangerous one, accidents of this kind are peculiarly liable to occur.[53]

Like the shipmaster, the astronaut in command could be confronted with the choice of continuing the mission at some risk of the loss of expensive investigations or explorations underway. When a space rescue service is inaugerated, intervehicular transfers will somewhat alleviate the problem of what to do with seriously sick personnel on board, but this will not totally solve the problem where the voyage is to a distant planet or otherwise beyond the range of rescue vehicles. In the final analysis, the saving of life, and not the preservation of equipment and cargo, should be the paramount concern; the difficult determination will arise when the premature de-orbit to save one life places the rest of the personnel on board in some jeopardy.

In 1980, NASA, for the first time, promulgated a regulation dealing with astronaut commander of the space transportation system.[54] NASA cited in support of this regulation the NASA Act relation to the security and plenary powers of the Administrators, sections of the criminal code relative to punitive sanctions for violating NASA regulations, and Article VIII of the Outer Space Treaty. The NASA regulation provides that all personnel on board an STS flight are subject to the authority of the commander and to this order.[55] The STS commander's authority is absolute, and he

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[52] 46 U.S.C. § 667 (1976).

[53] The Iroquois, 194 U.S. 240, 243 (1904).

[54] 14 C.F.R. § 1214.700 (1981).

[55] *Id.* § 1214.702-.704.

may take whatever action he deems necessary to enforce order and discipline, to provide for the safety and well-being of all personnel on board, and to protect the spacecraft and its payload. The STS commander may use any reasonable and necessary means, including the use of force, to fulfill his responsibilities. His authority is not limited to United States employees or to United States nationals. When necessary for the safety of the STS and other personnel, the STS commander may subject any person on board to restraint.[56] In case the STS commander becomes incapacitated, the second in command, the pilot will assume the duties of the commander.

The Federal Aviation Regulations (FARS) do not go into the same detail with respect to the disciplinary authority of the aircraft commander. The regulations simply provide that the pilot in command of an aircraft is directly responsible for, and is the final authority as to, the operation of that aircraft.[57] In an emergency the pilot in command may deviate from the rules governing flight operations to the extent required. The regulations also provide that no person may assault, threaten, intimidate, or interfere with a crewmember in the performance of his duties aboard an aircraft being operated.[58] There is no specific provision concerning the disciplinary powers of the pilot in command, but they can be implied from other provisions. For example, one provison states that no pilot in command may allow any object to be dropped from his aircraft in flight if that creates a hazard to persons or property.[59]

The powers of the aircraft commander are specially delineated in Chapter III of the Tokyo Convention, to which the United States is a party.[60] The commander may impose reasonable measures, including restraint, when necessary to protect the aircraft, personnel, and property, to maintain discipline, or to maintain custody until appropriate authorities on the ground can take custody.[61] The basic objective of the Tokyo Convention is to prevent crimes on board and to forestall any threats to flight safety. Although an agreement between the contracting parties, the Tokyo Convention requires specific implementation by each country's own law. There has been no statutory implementation in the United States, however, of the specific powers of the aircraft commander. The Federal Aviation Act does make aircraft piracy punishable by twenty years imprisonment, or more if death results from the act or attempt.[62] The Act also makes it a crime to interfere with flight crew members. Since neither the statutes nor the FARS are specific on the aircraft commander's responsibilities, they must be inferred from the powers given to him under the Tokyo Convention.

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[56]*Id.* § 1214.702(d).

[57]14 C.F.R. § 9163(a) (1980).

[58]*Id.* § 591.8(a).

[59]*Id.* § 91.13.

[60]Convention on Offenses and Certain Other Acts Committed on Board Aircraft, September 14, 1963, (1969), 20 U.S.T. 2941, T.I.A.S. 6768 [hereinafter cited as Tokyo Convention].

[61]*Id.* at art. 6.

[62]49 U.S.C. § 1472(n) (1) (1976 & Supp. III 1979).

Maritime law provides the master with absolute authority on board ship. Shipping articles contain the promise that the crew will be "obedient to the lawful commands of the . . . master, or of any person who shall lawfully succeed him and of their superior officers in everything relating to the vessel . . . ."[63] In holding that under the Articles, a crew may not strike, Justice Byrnes of the Supreme Court said:

> Ever since men have gone to sea, the relationship of master to seamen has been entirely different from that of employer to employee on land. The lives of passengers and crew as well as the safety of ship and cargo are entrusted to the master's care. Everyone and everything depends on him. He must command and the crew must obey. Authorities cannot be divided.[64]

Quoting from an economic survey of the United States Merchant Marine, Justice Byrnes inserted a footnote: "[W]hen a man puts foot on the deck of a ship, he becomes part of a disciplined organism subject to the navigation laws of the United States."[65] There are numerous provisions in the laws governing merchant seamen that provide statutory sanctions for the master's authority over his crew. The master may place a willfully disobedient seaman in irons and if disobedience continues, may place him on bread and water for four days at a time.[66] Any seaman who incites another to resist lawful orders of the master or to neglect his proper duty on board may be punished by a $1,000 fine or by five years of imprisonment. Any revolt or mutniy of seamen is a serious offense punishable by a fine of $2,000 or by ten years imprisonment, or both. The refusal by seamen to obey orders while on board their vessel can amount to mutiny.[67] The authority of a master over his crew has been compared to that of a parent over his children, and the master has been referred to as standing in *loco parentis*.

In some ways the maintenance of discipline on board spacecraft can best be analogized to the maintenance of discipline on board aircraft. In other respects, it is the totalitarian authority of the sea captain that may have the most resemblance to the authority of the aircraft commander. The Tokyo Convention deals explicitly with the authority of the aircraft commander.[68] Although it spells out the commander's authority to enforce discipline on board, its major thrust is to provide security against the passengers who harbor criminal intent. By contrast, the emphasis in the maritime laws concerning the master's authority relates to his control of the crew, rather than to his control of the passengers on board. The reason is partly historical. Seamen, as wards of admiralty, were considered vagrant and irresponsible and in need of a stern hand while the maritime passengers were considered more educated and respectable. In contrast, aircraft crews have generally been regarded as, and in fact have been, highly-

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[63]46 U.S.C. § 713 (1976).

[64]Southern S. S. Co. v. NLRB, 316 U.S. 31, 38 (1942).

[65]*Id.* at 45.

[66]46 U.S.C. § 701 (1976).

[67]18 U.S.C. § 2192 (1976).

[68]*See supra* note 60 and accompanying text.

trained and motivated as well as self-disciplined. Most of the disciplinary problems on board aircraft have come from the criminal or uninhibited, sometimes intoxicated, elements among the passengers. A disruptive passenger on board an aircraft is normally far more dangerous than one on board ship.

For the immediate future, STS commanders are not likely to encounter disciplinary problems. Crew members will be highly trained and motivated, and the passengers, or the payload specialists, will be carefully selected and will be retained for their roles under NASA guidance. Disciplinary problems can be expected to occur when non-mission related passengers are carried, such as journalists, technical representatives of contractors, and foreign observers, and when the Shuttle becomes a space bus to transport construction and repair personnel to work on space stations and orbital factories.

As space missions take transport spacecraft farther from earth and require larger on-board maintenance and operational crews, the precedent of maritime law will become increasingly important. When great distances separate the spacecraft from its home port, it will not be as easy to offload the recalcitrant or disorderly crewman or specailist as it is for the aircraft to offload the offending air passenger by making an unscheduled landing. Spacecraft crews that live together over extended periods of time provide a greater potential for dissension and word disruption than do aircraft crews that have only transitory relations with their fellow crewmen on board. Just as mariner finds limited diversion opportunities at sea to provide relief from the monotony of work, spacemen, without even limited opportunity for shore leave, may find time heavy on their hands. Crew morale is an extremely important factor at sea and will be equally or more important in space. The need for the absolute, undivided disciplinary authority of the shipmaster, then, becomes a striking parallel to spell out in detail the full range of the disciplinary authority vested in the spacecraft commander by NASA regulation. There will have to be a statutory basis for command authority, authority which is not limited to NASA spacecraft commanders, but to all in charge of any object in space. The Tokyo Convention will have its application to spaceflight and so will the disciplinary laws and regulations pertaining to the Merchant Marine.

This article has attempted to survey the law of astronauts as it might develop along parallel lines to the law of seamen. Quite obviously only time will reveal how and to what degree the legal status of astronauts will be assimilated to the legal status of seamen. Yet the problems of astronauts' safety and welfare over long periods of space travel will inevitably bring forth a new body of law in this area. Because jurisprudence is achieved by comparisons and analogies, it is the view here that this will lead decision makers and legislators to draw extensively on the most beneficial treatment provided seamen when shaping new law to protect astronauts in space.

A. Past Events

(a) Reports on UNISPACE 82

1. UNISPACE 82 and Beyond

UNISPACE 82,[1] was born out of a desire to explore how the world-wide activities in outer space, including international cooperation, could be developed to ensure that the potential benefits from space science, technology and their applications would be truly realized for all countries. There was a general feeling that the potential of space was much greater than currently appreciated and utilized by most countries and that the benefits were not shared as widely as they could be. It was also felt, in a sense, that one should now move beyond widening the already existing highways to building new pathways in the wilderness.

The planning for the Conference was carried out by the 53-member United Nations Committee on the Peaceful Uses of Outer Space (COPUOS) and its Scientific and Technical Sub-Committee; these two were designated as the Preparatory Committee and Advisory Committee, respectively, for the Conference.

The decision to hold the Conference was made after lengthy discussions lasting several years. The drawing up of the agenda of the Conference was in itself a significant part of the initial preparations—to the extent that the detailed agenda itself recognized, and set a tone for the manner in which the Conference might address various issues. While "legal" issues as such were not included, it was clearly stated that "the Conference should not be limited to discussions of science and technology, but should also consider the relevance to man and his environment." This was specifically stated to counter a move to convert the Conference to an international scientific and technical symposium, somewhat along the lines of the 1968 Conference on Space. The broad scope of the Conference was further emphasized by stating that the agenda should be broad enough to include all considerations set out and "permit discussion of scientific, technical, social, economic, organizational and other aspects as well as their interrelationship."

This is perhaps not the time to recount all the details of the extensive preparations for the Conference, lasting well over two years, but some of the elements might be of interest. The draft report of the Conference was to be based primarily on the national papers submitted by various member states, reports of various specialized agencies and the discussions within the Preparatory Committee. One important source of input for preparations was the series of twelve background papers produced with the help of about 200 scientists from around the world. These papers were edited and circulated to all member-states and everyone else concerned with the Conference. It is significant to note that among the many organizations and individuals who contributed to this vital

+ This report is based on an invited lecture delivered by the author at the Congress of the International Astronautical Federation (Paris, Sept. 27, 1982).

[1]United Nations Conference on the Exploration and Peaceful Uses of Outer Space (Vienna, Aug. 9-21, 1982).

activity, the IAF,[2] along with COSPAR,[3] played a stellar role. Recognizing that the value of these background papers goes beyond this Conference and that the interested audience might be much larger than the participants in UNISPACE 82, an edited version of these papers has been published in the form of a book entitled "The World in Space"[4].

A large number of regional and inter-regional seminars on Space Applications—and the meaning of the Conference in this regard—were organized in several places around the world. The agenda of UNISPACE 82 was addressed extensively in these seminars, some of which were also able to discuss the earlier versions of the draft report. The reports of these seminars provided useful material for revising the draft report and some additional background information to the participants of the Conference. Several other activities for public information and generation of a global interest in the issues of the Conference were carried out. These included essay and poster contests, space exhibitions at the UN Headquarters, newsletters and a number of seminars and meetings initiated by the Conference Secretariat and arranged by several interested organizations.

The first version of the draft report was prepared by the Secretary-General of the Conference and presented to the Advisory Committee at its meeting in January 1982. In preparing this draft an attempt was made by us to synthesize the views expressed in various national papers, regional seminars and discussions in the Preparatory Committee, drawing upon the information and analysis contained in the background papers and, of course, our own learning and understanding of the state of space science and technology around the world and various efforts and aspirations in this regard. Taking into account the comments of the Advisory Committee and those of various specialized agencies and organizations, a revised version of the draft report was prepared for consideration of the Preparatory Committee in March 1982. This was considered on a paragraph-by-paragraph basis and a number of amendments were made. The final version of the draft report had 430 paragraphs out of which only fifteen could not be adopted by general consensus, and were therefore put in "square brackets". This draft, as approved by the Preparatory Committee, was circulated to all member-states and others concerned in May 1982 and was the main topic of discussion at the Conference in Vienna in the month of August 1982.[5] Those who participated in the Conference would recall that the discussions were intense and the atmosphere very dynamic. It is noteworthy that the final report of the Conference was adopted by agreement of all concerned.[6] This result bodes well for the future of world-wide space activities and international cooperation in this important, many facted adventure of man.

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[2]International Astronautical Federation (IAF).

[3]Committee on Space Research (COSPAR), International Council of Scientific Unions.

[4]The World in Space (Chipman ed., 1982).

[5]Draft Report of the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space, U.N. Doc. A/CONF. 101/3 (1982).

[6]Report of the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space, U.N. Doc. A/CONF. 101/10 (1982).

Before dilating on the outcome of the Conference and its future significance, let me touch on one of the important, perhaps peripheral, activities which took place during the Conference—an activity which might come to have a wider relevance for the future. These were connected with a series of "space demonstrations" that we had organized with the cooperation of various countries and organizations. The purpose was to highlight ways in which space technology is actually being applied in various countries, in different social and physical settings and to attempt to bring to the conference hall in Vienna varying images of humanity in different parts of the world as it is being touched by space technology (*e.g.,* scenes from village India, Indonesia and Northern Canada). Several of the demonstrations were brought live to the conference hall using a number of satellites and earth stations, and projected onto a large screen. Included was an experiment in remote interpretation (with interpreters in New York) and the operational use of satellite channels for transmission and translation of documents. The implication is that in the space age large international conferences and other professional and political dialogues can be held at many places around the world which otherwise would have been unacceptable; further, that there could be, in principle, a substantial cost saving.

It is difficult to remain impartail in evaluting something, in the creation of which one has played some modest role. It is therefore not surprising that I tend to agree with the assessment of a friend that the document incorporating the conference report[7] is perhaps the best existing material, between two covers, dealing analytically with the current status, social implications, and the future agenda of space activities, keeping in mind the diversity of the current social and techno-economic situation on the planet. If generally accepted as it is hoped it would be, this would be a rather remarkable statement about a document produced by an international conference, where so many different points of view need to be accommodated. The analysis of issues is followed up with specific recommendations for studies and other action. The suggestions and recommendations are addressed to countries themselves, to specialized agencies, international organizations and the UN system itself. Among the numerous recommendations in the report, the following are, in my view, of special importance:

1. Feasibility studies on the need and viability of operational international satellite systems for meteorology, remote sensing and navigation.
2. A substantial programme for human resource development involving a number of fellowships for indepth exposure of developing-country personnel to space science, technology and applications.
3. Stimulation of greater cooperation amongst developing countries through exchange of information and by encouraging use of equipment developed in these countries.
4. Setting up of an international space information service.
5. Expanding and re-orienting the United Nations Programme on Space Applications.
6. Strengthening and expanding the United Nations Outer Space Affairs Division and, if the General Assembly so decides, converting it to a Centre for Outer Space.
7. Giving appropriate attention and high priority to mechanisms for responding to the grave concern of the international community about an arms race in outer space.

[7] American Institute of Aeronautics and Astronautics (AIAA).

The report stresses the need and advantages of greater international cooperation and, at the same time, emphasizes the importance of stimulating the growth of indigenous nuclei and an autonomous technological base in developing countries. While giving a rather balanced assessment of the state of space science and technology and stressing the need for pursuing space science even in the developing countries, the report rightly gives more attention to the earth-bound applications of space technology. Considerable attention is devoted to actual means and mechanisms, including the organizational elements, through which the full benefits of space could be realized and shared more widely and equitably. This is a matter of great importance if space technology is not to become, as many other technologies have in the past, a cause for further widening of these disparities.

Unlike many recent world conferences, this one did not choose to recommend the creation of a large new fund or a major new institution. Such simple symbols of having done something big and important as a result of a large world conference are often facades to hide the lack of agreement and understanding on substantive issues.

The Conference report is laced with suggestions and recommendations for various types of studies. This arises from the fact that the Conference engaged in a searching enquiry into a very complex question of finding ways to convert and bend this most modern of technologies into becoming an appropriate means for enhancing the human condition in different parts of the world. There was also a concern that the introduction of this technology should not lead to an increase in dependence; instead, it should provide ways of inter-linking people everywhere, giving voice to those who are never heard, an initiative to the latent energies of large masses of humanity far away from centres of action and influence. Suggestions for some of the major studies arise from a concern that people around the world, after being introduced to, and possibly addicted to, the applications of some of the experimental space systems in meteorology, remote sensing and navigation should have some assurance that the services provided by such systems would be available on a continuing basis. That is why it is vital to give due importance to the recommendations about feasibility studies on the need and viability of operational international systems for meteorology, remote sensing and navigation. As of now there is no guarantee of any kind that data from such systems, or from more appropriate systems to be developed in the future, would continue to be available at affordable prices to all countries. If these studies finally do result in the establishment of operational international systems in these fields, it would be an important achievement of UNISPACE 82.

The recommendation about the setting up of an international space information system, "initially consisting of a directory of sources of information and data services", is relatively easy to implement in terms of mechanics. However, the categorization of relevant data, and even an appropriate index thereof, would require imaginative handling, with due appreciation that often-times the need is for information, equipment and methodologies which, on the face of it, may not have much to do with satellites, launch vehicles, receiving stations or computarized processing equipment. One will have to learn to assess the information needs from the point of view of the end-user and not suppliers of the most sophisticated hardware. The appreciation for what is relevant can clearly come through a close working with the real life problems which

might have a space-related component. Such an information system within the UN could play a very important catalytic role in development of true international cooperation in space-impacted areas and perhaps even beyond these areas.

The report refers to the need for regional cooperation. A great deal already exists, but there is a largely untapped scope for this, especially between developing countries. The already existing initiatives in this regard are the African Remote Sensing Council, AFROSAT, ASEAN cooperation with regard to PALAPA utilization, the Asian Remote Sensing Programme, proposals for a Latin American Remote Sensing Council and even a space agency, and so on, and these should be more actively pursued. The European Space Agency (ESA) provides an outstanding example of what regional cooperation in space can yield. Perhaps the focus, in the case of developing countries, would have to be somewhat wider than the merely technical and financial cooperation, but even this itself would go far towards building islands of self-confidence in parts of the world where few exist. Hopefully, the recommendations of the Conference in this regard would be pursued vigorously both at the national and international level.

Increasing military uses of outer space was initially not a topic of the Conference agenda. However, while considering the need and means for enhancing international cooperation in the peaceful uses of outer space, it is natural that the attention of the participants in the Preparatory Committee and the Conference would be drawn to the already existing, and the potential for increased, non-peaceful uses of space. After a great deal of discussion, the Conference agreed to express its grave concern over the extension of an arms race into outer space and urged all nations to contribute actively to the prevention of this. Attempts of a large majority of the countries to introduce language to the effect that the testing and deployment of anti-satellite weapons should be banned and that the inviolability of all peaceful space activities must be guaranteed did not find a general consensus. It is my personal belief that the development of peaceful uses of space would ultimately suffer from increased military activities even though some people point to the great spin-offs for civilian use which come from military research. One should be filled with despair at the general consensus in the current world wisdom that society will bring forth its best creative energies and financial support only for the design and production of systems meant for the destruction of parts of it. One would have thought that a deep involvement with what space itself means in terms of knowledge and understanding would have led mankind away from such archaic and tribal ways of looking at ourselves.

In this connection, I would like to end by recalling some personal reflections from my keynote address at the AIAA Symposium in Aspen last year:

> I share the excitement of those first pictures of the whole earth taken from space and believe that this was an act of communication of a rather unique significance. I also believe that space has an important role to play, in understanding the earth, the planets, the universe, and our relationship to the whole of creation. Such space activity is a necessary part of being human. Space activity is of course not a separate "science" *per se;* we have been engaged in this since the time we first looked at the star-studded sky and started wondering about the meaning of it all. But I believe that through the coming of the space age a potential revolution has occured in human knowledge, which in my view, goes beyond knowledge, perhaps even to "knowing". What concerns me greatly is that this revolution has not sufficiently percolated into the folds and fabric of our society even where the state of the technological and industrial development is the highest. When one begins to have a feeling, even an understanding, not only for the

possible origins of the solar system, but also the connections between the earth, the solar system and the rest of the universe—how various elements were synthesized, the fact that the stuff we are made of was at some time cooked in the middle of the same star, from the same ingredients, that indeed there is a geneological connection between various segments of the universe, between things we call dead and those we call living, not only between all people but everything around—one would have expected that man's actions would begin to be controlled by a new shared ethos.

Is this kind of hope just a romantic extension of a scientific mind given, as some would accuse, to mystic rambling? I can't help feeling that somehow all this is centrally related to the kind of questions humans have been asking for ages. I do not know of any blue-blooded—or for that matter red-blooded—religion which has not addressed the personal question: who am I, what am I, where did I come from, where am I going?

But this new consciousness of common origin and destiny and our global connection is something which has not been shared at a deep personal level by most of humanity. This picture in its essentials is not meant only for scientists, or for societies in which most of the science is done; this should be the new back-drop against which man everywhere should begin to define his meaning, his purpose, and his practical functions. Perhaps man has been so successful in applying science, that he has not had the detachment required to appreciate the meaning behind our new knowledge. Perhaps the rate of collation of this new awareness is by its very nature much slower than the rate at which technological tools can be produced to solve some of the problems which have arisen from yesterday's living and yesterday's action. These problems are, of course, important and we have demonstrated our technical virtuosity in dealing with their symptomatic manifestations. Our solutions create new problems, demanding new solutions, and we proceed every more vigorously in a direction set by urges of a parochial man, rather oblivious to the beauty of the new countryside, with its flowers and its new possibilities. We do not have the time to stop and ponder whether, finally, the time has not come to redefine our agendas, somewhat more consistent with the new vision that has come our way. We have reached some sort of cross-roads during last 30 odd years, when we are beginning to learn not only the way of doing things but have also touched the periphary of a new understanding which should also impact the question of what is worth doing; not only the "possibilities" of what can be done, but also the world of "desirables" ought to change. I say "ought to", but what is "ought to"? Clearly, one cannot legislate that. But, somehow, we don't have this awareness percolating. No doubt we are impressed and "wonder-struck" by what we find about the universe and its working, as also by our great new abilities, amongst others, to see and communicate with the whole world. . . . . but what is the human meaning behind all this knowledge and what are the new responsibilities arising from these new capabilities? Do these questions arise often enough when we go about the business of taking real-life, practical, decisions?

I have talked, as have others, about the meaning of the understandings about the large scale universe, and our place in the scheme of things, that view of the earth from space in its meaningful loneliness, universal communication, abolition of distance, redefinition of neighbourhoods, common origins and common destiny, a world ecology encompassing life, people and things. I realize, of course, that these supposedly new elements in our consciousness are not so new. Many of these concepts have been with us through the holistic discoveries of the past—some of them parts of the philosophic and ethical frameworks of great religions, others resulting from the work of secular philsophers. What is new is that for the first time, we have found and done things which begin to "objectify" these concepts. The world of values and the worlld of science (including its practical applications) begin to develop a deeper connection. I begin to see the possibility of a new type of "religiosity" not based on dogma or revelation which might begin to encompass the earth. I am impatient that this is taking so long—and sometimes apprehensive that there might be an inherent difference in the natural time constants for development in these two realms and we might end up losing the new vision that is just beginning to emerge. Perhaps we scientists have a new role to play. But

then most of us are so taken up with the intellectual and practical adventure of what we discover and create, and so impressed by our own technical virtuosity, that we either do not have the time to step back and look at the implications of what we do, or we are too embarrassed to talk of things which are supposed to be in the curriculum of some other department. Perhaps the real communicators of this vision will be others—those who create the colour and character of society through stories and fables, poems and pictures. How do we influence the art and poetry of our time and share the glimpses of beauty and harmony that have come our way through our privileged pursuits?

Of course, UNISPACE 82 did not have these questions on its agenda. However, one suspects that during the period of its preparation, some of these thoughts did surface more often than before, and that some of the discussions at the Conference were illuminated by such a vision. Many of the recommendations of the Conference are in the nature of a practical agenda, and, in my view consistent with the rather philosophic and romantic ideas presented. The real work, of course, lies in the future, much of it in your hands.

Yash Pal
Secretary-General, Second United Nations
Conference on the Exploration and
Peaceful Uses of Outer Space.

2. The Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE 82)

International special conferences convened on an *ad hoc* basis to consider specific subjects have been of particular importance to poorer and weaker States of the third world as instruments of foreign policy. The majority of numbers which they command and the opportunity afforded by interactions within multilateral conferences to form coalitions, have reinforced the importance of such fora. The concept of *ad hoc* conferences also has a long history as a teaching, problem-solving, information-sharing and conflict-resolving mechanism. During the last two decades, the United Nations has convened over a dozen such *ad hoc* special conferences on various global issues, including food, trade, industry, law, population, women, and science and technology.

Since the first United Nations Conference on the Exploration and Peaceful Uses of Outer Space held in 1968, six science and technology related *ad hoc* special conferences have been held by the United Nations: The UN Conference on the Human Environment (1972); the UN Conference on Human Settlement (1976); the UN Conference on Desertification (1977); UN Water Conference (1977); the UN Conference on Technical Cooperation among Developing Countries (1978); and the UN Conference on Science and Technology for Development (1979). The primary stated purpose of these conferences was to bring these issues to world-wide attention in order to stimulate the necessary political will to institute policies at the national, regional and international levels that would alleviate the problems encompassed within each area discussed. Depending on one's point of view and definitions, these conferences achieved varying degrees of success in terms of publicity, policy changes and international cooperation to solve common problems.

Much of the initiative for convening UNISPACE 82 also came—especially at the outset—from the developing countries. In particular, these countries expressed a desire to explore how the world-wide activities in outer space, including international cooperation, would be developed to ensure that the potential benefits from space science and technology and their applications, would be truly realized for all countries. There was a general feeling that the potential for space was much greater than currently seen and utilized by most countries and that the benefits were not shared as widely as they could be.

The growing involvement of all nations, developed and developing in the once-limited sphere of outer space activities was reflected in the work of UNISPACE at which 94 States participated.[1] In addition, representatives of several international intergovernmental and nongovernmental organizations participated in the Conference.

The Conference provided a unique opportunity for the entire international community to gather together to consider in great detail the complex issues of this new global concern. It dealt with the entire gamut of space science and technology and their applications from scientific, technical, political, economic, social and organizational points of view and their interrelationships. Some countries felt that legal issues should also be discussed. However, these issues were excluded from the agenda primarily at the insistence of developed countries. Nevertheless, the Conference discussed legal implications of certain issues and the results of the discussions at the Conference provide the backdrop against which legal issues will have to be considered in the future. Similarly, at the insistence of certain developed countries, the agenda of the Conference was limited to peaceful uses of outer space. The Conference, however, discussed at length the military implications of outer space, particularly during the general debate when almost all countries expressed their concern on the growing military activities in space.

The first United Nations Conference on the Exploration and Peaceful Uses of Outer Space was held in 1968. Its objective was "to assess the practical benefits to be derived from space exploration and to find the practical means for the sharing of these benefits by all countries". That Conference helped to create greater awareness among nations about the possibilities and potential of space technology for peaceful applications. It was, however, organized basically as a "scientific exposition" and unlike the second conference, was not mandated to make any recommendations. UNISPACE 82 was specifically requested to make recommendations and was not intended to be a scientific symposium merely for the exchange of information as the first conference was.

The rapid progress since 1968 in the development of space technology, and particularly the vast increase in actual and potential applications, led some countries to suggest, in the mid-70's, the convening of a second conference. In the following years, the desirability and need for such a conference was widely felt. The original preparations for the conference began in 1976 when the Scientific and Technical Sub-Committee of the United Nations Committee on the Peaceful Uses of Outer Space set up a working group to consider this matter. On the basis of these considerations, the General

[1]This conference was held at Vienna, August 9-21, 1982. *See* Report of the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space, U.N. Doc. A/CONF. 101/10 (1982) [hereinafter cited as UNISPACE Report]. A summary of recommendations from the report appears in the section of Current Documents, I, *infra*.