United Nations A/AC.105/C.1/L.248/Add.2

General Assembly

Distr.: Limited
21 February 2001

Original: English

Committee on the Peaceful Uses of Outer Space
Scientific and Technical Subcommittee
Thirty-eighth session
Vienna, 12-23 February 2001

Draft report

Addendum

IV. Use of nuclear power sources in outer space

1. In accordance with General Assembly resolution 55/122, the Scientific and Technical Subcommittee continued its consideration of the item on the use of nuclear power sources in outer space under the work plan that it had adopted at its thirty-fifth session (A/AC.105/697 and Corr.1, annex III, appendix). In accordance with the work plan, the Subcommittee reviewed national and international processes, proposals and standards and national working papers relevant to the launch and peaceful use of nuclear power sources in outer space.

2. The Subcommittee had before it the following documents:

(a) Note by the Secretariat, entitled "National research on space debris, safety of space objects with nuclear power sources on board and problems of their collisions with space debris" (A/AC.105/751 and Add.1);

(b) Report by the International Atomic Energy Agency (IAEA) entitled "Preliminary review of international documents relevant to the safety of nuclear power sources in outer space" (A/AC.105/754);

(c) Working paper submitted by the Russian Federation entitled "Collisions between nuclear power sources and space debris" (A/AC.105/C.1/L.246);

(d) Working paper submitted by the Russian Federation entitled "National research on safety of space objects carrying nuclear power sources, including information on national procedures for obtaining final authorization to launch such objects" (A/AC.105/C.1/L.247);

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(e) Working paper submitted by the United Kingdom entitled “Convention on Nuclear Safety and the Safety Fundamentals of the International Atomic Energy Agency: a common approach to the safety of terrestrial nuclear power sources” (A/AC.105/C.1/L.242);

(f) Working paper submitted by the United Kingdom entitled “Review of international documents on radiation protection of particular relevance to nuclear power sources in outer space” (A/AC.105/C.1/L.245);

(g) Working paper submitted by the United States entitled “A database of international documents of potential relevance to nuclear power sources in outer space” (A/AC.105/C.1/L.244).

3. The representatives of [Argentina, Brazil, France, Nigeria, the Russian Federation, the United Kingdom, the United States …] made statements under this agenda item. In addition, the Subcommittee heard two technical presentations under this agenda item by representatives of the United States entitled “International documents of potential relevance to nuclear power sources in outer space” and “Nuclear power source launch approval process in the United States”.

4. The Subcommittee recalled that the General Assembly, in its resolution 47/68 of 14 December 1992, had adopted the Principles Relevant to the Use of Nuclear Power Sources in Outer Space, contained in that resolution. The Subcommittee noted that the Committee on the Peaceful Uses of Outer Space, at its forty-third session, had recalled its agreement that the Principles should remain in their current form until amended and that, before making any amendment to the Principles, proper consideration should be given to the aims and objectives of the proposed revision.[1] The Committee had agreed with the Subcommittee (A/AC.105/736, para. 78) that, while a revision of the Principles was not necessary at the current stage, it was important that States making use of nuclear power sources should conduct their activities in full accordance with the Principles.[2]

5. The Scientific and Technical Subcommittee agreed that, at the present time, revision of the Principles was not warranted. It also agreed that, until a firm scientific and technical consensus had been reached on the revision of the Principles, it would be inappropriate to pass on the topic to the Legal Subcommittee.

6. The view was expressed that the analyses appearing in the documents before the Scientific and Technical Subcommittee at its current session provided a sound basis for the ultimate elaboration of specific technical standards necessitated by the unique nature of the use of nuclear power sources in outer space. That delegation was also of the view that, in the light of the fact that the Principles, having been developed in 1992, had focused almost exclusively upon the protection of the biosphere, consideration should be given to the extension of any newly elaborated safety processes and standards to provide for the broadest range of existing and future applications of nuclear power sources in outer space, including applications on other celestial bodies such as the Moon.

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[1] *Official Records of the General Assembly, Fifty-fifth Session, Supplement No. 20* (A/55/20), para. 96.

[2] Ibid., para. 97.

7. The view was expressed that the provisions of the Convention on Nuclear Safety[3] should also be applied to the use of nuclear power sources in outer space and that the IAEA Safety Fundamentals and Standards for terrestrial reactors should be taken into consideration in the design, construction and licensing of nuclear power sources used in outer space and devices containing such sources. In addition, the provisions of the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency[4] should be applied in the case of an accident involving a nuclear power source used in space that could cause contamination of the environment. That delegation was also of the view that the analysis of safety measures for nuclear power sources in outer space should be particularly rigorous for the two phases of greatest risk for the environment, namely their launching and re-entry into the atmosphere.

8. The view was expressed that, recognizing the particular competence and experience of IAEA in ensuring terrestrial nuclear safety, any new standards or principles which might be elaborated in the future for the use of nuclear power sources in outer space should be in conformity with those already existing under the auspices of IAEA. That delegation was also of the view that issues concerning possible accidental contamination of the Earth's environment as a result of the use of nuclear power sources in outer space were of the greatest importance.

9. The view was expressed that the space environment could now be considered an extension of the human environment and that, consequently, issues relating to the use of nuclear power sources in outer space were of the greatest importance. That delegation was of the view that, for that reason, that item should remain on the agenda of the Subcommittee and should be considered on a priority basis.

10. In accordance with General Assembly resolution 55/122, the Subcommittee, at its 555th meeting, on 20 February 2001, reconvened its Working Group on the Use of Nuclear Power Sources in Outer Space under the chairmanship of Sam Harbison (United Kingdom). The Working Group held […] meetings. At the meeting held on […] February 2001, the Working Group adopted its report.

11. At its […] meeting, on […] February 2001, the Subcommittee endorsed the report of the Working Group, which is contained in annex […] to the present report.

[…]

VII. Space debris

12. In accordance with General Assembly resolution 55/122, the Subcommittee continued its consideration, on a priority basis, of the agenda item on space debris.

13. The Subcommittee had before it a note by the Secretariat entitled "National research on space debris, safety of space objects with nuclear power sources on board and problems of their collisions with space debris", compiling responses received from Member States and international organizations on the issue (A/AC.105/751 and Add.1) and a note verbale dated 23 January 2001 from the

[3] International Atomic Energy Agency, "Convention on Nuclear Safety" (INFCIRC/449), annex.
[4] United Nations, *Treaty Series*, vol. 1457, No. 24643.

Permanent Mission of the Russian Federation to the United Nations (A/AC.105/759) about the planned controlled descent from orbit of the orbital station Mir.

14. The Subcommittee also had before it a working paper containing a proposal on a work plan for the item entitled “Space debris” on the agenda of the Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space, submitted by Canada, China, France, Germany, India, the Russian Federation, the United Kingdom and the United States (A/AC.105/C.1/L.251/Rev.1), and the following conference room papers: “Ensuring controlled descent of the Mir orbital station”, submitted by the Russian Federation (A/AC.105/C.1/2001/CRP.5); “Online Index of Objects Launched into Outer Space”, submitted by the Secretariat (A/AC.105/C.1/2001/CRP.13); and “The financial loss due to the space debris hazard”, submitted by Japan (A/AC.105/C.1/2001/CRP.15).

15. Representatives of Canada, the Czech Republic, France, Germany, India, Italy, Japan, Saudi Arabia and the United States made statements on this item.

16. The Subcommittee heard the following scientific and technical presentations on the subject of space debris:

(a) “Space debris mitigation in CNES”, by the representative of France;

(b) “Efficiency and economical aspects of space debris mitigation measures”, by the representative of Germany;

(c) “Cost-effectiveness of space debris mitigation measures“, by the representative of the United Kingdom;

(d) “Re-entry of the Compton Gamma Ray Observatory and launch vehicle debris mitigation”, by the representative of the United States;

(e) “Index to the United Nations Register of Objects Launched into Outer Space”, by a representative of the Secretariat;

(f) “Space debris research at the European Space Agency”, by the representative of ESA;

(g) “Updated IAA position paper on space debris”, by the representative of IAA.

17. The Subcommittee noted with satisfaction that, at the invitation of the Committee on the Peaceful Uses of Outer Space,[5] a representative of the Interagency Space Debris Coordination Committee (IADC) had made a technical presentation on its activities and views on reducing space debris from launch vehicles. The Subcommittee agreed that IADC should continue to make technical presentations on its work on an annual basis.

18. The Subcommittee noted that international cooperation had continued through IADC, with the participation of Japan, NASA of the United States, ESA, the Russian Aviation and Space Agency, the China National Space Administration, the British National Space Centre, CNES of France, ISRO, the Italian Space Agency, the German Aerospace Centre (DLR) and Ukraine, to enable its members to exchange information on space debris activities, facilitate opportunities for

[5] *Official Records of the General Assembly, Fifty-fifth Session, Supplement No. 20* (A/55/20), para. 106.

cooperation in space debris research, review the progress of ongoing activities and identify debris mitigation options. It also noted that Canada was considering applying for membership in IADC.

19. In accordance with the agreement reached at its thirty-seventh session (A/AC.105/736, annex II, para. 42), the Subcommittee examined the questions of the costs and benefits of debris mitigation measures. As part of that examination, member States reported on:

(a) The costs of various debris mitigation measures;

(b) The consequences, including the economic aspects of taking no debris mitigation measures;

(c) An analysis of the costs and benefits in various debris mitigation scenarios.

20. In accordance with the agreement reached at its thirty-seventh session (A/AC.105/736, annex II, para. 42), the Subcommittee discussed the passivation and limitation of mission-related space debris for launch vehicles, including the cost-benefit aspects (see para. [19] above).

21. The Subcommittee noted that, although adequate attention was being given by member States and space agencies to the above-mentioned issues, further research would be needed to determine whether identified mitigation measures were cost-effective and could minimize the short-term cost while maximizing the long-term benefit for the space environment.

22. The Subcommittee noted with satisfaction that, as requested by the Committee on the Peaceful Uses of Outer Space,[6] the Secretariat had prepared a sample index to the United Nations Register of Objects Launched into Outer Space, which would provide an easy and quick reference to government announcements of space launches and changes in the status of space objects, including their decay in the atmosphere. It noted that the searchable index, available on-line on the web site of the Office for Outer Space Affairs, would greatly facilitate its work. The Subcommittee recommended that the usefulness of the index could be enhanced through additional information provided by member States and comments received from its users.

23. The Subcommittee noted with satisfaction that a process of controlled de-orbiting was being gradually introduced by national space agencies for large artificial space objects in order to decrease the probability of collisions in low-Earth orbit, which could lead to the creation of secondary debris, and also to minimize possible damage on the ground caused by falling space objects. It noted that, in addition to regular de-orbiting of Progress-type cargo spacecraft, the United States Compton Gamma Ray Observatory had been safely de-orbited on 4 June 2000 and de-orbiting of the Mir manned orbital station was scheduled for March 2001.

24. The Subcommittee agreed that further consideration of space debris was important and that international cooperation was needed to expand appropriate and affordable strategies to minimize the potential impact of space debris on future space missions.

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[6] Ibid., para. 108.

25. The Subcommittee agreed that member States should pay more attention to the problem of collisions of space objects, including those with nuclear power sources on board, with space debris and to other aspects of space debris. It noted that the General Assembly, in its resolution 55/122, had called for the continuation of national research on that question, for the development of improved technology for the monitoring of space debris and for the compilation and dissemination of data on space debris. The Subcommittee took note of the replies from Member States (A/AC.105/751 and Add.1) that had been submitted to it in accordance with that request. The Subcommittee agreed that national research on space debris should continue and that Member States and international organizations should make available to all interested parties the results of that research, including information on practices adopted that had proved effective in minimizing the creation of space debris.

26. The Scientific and Technical Subcommittee agreed that member States of the Committee on the Peaceful Uses of Outer Space shared a common interest in limiting the production of space debris. The Subcommittee had addressed the topic of space debris over many years and had compiled useful technical information on the debris environment, debris modelling and debris mitigation in its *Technical Report on Space Debris*.[7] The Subcommittee strongly endorsed the action undertaken by IADC to reach consensus on debris mitigation standards and encouraged IADC to treat the topic with due priority, with a view to completing the task during 2002 so that the results could be reported to the Subcommittee at its fortieth session, in 2003. The Subcommittee agreed that a work plan should be established with the goal of expediting international adoption of voluntary debris mitigation measures. In addition to the plan to address debris mitigation measures, it was envisaged that member States and international organizations would continue to report on research and other relevant aspects of space debris.

27. The Subcommittee considered the proposal submitted by Canada, China, France, Germany, India, the Russian Federation, the United Kingdom and the United States (A/AC.105/C.1/L.251/Rev.1), according to which the Subcommittee would undertake a multi-year work plan on the subject of space debris. In addition, the Subcommittee at its thirty-ninth session would address space debris impact hazards and shielding. The Subcommittee agreed that an item reflecting the proposal should be included in the draft provisional agenda for its thirty-ninth session.

28. The Subcommittee agreed that, starting with its thirty-ninth session, in 2002, it should consider space debris according to the following multi-year work plan:

2002	The Subcommittee invites IADC to present its proposed debris mitigation standards at the fortieth session of the Subcommittee, in 2003.
	The Subcommittee discusses space debris impact hazards and shielding.
2003	IADC presents its proposed “debris mitigation standards”, based on consensus among its members.
	Member States review the IADC “debris mitigation standards” and discuss the means of endorsing their utilization.

[7] United Nations publication, Sales No. E.99.I.17.

2004 IADC continues its presentation on its proposed “debris mitigation standards” (as required), based on consensus among its members.

Member States continue to review the IADC “debris mitigation standards”.

The Subcommittee may wish to endorse the utilization of the IADC “debris mitigation standards” as guidelines to be implemented on a voluntary basis through national mechanisms.[8]

2005 Member States begin annual reporting on a voluntary basis of national activities to implement the guidelines.

29. The view was expressed that, as indicated in the report on UNISPACE III,[9] the Committee on the Peaceful Uses of Outer Space should examine the various aspects of the space debris issue; therefore, in addition to the discussion of technical aspects, it should also investigate economic, legal and ethical aspects. In the view of that delegation, the discussion of economic aspects in 2001 was a move in the right direction, and the strategy for future years, including possible involvement of the Legal Subcommittee and the Committee itself, could be discussed in 2002.

30. Some delegations expressed the view that the recommended practice of disposing of satellites at a safe distance from the geostationary orbit before the end of their operational life had not been universally applied. In their view, the Subcommittee should encourage relevant operational entities to report on possible technical or financial reasons that prevented such end-of-life manoeuvres and to consider ways to ensure that that practice was more widely adopted.

31. The view was expressed that a significant fraction of the total mass of the space debris population was concentrated in a few large space objects that had terminated their activities but were still intact. They were increasing the collision probability in orbit, but actual information about their functional status was usually not officially announced. In the view of that delegation, the practice of submitting authoritative announcements on changes in the functional status of objects contained in the United Nations Register of Space Objects Launched into Outer Space should be adopted by all launching States.

32. The view was expressed that, because of the growing number of cases in which parts of space objects had been found on the ground, the Subcommittee should adopt a follow-up programme for advanced alert and localization of decaying space debris that could cause damage on the ground. That delegation expressed the view that it might be possible to make such information available on the web site of the Office for Outer Space Affairs, as data on the subject were scarce and sometimes contradictory.

33. The view was expressed that providing all interested parties with access to the orbital elements of all catalogued space debris would greatly enhance international cooperation. Similarly, space debris mitigation measures should be made available for possible refinement or usage. In the view of that delegation, according to the

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[8] This is a notional schedule. The timing of the endorsement is dependent upon how much time member States require to review and approve the proposed standards.

[9] *Report of the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space, Vienna, 19-30 July 1999* (United Nations publication, Sales No. E.00.I.3), para. 370.

principle of “common but differential responsibility”, which was commonly accepted in other areas, those who were largely responsible for the creation of the present situation and those who had the capability to take action for mitigation should take lead roles in that matter.

[…]

IX. Government and private activities to promote education in space science and engineering

34. In accordance with General Assembly resolution 55/122, the Scientific and Technical Subcommittee considered a single issue/item for discussion on government and private activities to promote education in space science and engineering.

35. The Subcommittee had before it a note by the Secretariat, entitled “Activities of Member States for young people” (A/AC.105/755 and Add.1), containing a compilation of contributions from Member States on the subject.

36. The Subcommittee heard the following technical presentations: “Institute for Space Sciences and Applications of Toulouse (ISSAT) activities for young people”, by the representative of France; “CNES activities in education”, by the representative of France; “Space education efforts of NASA”, by the representative of the United States; and “Private sector space education in the United States”, by the representative of the United States.

37. The representatives of Argentina, Australia, Brazil, Canada, Cuba, Hungary, India, Italy, Japan, Malaysia, Nigeria, Romania and the United States made statements under this agenda item. The observer for ISU also made a statement.

38. The Subcommittee noted the activities of Governments, space agencies, non-governmental organizations and research institutes to promote education in space science and engineering. The Subcommittee also noted a number of space education workshops, seminars, university and school programmes organized for students of all ages, ranging from the pre-school level to the postgraduate level and for educators and the general public. Education in space science and engineering had been actively promoted through print and electronic media, such as magazines, teaching materials, Internet web sites and webcasts, and through space camps, space days and space competitions, exhibitions and other public relations events. Those activities had focused on topics such as space science, technology, mathematics, engineering, astronomy, life sciences, rocketry, robotics and space law. The Subcommittee further noted regional and international cooperative programmes and activities to promote education in space science and engineering.

39. The Subcommittee noted the programmes and activities organized during World Space Week, from 4 to 10 October 2000. The Subcommittee noted that education in space science and engineering had been promoted, for example, by the publication of space science books for youth, by the provision of lesson plans and other teaching materials and by the organization of webcasts to engage classrooms in science. The Subcommittee took note of a conference room paper (A/AC.105/C.1/2001/CRP.4) on the activities of Member States during World Space

Week 2000. The Subcommittee heard a presentation by the Spaceweek International Association on the international celebration of World Space Week in 2000.

40. The view was expressed that education in space science and engineering remained an important issue and that it should be addressed by the Subcommittee every few years.

X. Draft provisional agenda for the thirty-ninth session of the Scientific and Technical Subcommittee

41. In accordance with General Assembly resolution 55/122, the Subcommittee considered proposals for a draft provisional agenda for its thirty-ninth session, in 2002, to be submitted to the Committee on the Peaceful Uses of Outer Space. Pursuant to paragraph 19 of Assembly resolution 55/122, the Subcommittee requested the Working Group of the Whole, established at its 547th meeting, to consider a draft provisional agenda for its thirty-ninth session.

42. At its […] meeting, the Subcommittee endorsed the recommendations of the Working Group of the Whole concerning the draft provisional agenda for the thirty-ninth session of the Subcommittee as contained in the report of the Working Group of the Whole (see annex [II] to the present report).

43. The Subcommittee recommended that its thirty-ninth session be held from 18 February to 1 March 2002.