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THE NEW ERA IN OUTER SPACE

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THE LAUNCHING of the first reusable manned spacecraft, commonly known as the space shuttle, into orbit around the earth will mark the beginning of a new era in outer space. As a historic event occurring in a medium above the surface of the earth, it will equal, in the immensity of its significance to mankind, the first manned power flight by the Wright brothers. That flight was of about 12 seconds duration for a total distance of 103 feet, a distance shorter than the length of the shuttle orbiter (122.2 ft). The shuttle will be powered initially by two adjacent solid rocket boosters, and, after reaching an altitude of approximately 31 miles, by three orbiter main engines. It can carry a payload of up to 65,000 pounds and its normal earth orbit operation will be from 1 to 30 days. It will circle the earth at altitudes from 115 to 690 miles. The shuttle system is called reusable because only the large external fuel tank hinged to the underside of the shuttle is expended. When this tank separates from the upward thrusting shuttle, just prior to orbital insertion, it will fall back towards earth and disintegrate in the earth's atmosphere. The solid rocket boosters will parachute down, landing on the ocean's surface about one hundred and forty miles from the launch site. There they will be picked up by naval craft and returned to the space center for reuse.¹

The manned orbiter itself, after completing its mission, will return to earth first descending through space as a satellite, and as it reaches the airspace, like a powerless overweight glider. After approximately two weeks of maintenance and refurbishment, it can be reattached to rocket boosters and a new external tank for further outer space missions.

Eight years ago, the National Aeronautics and Space Administration (NASA) was given Congressional authority to proceed on a space shuttle contract. In August of 1972, Rockwell International's Space Division was awarded the prime contract by NASA for assembling the Shuttle orbiter. The shuttle system was to be ready for the first manned orbital flight test by the second quarter of 1979. However, successive delays in qualifying the

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¹The characteristics of the Space Shuttle are explained in a pamphlet published by the ROCKWELL INTERNATIONAL SPACE DIVISION, OFFICE OF PUBLIC RELATIONS, SPACE TRANSPORTATION SYSTEM, (January 1978). For a definitive analysis of the legal characteristics of the Space Shuttle see, Sloup, *The NASA Space Shuttle*, 8 CALIF. W. INT'L L.J. 403 (1978).

main engines for safe operation, and in attaching a thermal tile protective heat shield, have repeatedly moved back the target date.² It now has been programmed for the first quarter of 1981. Six orbital test flights have been scheduled over an approximate twelve month's period after which the first operational flight will occur.³ NASA has authorization to build four shuttle orbiters and funding to keep open the option for a fifth. Four hundred eighty-seven shuttle flights are projected over an eleven-year operational period beginning in 1982.⁴

Almost two and three quarter billion dollars has been requested by NASA for the space transportation system alone for the fiscal year 1981 budget.⁵ This is nearly half the total NASA budget and a budget only exceeded by the nearly six billion dollars appropriated in fiscal year 1966 for the Apollo moon program.

While the advent of the shuttle era will open new vistas for science, medicine, and commerce, it will also pose challenges for the creation of a new legal framework. The shuttle is a space object and will be covered by existing space treaties which set forth the general principles of outer space.⁶ The versatility of the shuttle will transform the outer space into an

² *Orbiter Protective Tiles Assume Structural Role*, AV. WK. & SPACE TECH. 22-24 (Feb. 25, 1980); *Engineers Assess Shuttle Engine Failure*, New York Times, Dec. 31, 1979, § A, at 10.

³ *Hearings on S. 357 before the Committee on Commerce, Science and Transportation of the Senate*, 96th Cong., 1st Sess. 1052 (1979) (Statement of John F. Yardley, Associate Administrator for Space Transportation Systems, NASA) (hereinafter *Hearings*).

⁴ *Hearings*, *supra* note 3, at 1030, 1084. As to the military needs for a fifth orbiter see AV. WK. & SPACE TECH. 24 (Feb. 18, 1980).

⁵ *Shuttle Boosts NASA Budget to Record*, AV. WK. & SPACE TECH. 21 (Jan. 28, 1980).

⁶ The principal multilateral Space treaties to which the United States is a party are: The Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, Jan. 27, 1967, 18 U.S.T. 2410, T.I.A.S. No. 6347, 610 U.N.T.S. 205 (effective Oct. 10, 1967) (hereinafter the Outer Space Treaty); the 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 (effective Dec. 3, 1968); Convention on International Liability for Damage Caused by Space Objects, Mar. 29, 1972, 24 U.S.T. 2389, T.I.A.S. No. 7762 (effective Oct. 9, 1973) (hereinafter the Space Liability Convention); and the Convention on the Registration of Objects Launched Into Outer Space, T.I.A.S. No. 8480 (ratified Sept. 15, 1976). All of the foregoing treaties are contained in STAFF OF SENATE COMM. ON COMMERCE, SCIENCE AND TRANSPORTATION, 95TH CONG., 2D SESS., SELECTED BASIC DOCUMENTS ON SPACE LAW (Comm. Print 1978) (hereinafter BASIC DOCUMENTS). A fifth treaty is the Agreement Governing the Activities of State on the Moon and Other Celestial Bodies adopted by the United Nations General Assembly on Dec. 5, 1979. See U.N. Doc. A/34/664 (1979) reproduced in 18 INT'L LEGAL MATERIALS 1434-1449 (1979). The Moon Treaty has not yet been submitted to the Senate for advice as to ratification.

ocean for commerce and industry.⁷ As space traffic increases, more concrete legal principles and regulation will become imperative.

In a speech given at the Kennedy Space Center October, 1978, President Carter noted that the United States has invested about one hundred billion dollars in the United States space program and that the inauguration of the space shuttle will bring the second great era of the space age. He stated that the most paradoxical and exciting thing about the shuttle is that "it will make our use of space in the future routine and perhaps not very exciting. . . ."⁸ Routine it may not become for perhaps a generation, but exciting it will almost certainly be from the dramatic liftoff of the first orbiter in space, the Columbia, next year.

In my view there are four broad ranges of legal considerations which must be raised.

I. DEFENSE AND NATIONAL SECURITY

Foremost are defense and national security issues. The full extent of the shuttle's capabilities will only be realized after many orbital, experimental and operational missions. As an orbital platform it will be able to function as a reconnaissance, navigational, or weapons based satellite. It can serve as a way station for repair and resupply of other satellites. It can boost other objects into deep space, or recapture them for return to earth. With its massive sixty-foot bay doors, it can serve as a base for building large structures in space and other extra vehicular activity. The shuttle's deployment for national security has to be, in my opinion, its overriding justification. It will be able to detect, and if necessary, destroy hostile alien satellites, provide early warning for any enemy missile launches, serve as a platform for the launch of our own missiles, and operate as a spaceborne command and control center.

The Outer Space Treaty clearly mandates that outer space will be used for peaceful purposes only.⁹ Nothing in that treaty, however, negates the inherent right of self defense and the use of military personnel in space is specifically authorized. The Air Force Director of Space Systems and Command recently stated that "the shuttle era will be decisive in its contribution to an understanding of the military man's role in space."¹⁰ Measures taken in space for national security purposes are now universally held to

⁷ See *Shuttle Pivotal To Space Plans*, AV. WK. & SPACE TECH. 69 (March 3, 1980). See, generally Moss, *The Space Shuttle and the Law of Outer Space*, 19th Colloquium on the Law of Outer Space, Anaheim (1976) 175-184.

⁸ White House Press Release, Oct. 1, 1978; Press, *U.S. Space Policy A Framework for the 1980's*, AERONAUTICS & ASTRONAUTICS 34 (July-August 1979). The first great era was inaugurated with the launch of the Soviet satellite Sputnik in 1957.

⁹ Articles 3 and 4, Outer Space Treaty; BASIC DOCUMENTS at 26, 27.

¹⁰ Maj. Gen. Yost, AIR FORCE POLICY LETTER No. 1-1980, NATIONAL SPACE POLICY AND AEROSPACE DOCTRINE 7 (1980).

be consistent with peaceful purposes.¹¹ This does not resolve the many legal issues related to the use of the shuttle in the exercise of the inherent right of self defense.

Reusable manned space transportation systems will not be the exclusive preserve of the United States for long. The Secretary of Defense has recently testified that intelligence data indicates Soviet authorities are developing their own manned, winged, reusable spacecraft which will have intercept and detection capabilities.¹²

Warships navigate the high seas and into foreign territorial waters under a fairly explicit legal code developed both by customary and treaty law. Warships possess sovereign immunity, are not subject to visit and search by foreign authority in time of peace, and may enter foreign ports only with express permission. With the routine use of manned, military spacecraft, it will be the task of space lawyers to define their juridical status and codify the rules of the road for their navigation by analogizing to the law of the sea.

II. ENVIRONMENTAL PROTECTION

The second range of considerations generated by the shuttle age relate to the protection of the environment.

As the shuttle lifts off from its launch pad it will leave a toxic cloud which could contain up to three and one half million pounds of exhaust products in the airspace. This cloud can generate acidic rain which may cause pollution of subjacent areas. When shuttle flights become routine and frequent, they may also cause weather modification for as much as two days after liftoff in a radius of possibly eight miles from launch. The shuttle will also generate sonic booms in areas subjacent to the liftoff pad, and in the airspace on reentry. In addition, ascent and descent of the shuttle into the stratosphere will disturb the thin ozone layer.¹³ To my knowledge, no scientific determination has yet been made on the impact the shuttle will have on the quality of life on earth. The acoustic noise, sonic booms, acidic clouds, and ozone depletion created by shuttle flight must become the subject of national and international environmental regulation. The Outer Space Treaty provides that the party states will conduct exploration of outer space in a manner to avoid adverse changes in the environment of the earth.¹⁴ The implementing Space Liability Convention refers briefly to environmental damage which may be caused by space objects and which present a large scale danger to human life, or seriously interfere with the

¹¹ Reed & DeSaussure, *Self Defense in Outer Space*, 7 A.F. L. REV. 38 (1965).

¹² *Testimony of Secretary of Defense Brown*, AV. WK. & SPACE TECH. 25 (Feb. 18, 1980).

¹³ KAPLAN, *SPACE SHUTTLE (AMERICA'S WINGS TO THE FUTURE 82-88* (1978).

¹⁴ Article 9, *The Outer Space Treaty*; BASIC DOCUMENTS, at 29.

living conditions of the population.¹⁵ Under this convention member states must do what they can to render prompt and effective assistance to distressed areas when requested. However, claims for environmental damage are not resolved by those treaties.

One type of environmental harm not directly associated with the shuttle is the accumulation of space debris which is steadily mounting in the near space. This debris has been referred to as "nonfunctional objects put into orbit in connection with payloads, as well as payloads that no longer perform useful functions."¹⁶ Many of these nonfunctional objects disintegrate into smaller pieces in space, and the explosion, accidental or intentional, of satellites has also contributed to this debris. This proliferation of space junk can affect solar radiation, interfere with space communications, and pose a hazard to space navigation. The shuttle has obvious potential for the identification and removal of such debris. However, some kind of international salvage and waste removal agreement will be needed.¹⁷ The Outer Space Treaty provides that the registry state retains jurisdiction and control over its own space objects.¹⁸ Nonfunctional foreign satellites, and parts thereof, still belong to the state of registry and that state's consent to remove their abandoned satellites will be necessary. Keeping the highways of space free from pollution and navigational obstructions will require an international agreement between spacefaring states.

Manned flight in space is more akin to ocean navigation than to air travel, therefore the law of the sea, not air law, will provide the most rewarding analogy for establishing an environmental protection regime in space.¹⁹

III. SUBSTANTIVE LAW IN OUTER SPACE

The third area where the advent of the shuttle will have a profound influence on the development of space jurisprudence is in tort and property law. Both of these subjects have a territorial bias which has evolved along regional and substate lines according to local custom and mores. There is no universal tort or property law. How will these branches of legal thinking expand into outer space? The Outer Space Treaty provides that International Law applies to outer space which is to be used for the benefit of all mankind. The parcelling of national jurisdictions in this arena is clearly not contem-

¹⁵ Article 21, Space Liability Convention; BASIC DOCUMENTS, at 62.

¹⁶ Dembling & Kalsi *Pollution of Man's Last Frontier; Adequacy of Present Space Environmental Law In Preserving The Resource of Outer Space*, 20 NETHERLANDS INT'L. L. REV. 130 (1960); Menter, *Status of International Space Flight*, paper presented at the 30th Congress of the International Astronautical Federation, Munich, at 9.

¹⁷ Hall, *Comments on Salvage and Removal of Man-Made Objects from Outer Space*, 33 J. AIR L. & COM. 296 (1967); DeSaussure, *An International Right to Remove Earth Threatening Satellites*, 3 ANNALS AIR & SPACE L. 394 (1978).

¹⁸ Article 8, Outer Space Treaty; BASIC DOCUMENTS, at 291.

¹⁹ See Glazer, *Domicile and Industry in Outer Space*, 17 COLUM. J. TRANS. L. 98, 99 (1978).

plated. An international consensus as to the appropriate unified, substantive tort and property law must somehow be fashioned and this can best be done by turning the attention of the periodic Hague Conferences for the unification of private law toward this new domain.²⁰ Will the shuttle be judicially determined to be a dangerous instrumentality, as its predecessor, the aircraft was until the early 1930s?²¹ How long will it be before the shuttle sheds the mantle of experimental and dangerous? Will the liability of owners, operators, and insurers of space vehicles be limited by the doctrines of assumption of the risk, and contributory or comparative negligence?

As more and more mission and payload specialists and ultimately routine space travelers use the shuttle, their rights and duties, particularly in the tort and property fields, must be redefined. Basic assumptions as to the reasonable man and the threshold for gross negligence and wilful misconduct will come under judicial reevaluation. Human reaction time and mental processes may be significantly different for long duration space travelers than for those who travel by air and sea.²²

The Outer Space Treaty provides that states parties to the treaty shall bear international responsibility for national activities in space.²³ The implementing Space Liability Convention sets forth an absolute liability regime for damage caused by space objects on earth and to aircraft, and a regime based on fault for damage caused in outer space.²⁴ However, the Space Liability Convention has many significant gaps and those who transit space in a United States shuttle, will find the Convention of little practical importance.²⁵ In addition, the applicability of the Federal Tort Claims Act to activity in space is questionable. The extension of that Act into outer space has never been judicially considered.

The NASA Act provides the Administrator with authority to pay claims against the United States for \$25,000 or less for bodily injury, death, or damage to or loss of real or personal property resulting from NASA

²⁰ DeSaussure & Haanappel, *A Unified Multinational Approach To The Application of Tort and Contract Principles to Outer Space*, 6 SYRACUSE J. INT'L. L. & COM. 14 (1978).

²¹ DeSaussure, *A Strict, Limited Liability Regime in Outer Space*, 22d Colloquium on the Law of Outer Space, Munich, at 117-123 (1979).

²² ROBINSON, *LIVING IN OUTER SPACE* 58-64 (1975).

²³ Article 7, Outer Space Treaty; BASIC DOCUMENTS, at 28.

²⁴ Articles 2 & 3, Space Liability Convention, BASIC DOCUMENTS, at 54.

²⁵ For an excellent analysis of the Space Liability Conventions and its significant omissions, see Foster, *The Convention On International Liability For Damage Caused by Space Objects* 10 CANADIAN YEARBOOK OF INTERNATIONAL LAW 137 (1972); on space shuttle liability generally see Dula, *Management of Inter and Third Party Liability for Routine Space Shuttle Operations*, 20th Colloquium on the Law of Outer Space, Prague, 1978, at 201-212. He would like to see all shuttle tort adjudication vested in the Court of Appeals for the District of Columbia.

activity.²⁶ This is a discretionary provision, not based on a judicial finding. I know of no other express legislative basis for civil relief for torts committed by the United States in space.

Property law as applicable in outer space is equally clouded. This will become more apparent with routine shuttle use. The Outer Space Treaty specifically provides that ownership of objects launched into outer space or constructed on celestial bodies is not affected by their presence in space.²⁷ However, some property rights will originate in space travel. These rights must be governed by the law of some locality. New ideas, original research, even the invention and fabrication of new products will arise while on the shuttle or a manned space station. The laws which should apply must be determined by international agreement.²⁸

IV. INTERNATIONAL COOPERATION

The fourth broad area where shuttle operations will significantly influence the development of a modern space law is in the field of international cooperation and administration.

Routine manned flights beyond the earth's atmosphere will ultimately require an international traffic code for space, uniform standards for safe operation and for licensing crews and craft.²⁹ Uniform procedures as to approach, visit, inspection and removal of foreign satellites will become necessary. Whether the advent of the shuttle will hasten the need for a supranational administrative agency to coordinate and harmonize space activity remains open to question.

Many early jurists, including prominent Soviet authorities, believed that the optimum way to bring international order to outer space was to revise the Chicago Convention which established the International Civil Aviation Organization (ICAO).³⁰ Dr. John Cobb Cooper, the first Director of the International Institute of Air and Space Law at McGill University, was a

²⁶ Section 203(13) (c) NASA Act of 1958 as amended; 42 U.S.C. 2473(c)(13) (1976). There is also a recent amendment to the NASA Act authorizing the Administrator on terms he deems to appropriate to provide liability insurance for any user of a space vehicle to compensate for third party claims. Section 308(a), NASA Act of 1959, 42 U.S.C. 2458(b) (effective October 1, 1979). This provision is the subject of an interesting article, see Sloup, *Liability and Insurance Aspects of the Space Transportation System under the New Section 308 of the NASA Act*, 4 ANNALS AIR & SPACE L. 639-651 (1979).

²⁷ Article 8, Outer Space Treaty; BASIC DOCUMENTS, at 29.

²⁸ See generally Gorove, *Property Rights in Space*, 2 J. OF SPACE L. 27-30 (1974); DeSaussure, *An Integrated Legal System For Space*, J. OF SPACE L. 179-192 (1978).

²⁹ Bourelly, *Towards A Convention On The Legal Status Of Manned Space Flights*, paper presented at the 20th Congress of the International Astronautical Federation, Munich, Germany 1979. DeSaussure, *Evolution Toward An International Space Agency*, Zeitschrift Fur Luft Und Weltraumrecht 86-95 (1978).

³⁰ Smirnof, *The Need For A New System Of Norms For Space Law*, 1st Colloquium on the Law of Outer Space, The Hague 1959, at 108; PIRADOV, CURRENT PROBLEMS, INTERNATIONAL SPACE LAW 258 (1976).

proponent of this view.³¹ Other experts have leaned toward the view that a specialized international agency, subordinate to the UN but largely independent in its functioning is needed.³² These latter jurists point to ICAO which has enhanced the smooth operation of international air flight. They also refer to the International Maritime Consultative Organization (IMCO) which promotes the growth of maritime commerce. Finally, they consider the International Telecommunications Union (ITU) which allocates and assigns radio frequencies in the electro magnetic spectrum. All of these organizations are examples of international cooperation in discrete subject areas.

It seems reasonable to believe that the launch of the first shuttle orbiter, the Columbia, into outer space in early 1981 will hasten the need for some international agency to set standards for manned spacecraft, certify the competence of space crews, propose rules to regulate space traffic, and provide a clearing house for the exchange of information on manned flight space.³³

The next two decades will be compared to the first two decades of this century when the benefits to be achieved by the manned flight in air-space, for national security and commerce, were only beginning to be realized. Space lawyers today have a unique and exciting opportunity to pioneer legal thought in this new and unexplored media for the advancement of mankind.

³¹ Cooper, *International Control Of Outer Space*, 3d Colloquium on The Law of Outer Space, Stockholm 1960, at 25.

³² See Part I, *Should There Be a World International Space Agency?* 20th Colloquium on the Law of Outer Space, Prague, at 15-47 (1978).

³³ In early 1979, NASA named the four orbital vehicles as follows: Orbiter 102-Columbia; 099-Challenger; 102 Discovery; 104-Atlantis. Orbiter 101, which flew the Shuttle Approach and landing tests is named the Enterprise. See *Shuttle Orbiters named after Sea Vessels, Hearings*, *supra* note 3, at 908.