HEAVENLY JUNK

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Introduction

Space debris is no longer a "back burner" subject. Concern for the issue in recent years has grown rapidly. At a recent speech to the National Space Society at the New York Academy of Sciences, there was intense interest in the subject of space debris as a universal danger. In May 1988, the author chaired an American Bar Association (ABA) International Space Debris Panel in Montreal, Canada. Members of the ABA Panel have followed the scientific and legal studies on orbital debris conducted by the National Aeronautics and Space Administration (NASA), the European Space Agency (ESA) and the U.S. Inter-Agency Space Group. Attention to the subject continued to rise this past year as a result of a U.N. study concerning regulatory standards and 12 principles that were reached by consensus for nuclear power sources in outer space. The placement of overall orbital debris problems on the official agenda of the Legal Sub-Committee of the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS), is currently important. Space debris is also now being seriously studied by six countries, the International Aeronautical Federation, and the International Aeronautical Academy.

Space debris in low earth orbit (LEO) — four to six hundred kilometers from the ground — and at the important geostationary orbit constitutes a pressing problem today. The problem of space debris in other orbits has not yet risen to the same level of urgency. However, there is universal agreement that space debris in general will become increasingly problematic if international preventative measures, including those taken voluntarily and primarily by the United States, the ESA, Japan, and Russia are not implemented quickly. U.N. initiatives on the space debris problem are laudatory, and must be encouraged internationally. This article will provide a summary of current United Nations, United States, and Commonwealth of Independent States (CIS) positions on space debris.[1]

1. The Commonwealth of Independent States positions are essentially those of the Russian Federation, Ukraine, and Kazakhstan.

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International Action

Space debris is neither defined nor mentioned in current international treaties or conventions. The controversial draft treaty on Nuclear Power Source Satellites sponsored by the United Nations does not address the problem of overall space debris. Rather, it is mainly concerned with nuclear power source uses, shielding, launch notifications, immediate threats, warnings, recoveries, and nuclear satellite-related debris.[2]

To date, several formal agreements have been established under U.N. auspices: the 1963 Partial Test Ban Treaty, the 1967 Outer Space Principles Treaty (Article 9), the 1972 Liability Treaty, the 1975 Registration Treaty, and the 1986 Rescue and Return Treaty. These all apply to space debris. With the exception of the damages caused by COSMOS 954 in Canada and by Skylab in Australia in 1978, very little space debris has damaged the surface of the earth. Most debris has landed in the oceans or burned up during its entry into the earth's atmosphere. But much debris still remains in orbit, and is accumulating steadily.

Currently, space debris threatens the military and commercial satellites themselves, and obstructs tracking for electronic astronomy (radiotelescope surveys), research, and related satellite surveillance. Operating satellites at low earth, geostationary, and polar orbits are at greatest risk of being damaged by space debris.

Although nature has helped reduce the volume of space debris through burn up and self-destruction,[3] no international technical standards and very few legal regulations address the reduction of orbital debris.

The European Space Agency coordinated the First European Space Debris Conference in Darmstadt, Germany, in April 1993; 251 experts attended from 17 countries, including China, India, Japan, Russia, and the United States. The conference was co-sponsored by the national space agencies Agenzia Spaziale Italiana (ASI), British National Space Centre (BNSC), the French Centre National d'Etudes Spatiales (CNES), and Germany's Deutsche Agentur für Raumfahrtangelegenheiten (DARA). Not only did the conference provide a forum for research on space debris; it also assisted in the discussion of international implications and policy issues, helped define future directions for research, and identified methods of debris control, reduction, and protection. The numerous presentations covered the technical aspects of space debris as well as policy issues. At the end of the conference, participants met in a round table to explore the possibilities of controlling and regulating space debris.

The U.N. COPUOS Committee on Nuclear Power Sources and Space Debris is currently close to formally adopting substantive regulatory standards and international safety notification requirements. The COPUOS Chairman has

2. See Vladimir Kopal, "Use of Nuclear Power Sources in Outer Space, A New Set of United Nations Principals," 19 *Journal of Space Law* 103 (1991).
3. This natural decrease in debris has occurred particularly in low earth orbit with the solar cycles of 1978-1980 and 1988-1990.

wisely issued a chairman's list of agreed principles on nuclear power sources in outer space for all nations.[4]

Nuclear power source debris is currently on the U.N. agenda. The general topic of space debris was recently placed on the full U.N. COPUOS agenda out of concern for the costs of the removal of known debris, as well as concern for military and national security programs. Outer-space debris is a threat to world national security and peace. Furthermore, launch windows for all nations are now being lost due to space debris.

Unless a treaty on the overall space debris problem is not completed by 1995, an almost insolvable space debris problem will develop by the year 2000 in LEO, GEO, and polar orbits. In the absence of a new treaty, launch windows for civilian, military, and national security "eyes and ears" purposes will also be reduced.

The problem of space debris is only getting worse. In 1993, for example, Russian ground controllers deliberately blew up an advanced military reconnaissance satellite in space to prevent it from falling on people or property and being recovered by military or civilian intelligence analysts. The explosion of the COSMOS 2225 satellite in orbit marks the fourth time in the last few years that Russia has deliberately destroyed one of its new imaging reconnaissance satellites, an advanced type of satellite that usually returns intelligence imagery to earth in film pods. The COSMOS 2225 may have used a nuclear power source. As in all three previous flights of this new design, the vehicle was destroyed after the mission was completed. Its destruction on 18 February 1993 came only 58 days following its launch, leaving hundreds of pieces of space debris in a tenuously low orbit inclined 64.8 degrees.[5] Most of the debris fell out of orbit quickly.

Since 1987, the United States has had a national policy on space debris which dictates that intentionally created debris (for tests) and material that is reasonably controllable will be held to an absolute minimum. As of November 1989, the National Space Policy of the United States has stated that "all space sectors will seek to minimize the creation of space debris . . . consistent with mission

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4. United Nations General Assembly, Doc. no. A/RES/47/68, 23 February 1993. The eleven U.N. principles relevant to the use of nuclear power sources in outer space are:
   Principle 1. Applicability of international law
   Principle 2. Use of terms
   Principle 3. Guidelines and criteria for safe use
   Principle 4. Safety assessment
   Principle 5. Notification of reentry
   Principle 6. Consultations
   Principle 7. Assistance to states
   Principle 8. Responsibility
   Principle 9. Liability and compensation
   Principle 10. Settlement of dispute
   Principle 11. Review and revision
5. Bruce D. Nordwall, "Air Force Uses Optics to Track Space Objects," *Aviation Week & Space Technology*, 16 August 1993.

requirements and cost-effectiveness. And we will encourage other space-faring nations to adopt policies and practices aimed at debris minimization." This policy remains in effect today, permitting ballistic missile defense (BMD) tests, and thus creating further space debris, which could decay and burn up with atmospheric drag heat.

Even U.S. efforts are incomplete. Only the Office of Commercial Space Transportation of the U.S. Department of Transportation considers debris generation part of general safety in satellite design. Under U.S. Executive Order 12465 of 24 February 1984,[6] this factor is now being carefully considered by the U.S. Department of Transportation and the Space Interagency Group in determining whether to license a satellite launch.

The U.S. Space Command's tracking system in Colorado Springs tracks over 7,000 pieces of space debris larger than ten centimeters and has distributed up-to-date information to all nations regarding satellite launches, orbits, and survivability in a constantly changing outer-space debris environment. It has been particularly helpful as to LEO, GEO and low perigee orbits. The Altitude Stabilization Attachment Program (ASAP) of Spaceways, Inc., which extends the orbital life of satellite payloads, is an important initiative to minimize debris creation and provide failing satellites with enough boost energy to project them into a safer, distant orbit, sometimes termed "a garbage orbit." Spaceway's ASAP program is pending further development.

There have been other encouraging developments in the reduction of space debris and its deleterious effects. German scientists have recently proposed to remove objects larger than one centimeter. The removal process involves a cycle of energy transfer and conversion with the help of a conductive space tether, and altitude loss with a "remover satellite." In addition, the first set of new solar arrays have been installed by extra vehicular activities on the Hubble Space Telescope. The old solar arrays have been returned to ESA for detailed examination and are yielding very useful information on space debris and on micrometeorites.

Debris-shielding is another dimension of the space debris problem that has already been substantially researched by the United States, specifically for the Space Station Freedom. U.S. Space Station Freedom, redesigned with Russian cooperation, will have the necessary shielding to prevent space debris damage from particles smaller than two centimeters. This assumes that the U.S. Congress will not require any substantial sizing, budgetary or engineering changes in the program after early 1994. Shielding is a necessary precaution, and is quite advanced in its final planning stage. President Clinton has directed NASA Administrator Goldin to redesign the space station into a smaller, streamlined, cost-effective program, assuring performance stability during the transition. The president and NASA are working closely with the U.S. Congress and international partners to maintain international engineering continuity and cost sharing. Japan, Canada, and ESA have invested $8 billion in Space Station

6. *Federal Register* 49, 24 February 1984.

Freedom to date. Russia will contribute hardware, expertise and the launchings. Current U.S.-funded research policy is also to develop non-polluting rocket propellants that generate no orbital debris.

Recommendations

Derrin McKnight of Command Sciences, Nicholas Johnson of Teledyne, and others have told me and have recommended that certain scientists, lawyers, and public non-governmental organizations should vigorously engage in informal, so-called "Track Two" discussions of space debris. This is a useful approach which should be encouraged, as space debris issues need further scientific and legal study. The time has come to create a thoughtful "Working Group on Space Debris" in the U.N. Outer-Space Affairs Division to coordinate its work with the COPUOS Scientific and Legal Sub-committees.

The proposed space debris working group would function within the United Nations by coordinating the exchange of data amongst governments and disseminate the results of the "Track Two" informal meetings. These developments should clearly precede any final new U.S. national policy or regulatory formulation, or recommendation for U.N. treaty codification. The U.S. Departments of Defense, Transportation, Commerce, and Energy, as well as NASA and the White House should consider strongly supporting the creation of a U.N. Working Group on Space Debris.

This recommendation follows former President Bush's advocacy of a "broad vision approach to space."[7] It is also compatible with President Clinton and Vice-President Gore's current support for a smaller, cheaper, more effective outer-space policy. President Bush's statement regarding America's space policy was influenced by his reading of the "Magna Charta of Outer Space."[8] The "Magna Charta" offers a set of suggested principles for consideration in drafting new outer-space treaties. Since its first publication in 1983, it has been published in several languages, first as an *International Astronautical Academy Official Note*, then in *The New York Times* and in *Acta Astronautica*. It has gained wide international acceptance. The "Magna Charta" highlights the international legal, scientific, and economic factors which must be considered in formulating overall space debris policy for a new outer space treaty. The "Magna Charta" also serves as an international framework for policy guidelines of a new treaty on space debris in 1995.

The CIS nations have stated informally in the United Nations that they welcome discussions on a new multilateral agreement on space debris, and perhaps on testing in outer space. In addition, several nations have indicated that the United Nations should establish a database on trackable space debris. Though there are serious reservations to both of these suggestions, the first step

7. Letter to author from President George Bush of 10 April 1989.
8. Edward R. Finch, Jr. "Magna Charta of Outer Space." Document presented by the author to the International Astronautical Federation and International Institute of Space Law Congress, Budapest, 1983.

towards implementing these recommendations should be taken within the informal "Track Two" diplomacy and non-diplomatic discussions.

Despite discussion, there is still disagreement over the allocation of years of space debris responsibility. In a paper presented by Dr. Veresckетin, the former Soviet Union indicated that the United States was responsible for generating approximately 48 percent of trackable space debris, whereas the former Soviet Union produced 41 percent, and other nations approximately 10 percent. The United States contends that the former Soviet Union for years annually out-launched the United States in outer space by a factor of at least three-to-one. Therefore, the volume of space debris should reflect the same ratio. The sources for these percentages are unclear. At present, the total launch rate for the CIS barely equals the U.S.-launch rate. As these new countries become more stable, their space programs could grow, possibly leading again to an increase in launches. This would further increase the rate of space debris creation.

The United Nations, the United States, Russia, Japan, and China should demand the immediate creation of a U.N. Working Group on Space Debris. States should adopt in 1995 an amended 1975 Registration Treaty which would set maximum a time limit of two hours for governments to report all nuclear and non-nuclear launches to the U.N. Secretary General. A two-hour minimum pre-launch notification time limit would suffice for nuclear power source satellites. A two-hour maximum notification post-launch time limit to the U.N. Secretary-General under the existing 1975 Registration Treaty would greatly contribute to the national security, especially of developing countries. Timely pre-launch notification, as well as proposed timely post-launch notification by an immediate amendment to the 1975 Registration Treaty, is vital. It is currently under consideration by the U.S. Interagency Group.

When deliberations on international safety standards and suggested guidelines for nuclear power sources in outer space are completed, then U.N. member states should adopt a similar treaty, with U.S. support. The new nuclear power sources treaty should also follow the ten treaty drafting principles from the "Magna Charta of Outer Space." This will promote strong U.S. leadership on the development of a new international space debris treaty, and lead to a multilateral treaty within the next three to four years.

After a nuclear power sources treaty is drafted, presumably by 1995 or 1996, the author intends to reintroduce to the American Bar Association the "Magna Charta" resolution through the ABA Section of Science and Technology which could state:

> The ABA urges preparation of an international convention that would provide for the prevention of the creation of space debris and the pollution of outer space in any manner whatsoever to the greatest extent feasible and practical consistent with each nation's national security.[9]

9. Finch, *Magna Charta*.

This proposed resolution must await the work of an established U.N. Working Group on space debris. Only then, when such a Working Group on space debris has thoroughly studied the overall legal and scientific problems, can recommendations be made acceptable for all nations directly involved.