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**Committee on the Peaceful
Uses of Outer Space**

**United Nations Regional Workshop on the Use of Space
Technology for Disaster Management for Western Asia**

(Riyadh, 2-6 October 2004)

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I. Introduction

A. Background and objectives

1. In its resolution entitled “The Space Millennium: Vienna Declaration on Space and Human Development”,¹ the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III) recommended that the United Nations Programme on Space Applications assist in the improvement of the capacity-building process in developing countries and countries with economies in transition by emphasizing the development of knowledge and skills.
2. At its forty-sixth session, in 2003, the Committee on the Peaceful Uses of Outer Space endorsed the programme of workshops, training courses, symposiums and conferences planned for 2004.² Subsequently, the General Assembly endorsed the United Nations Programme on Space Applications for 2004 in its resolution 58/89 of 9 December 2003.
3. Pursuant to resolution 58/89 and in accordance with the recommendation of UNISPACE III, the United Nations Regional Workshop on the Use of Space Technology for Disaster Management for Western Asia was held in Riyadh from 2 to 6 October 2004. Organized by the Office for Outer Space Affairs of the Secretariat and the King Abdulaziz City for Science and Technology (KACST) of Saudi Arabia, the Workshop was co-sponsored by Space Imaging Middle East and hosted by the King Abdulaziz City for Science and Technology.
4. As space technologies play a vital role in disaster management, the latter has been identified as a priority thematic area in which the greater use of space-based solutions in developing countries should be promoted. Earth observation satellites and other space-based technologies, such as meteorological satellites, communication satellites and global navigation satellite systems (GNSS), contribute to providing improved solutions for all phases of disaster management: disaster mitigation, disaster preparedness, disaster relief and disaster rehabilitation. Such solutions are already an integral part of disaster management activities in many developed and even some developing countries. Although national capabilities in the use of space technologies have increased significantly in recent years, there is still a need to develop appropriate methodologies and to support the transfer of available solutions for use in disaster management activities.
5. In order to promote the use of space technology for disaster management and risk reduction in developing countries and in countries with economies in transition, the Office for Outer Space Affairs, within the framework of the United Nations Programme on Space Applications, has organized, over a five-year period, six workshops (five regional workshops and one final international workshop) on the use of space technology for disaster management. The overall objective of those efforts was to successfully integrate space technology solutions in a sustainable manner into the operational disaster management programmes of Member States, through the definition and implementation of appropriate actions that contribute to incorporating space technologies in disaster management activities.
6. The overall goal of the Regional Workshop for Western Asia was to contribute to the ongoing efforts to integrate space technologies into operational programmes in the region, with a focus on disaster management. The specific objectives were:

(a) to increase the awareness among managers and decision makers involved in disaster management of the potential benefits and the cost-effectiveness of using space technologies; (b) to determine the types of information and communication needed in managing specific disasters and the extent to which they could be provided by space technologies; and (c) to develop a regional plan of action that would contribute to defining actions, which in turn would help interested national institutions incorporate and test the use of space technologies for disaster management and risk reduction.

7. Furthermore, participants focused on identifying possible synergies with several ongoing initiatives, including the goals set forth in the United Nations Millennium Declaration (General Assembly resolution 55/2); the Plan of Implementation of the World Summit on Sustainable Development, held in Johannesburg, South Africa, from 26 August to 4 September 2002;³ the work being carried out by the Action Team on Disaster Management working within the framework of the Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space; and the Charter on Cooperation to Achieve the Coordinated Use of Space Facilities in the Event of Natural or Technological Disasters (International Charter “Space and Major Disasters”).

8. The present report was prepared for submission to the Committee on the Peaceful Uses of Outer Space at its forty-eighth session and to its Scientific and Technical Subcommittee at its forty-second session, in 2005.

B. Programme

9. At the opening of the Workshop, statements were made by the President of KACST, the Director of the Space Research Institute of KACST and a representative of the Office for Outer Space Affairs. Representatives of KACST, Space Imaging Middle East and the Office for Outer Space Affairs made the keynote presentations. Four presentations were made at the open session and a total of 20 further presentations were made during the thematic sessions. Three discussion panels provided an opportunity for brief contributions by experts on specific discussion topics and focused questions from the audience. The four discussion sessions allowed for deliberation on the structured discussion topics, which led to the development of partnerships and a strategy and plan of action aimed at increasing the use of space-based technologies in disaster management in the region.

C. Attendance

10. Decision makers and technical personnel from developing and industrialized countries drawn from the following groups were invited to attend the Workshop: national and regional institutions responsible for providing disaster management support; national and regional institutions responsible for building capacity in the use of space-based technology; United Nations bodies; bilateral development agencies and funding institutions; space agencies; academic institutions; value-adding space technology institutions; and non-governmental organizations involved in disaster management mitigation and support.

11. A total of 90 participants from the following 19 countries attended the Workshop: Armenia, Austria, Bahrain, Bangladesh, Brazil, Egypt, Iran (Islamic Republic of), Jordan, Kenya, Kuwait, Lebanon, Pakistan, Russian Federation, Saudi Arabia, Sri Lanka, Sudan, Syrian Arab Republic, Turkey and United Arab Emirates. In addition, the Office for Outer Space Affairs and the Saudi Arabian Red Crescent Society were also represented.

12. Funds allocated by the United Nations and the co-sponsor, Space Imaging Middle East, were used to defray the cost of air travel and daily subsistence allowance of 18 participants and 2 representatives of the Office for Outer Space Affairs. Accommodation for the funded participants was provided by the Government of Saudi Arabia.

II. Summary of presentations

13. The presentation sessions enabled participants to learn about the potential application of space technology in the management of a wide variety of disasters and also stimulated discussion on the current status of the use of space technology in disaster management. The presentations made at the Workshop are available on the following website: www.oosa.unvienna.org/SAP/stdm.

14. The keynote addresses established a framework for the discussions that were to follow and highlighted the potential of space applications in disaster management in the region, as well as the existing constraints in applying space technology. The keynote addresses illustrated the wide range of disasters that could be managed using satellite data, the various types of data used and the importance of international and regional cooperation to enhance timely and equitable access to satellite data. Examples of current initiatives aimed at improving access to space infrastructure and data for disaster management were provided.

15. The first presentation session included case studies on the use of space technology for various forms of disaster management. Participants learned how an oil spill monitoring project in Brazil was using remotely sensed data and comprised data processing, oil dispersion modelling and in situ verification, resulting in predictions of oil transport within 1½ hours of a spill. The application of such a system in Saudi Arabia and neighbouring countries would be feasible because of the availability of existing infrastructure. The advantages of infrared spectral band measurements for the monitoring of seismic activity, desertification and locust mass breeding areas were demonstrated. In addition, the use of satellite data, specifically radar data, integrated with topographical maps and cadastral maps in the management of floods and earthquakes was demonstrated. A digital atlas, utilizing satellite imagery, was shown as a potential educational tool. A study based on Land Remote Sensing Satellite Thematic Mapper (Landsat TM) images and geographical information systems (GIS) for mitigating flash floods in the Nile River area was presented.

16. The second presentation session focused on the needs of the end-user and provided examples on the use of space technology for disaster management. The various phases of disaster management—the disaster itself, response, recovery, reconstruction, mitigation and preparedness—were discussed. The use of Ikonos imagery for earthquake damage detection in Turkey and the use of global

positioning system (GPS) stations to monitor plate tectonics in Lebanon were explained. The potential of space technology for forest fire and flood management in the region was highlighted. It was noted that, in Bangladesh, many lives had been saved thanks to cyclone warnings made possible by the use of satellite data to predict extreme weather events. In addition, the use of satellite imagery for flood monitoring and assessment of crop damage in Bangladesh was demonstrated.

17. Further examples of how space technology was being used to manage disasters in the region were provided during the third presentation session. The use of GPS for measuring tectonic movement and Landsat imagery for identifying faults in the Syrian Arab Republic was explained and the monitoring of cathodic protection on oil pipelines using Saudisat data was described. Participants heard how satellite images had been used to study the environmental effects of the Gulf War (such as pollution from oil fires) and how those data were being used to help rehabilitate the affected areas.

18. The fourth presentation session provided examples of integrated solutions for space technology and disaster management. A GIS for simulating earthquakes and assessing the resulting damage was presented. Participants heard how desertification was being monitored in southern Jordan by integrating Landsat data and topographic maps into a GIS. The Saudi Arabian National Geographical Information System for Disaster Management was presented. The application of remote sensing and GIS in site selection for hazardous waste disposal in arid areas in Egypt was explained.

19. The fifth presentation session focused on innovative developments and initiatives. The importance of continuous communication in disaster response and rehabilitation was emphasized. The proposed solution utilized portable very small aperture terminals (VSATs) for secure sharing of the disaster response and recovery information; satellite telephones for international communications; and Global System for Mobile Communication (GSM)-based services for local communication. The use of GPS in monitoring tectonic movements in the vicinity of the high dams in Egypt was demonstrated. Additionally, the measurement of tectonic movements using satellite laser ranging (SLR) was described and compared to measurement techniques such as GPS and very-long baseline interferometry (VLBI). It was reported that SLR was the most accurate method and was used to calibrate the other methods. VLBI had a unique celestial link, whereas GPS was very cheap and highly accessible. A further presentation illustrated how satellite images and ground-based data were being used for community-based drought monitoring in Kenya. Information on how to help disaster victims was being provided by the community and combined with satellite information to form a disaster early warning system.

20. The open session gave participants an additional opportunity to share their experience of space technology and disaster management. The potential use of the Argos system—a new geo-positioning system—for environmental, oceanography and wildlife-tracking applications was highlighted. The potential benefits of spatial decision support systems for land use planning in disaster mitigation were also presented. Examples of the use of high-resolution Quickbird imagery in the disaster recovery phases of the earthquake in Bam, Islamic Republic of Iran, and the stampede in Mina, Saudi Arabia, were provided and the importance of rapid data access during a disaster was highlighted. The final presentation described how desertification could be investigated by using remote sensing techniques integrated

into GIS. Data input into the GIS included information on urbanization, demography, agriculture, temperature, rainfall and land use change, as detected by analysing Landsat TM data from 1987 and 2001.

III. Observations and recommendations

A. Approach to establishing a regional strategy

21. Four discussion sessions were conducted with the purpose of developing a common strategy for the use of space technology for disaster management in the region of Western Asia. Participants were divided into the following three thematic groups: fires, floods and extreme climatic conditions; geo-hazards, landslides, land degradation and desertification; and technological hazards, oil spills, industrial accidents and pollution.

22. The first two discussion sessions were designed to build an understanding among participants of the common hazards in Western Asia, of successful examples of the use of space technology for disaster management in the region and current limitations and constraints to the further use of space technology for disaster management in the region. Each group discussed a number of potential projects that would demonstrate the benefits of using space technology for disaster management.

23. Participants agreed with the established comprehensive list of hazards, which included all hazard areas, as follows: avalanches, landslides, flash floods and mudflows; climate change and changes in sea level; coastal management, marine systems (including mangroves and coral reefs) and coastal erosion; crop pests and plagues; cyclones, tsunamis and storm surges; deforestation; desertification; drought; earthquakes; epidemiological and entomological risks; extreme weather conditions (temperatures, thunderstorms, snowstorms, windstorms and lightning); fires, both forest and grassland; floods; food security; glaciers; haze and fog; land degradation and soil erosion; land mines; oil spills; refugee flows; sand and dust storms; subsidence; technological, industrial and nuclear risks; transportation accidents; volcanoes; and water pollution. The list also included two support areas: capacity-building; and development of information and space technology systems and solutions.

24. Building on the first two sessions, the third session required participants to identify recommendations on how to deal with the limitations and constraints to the further use of space technology for disaster management. In addition, the groups further defined the projects that were discussed in the previous two sessions. They were asked to outline the projects, which should be achievable in the short term (one to two years), involve cooperation between two or more countries and not be resource-intensive.

25. During the final discussion session, the groups presented the results of their deliberations and the strategies of the three groups were united and agreed upon in order to produce recommendations and a common plan of action for the region.

B. Recommendations and plan of action

26. The discussions held by participants in each of the three working groups identified a number of issues that were currently limiting the use of space technology for disaster management in the region of Western Asia. Those issues are presented below, grouped in the following areas: capacity development and knowledge-building; networking and coordination mechanisms; data availability and data access; space technology infrastructure; and awareness-raising.

1. Capacity development and knowledge-building

27. Participants recognized that the disaster management user community had limited or no understanding of the potential of space technology for disaster management. They recommended that the space technology community attempt to understand the specific needs of the disaster management user community and subsequently develop solutions based on space technology that met those requirements. Furthermore, specific training activities for the user community should be a responsibility of the space technology community.

28. Participants agreed that there was a need for the continuous development of national and regional expertise and that that could be achieved through the provision of long- and short-term training and education at the Regional Centre for Space Science and Technology Education, affiliated with the United Nations and planned for Jordan, and also through other academic centres of excellence within the region. Support to such centres should also include the provision of books and academic journals. Additionally, participants identified the need to develop a training curriculum with case studies that were specific to the region.

2. Networking and coordination mechanisms

29. Participants acknowledged the insufficient coordination and cooperation between interested national organizations, not only among space technology institutions but also between those institutions and the disaster management user community. Such lack of cooperation and coordination was a significant problem, in particular during disasters.

30. For that reason, participants recognized the need to coordinate the sharing of space technology infrastructure and development of common solutions, citing the Disaster Monitoring Constellation (DMC) as an example of a successful joint effort. Furthermore, they recognized the need to build upon and contribute to international coordination initiatives such as the work being carried out by the Committee on the Peaceful Uses of Outer Space and the Geohazard Executive Bureau of the Integrated Global Observing Strategy (IGOS), as well as the proposed Global Earth Observation System of Systems (GEOSS).

31. In particular, participants stressed the importance of the coordination entity that was being proposed by the Committee on the Peaceful Uses of Outer Space, which, once implemented, would provide coordination and a means of optimizing the effectiveness of space-based services for use in disaster management.

3. Data availability and data access

32. Participants noted that there were no mechanisms in place in the region of Western Asia to allow data to be made available rapidly during disaster response and that, when data were available, they were not always in a user-friendly format. Participants mentioned the need for the consolidation of national spatial databases and, more specifically, the thematic databases that were needed to support disaster management activities. The content of the national data sets should be defined by a collective effort of all spatial data stakeholders in the country and, when producing such spatial data, institutions should take into consideration the existing common practice data standards in order to facilitate the sharing of data.

33. Participants agreed that the generally high cost of remotely sensed data limited their use and that there were no formal regional mechanisms in place to facilitate the sharing of data that were obtained from the regional satellites. Furthermore, participants urged satellite owners to make efforts to reduce the cost of imagery that could be used for disaster management activities. They also suggested that the Principles Relating to Remote Sensing of the Earth from Outer Space (General Assembly resolution 41/65, annex) should be revised to reflect the above concerns and suggestions.

4. Space technology infrastructure

34. Participants agreed that there were different levels of institutional capabilities within the region and that there was no consolidated understanding of the current national and regional capacities, recommending that information on existing and planned operational space technology systems in support of disaster management be compiled.

5. Awareness-raising

35. The general public was not aware of the potential of space technology for disaster management. Therefore, participants recognized the need to continuously raise awareness of the usefulness of space-based technologies and that such awareness-raising should begin with schoolchildren, involve the scientific community and extend to the media. In addition, participants recommended that Member States promote World Space Week (4-10 October) in their countries by focusing on space technologies and how they could contribute to development, including disaster management.

6. A common regional plan of action and commitments

36. Participants discussed action to be taken individually by each country and also actions that should be the result of collective efforts of interested institutions coming together as a regional task force.

37. Each country should assume responsibility for determining data needs, consolidating the data and making them available to the user community. Furthermore, raising awareness was a continuous process and institutions in each country that used space technology should assume responsibility for periodically carrying out activities that contributed to raising awareness. Those same institutions should also be responsible for improving ties with the disaster management community by making an effort to understand their needs. The provision of training

to the user community should be the responsibility of the space technology institutions in each country.

38. The proposed regional task force would be composed of focal points from each country who would work together to advance action that was important to the region as a whole. Participants welcomed the offer of the KACST Space Research Institute to coordinate such a regional task force. Space technology and disaster management institutions in all countries of the region should nominate focal points to participate in the task force.

39. The regional task force should develop a work plan that would include consideration for the recommendations put forward by participants at the Workshop, including development of a database of available experts; compilation of available institutional capabilities and space technology infrastructure and solutions in the region; development of a training curriculum with case studies; and definition of the information needed for disaster management and compilation of a list of the available information.

40. The Office for Outer Space Affairs would provide support to the regional task force by assisting in maintaining the list of focal points, bringing into the task force relevant institutions from other countries and linking the work of the task force with other international initiatives such as the proposed coordination entity and the International Charter "Space and Major Disasters".

41. The importance of the Regional Centre for Space Science and Technology Education to be set up in Jordan was reiterated and the participants noted with appreciation the offer of Jordan to host a meeting to discuss a strategy for the expeditious implementation of that Centre.

7. Demonstrating the use of space technology

42. Participants identified a number of projects to be developed together that would contribute to demonstrating the use of space technology for disaster management. Projects in the following areas were identified and will be developed jointly by interested institutions with the support of the Office for Outer Space Affairs: monitoring of oil spills; monitoring of forest fires; geo-hazards (earthquakes); and land degradation and desertification.

C. Role of the Office for Outer Space Affairs

43. The Workshop provided a unique opportunity to channel support for the further use of space technologies in the region. The recommendations and plan of action provide guidance on how institutions can work together through regional partnerships. The Office for Outer Space Affairs should provide support in the consolidation of the partnerships that were formed in Riyadh, which will result in the sharing and transfer of knowledge and the development of joint activities, in particular through the creation and strengthening of the regional task force of focal points. Additionally, the Office should continue its work on capacity-building through the regional centres for space science and technology education, affiliated with the United Nations, in particular the Regional Centre that is planned for

Jordan, and work further towards ensuring that end-users have easy access to relevant data sets.

Notes

- ¹ *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), chap. I, resolution 1.
 - ² *Official Records of the General Assembly, Fifty-eighth Session, Supplement No. 20 (A/58/20)*, para. 75.
 - ³ *Report of the World Summit on Sustainable Development, Johannesburg, South Africa, 26 August-4 September 2002* (United Nations publication, Sales No. E.03.II.A.1 and corrigendum), chap. I, resolution 2, annex.
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