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COMMITTEE ON THE PEACEFUL
USES OF OUTER SPACE

REPORT ON THE SECOND UNITED NATIONS REGIONAL CONFERENCE ON SPACE TECHNOLOGY FOR SUSTAINABLE DEVELOPMENT IN AFRICA

(Pretoria, 4-8 November 1996)

CONTENTS

INTRODUCTION

A. Background and objective

1. The Second United Nations Regional Conference on Space Technology for Sustainable Development in Africa was organized within the framework of the United Nations Programme on Space Applications. The theme selected for the Conference was "The role of space technology in addressing local needs". The objective of the Conference was to examine the reasons for the lack of exploitation of cost-effective space technology opportunities in Africa and the key role that decision makers could play in improving the current situation. The Conference was aimed at decision makers and science and technology advisers of Governments, including directors, programme managers, senior research and application scientists and senior university educators. Chief executive officers and senior technical managers of private institutions and industrial

establishments were also invited to the Conference. The Conference was co-sponsored by the Government of South Africa, the Earth Observation Satellite Company (EOSAT), the European Space Agency (ESA), the International Mobile Satellite Organization (Inmarsat), the National Aeronautics and Space Administration (NASA) of the United States of America and Nuova Telespazio of Italy.

2. The present report describes the organization of the Conference, the programme of the Conference and the proposed follow-up action. It has been prepared for the Committee on the Peaceful Uses of Outer Space and its Scientific and Technical Subcommittee.

B. Organization of the Conference

3. The initial announcement of and call for participation in the Conference were distributed via note verbale in April 1996 to the missions of all African States to the United Nations. A second note verbale was sent in June 1996. Copies of the notes verbales were sent to all resident representatives of the United Nations Development Programme (UNDP) in Africa. In July 1996, the Office for Outer Space Affairs of the Secretariat requested the assistance of UNDP resident representatives in ensuring that high-ranking government officials were nominated to participate in the Conference.

4. The Government of South Africa defrayed the costs of boarding and lodging 30 participants from other African countries, as well as all other local costs associated with the organization of the Conference. Funds for the international travel and subsistence allowance of 30 participants were provided from the fellowship budget of the United Nations Programme on Space Applications and the financial support provided by the co-sponsors.

5. A total of 99 persons attended the Conference; 43 of the participants were from South Africa. The African participants were nationals of the following 21 countries: Angola, Benin, Burkina Faso, Cameroon, Ghana, Kenya, Lesotho, Libyan Arab Jamahiriya, Malawi, Mali, Mauritius, Morocco, Nigeria, Senegal, South Africa, Togo, Tunisia, Uganda, United Republic of Tanzania, Zambia and Zimbabwe. Representatives of the following organizations were also in attendance: the International Telecommunication Union (ITU), EOSAT, the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT), ESA, the International Development Research Centre, Inmarsat, Matra Marconi, NASA, Nuova Telespazio and the Regional African Satellite Communications Organization (RASCOM).

C. Programme summary

6. The programme of the Conference (see annex) was developed by the Office for Outer Space Affairs, taking into account several factors, including the discussions and eventual outcome of the first United Nations Regional Conference on Space Technology for Sustainable Development in Africa, held at Dakar from 25 to 29 October 1993 and other technological and political developments relevant to Africa. The Conference consisted of several plenary and concurrent technical sessions, during which formal presentations were given on various topics related to the use and development of space technology. Approximately one day was reserved for working group discussions, during which the recommendations of the Conference were discussed. One day was devoted to a technical visit to the satellite tracking and receiving station at Mikomtek.

7. The plenary sessions focused on topics of interest to all participants and served as starting points of discussion at the subsequent working group sessions. The topics dealt with included: (a) the potential contribution of space technology in meeting local needs; (b) trends in space technology applied to health, education, communications, natural resources and the environment; (c) communications policies and regulations and their impact on the social and economic development of Africa; (d) the potential impact of the NASA Mission to Planet Earth on Africa's development; (e) the commercialization of space activities; (f) how Africa could benefit from the experience of India; and (g) cooperation among African countries in relevant areas of space science and technology.

8. The concurrent technical sessions concentrated on the following thematic areas: (a) Communications for development; (b) environment and food security; (c) research and applications in space technology; (d) land-use management; (e) Earth observation data gathering, analysis and applications; and (f) health care and education. Those sessions served to highlight the potential application of space technology in meeting local development needs. A special Youth Programme on Space, lasting approximately half a day and hosted by a former NASA astronaut, Dr. Mae Jemison, was attended by 70 South African secondary school students.

I. PRETORIA MEMORANDUM ON SPACE TECHNOLOGY IN AFRICA

9. During the Conference it was noted that the goal of national development in many African countries was pursued principally by undertaking activities that (a) promoted improvements in agriculture, forestry and their related industries, mineral and water resources and human resources and (b) served to mitigate the effects of natural disasters (severe drought, flooding etc.). In addition, there was an increased awareness of the environmental impact of various development activities. It was generally acknowledged that all those development activities required adequate access to and the exchange of information for informed decision-making. Papers presented at the Conference demonstrated the potential of space technology to contribute in a cost-effective manner to the provision of information and, ultimately, to the socio-economic development of African countries, as had been done in other developing regions of the world. Among other issues, the use of modern satellite telecommunications technology for supporting a range of services such as telephone, distance education and health-care services and the attendant improvement in the quality of life in remote and rural areas was demonstrated. In addition, the value of data from a variety of Earth observation and meteorological satellites in a wide range of activities such as famine early warning, food security, rainfall estimation, environmental monitoring, geological exploration and land-use/land-cover mapping was discussed.

10. Working group discussions focused on the reasons for the underutilization of space technology in Africa, on the disparity between African countries and those in other regions and on the identification of specific and realistic measures, achievable in both the short and the long term, which would eventually improve the current situation. The outcome of those deliberations was the Pretoria Memorandum on Space Technology in Africa. The Memorandum, which was formally adopted by the Conference on 8 November 1996, read as follows:

PRETORIA MEMORANDUM ON SPACE TECHNOLOGY IN AFRICA

Introduction

The participants of the Second United Nations Regional Conference on Space Technology for Sustainable Development in Africa noted that, as it has been proven in other parts of the world, space technology has tremendous potential for contributing to the economic and social development of countries in Africa, particularly through the improved management of the environment, improved communications, enhanced food security, delivery of services in health care and education, and the mitigation of natural disasters, just to name a few. In spite of their proven benefits, however, applications of space technology such as satellite remote sensing, geo-positioning systems (GPS), satellite meteorology, atmospheric and ocean sciences, basic space sciences and satellite communications are far from being effectively utilized by most African countries to address national development issues.

I. AFRICA AS WE UNDERSTAND IT

Africa is a land of striking contrasts and great natural wonders; a giant plateau between the Atlantic and Indian oceans, where humanoids evolved. It is the second largest continent on Earth,

embracing one fifth of its land area and supporting one eighth of the world's population and having a major impact on global change processes. It is blessed with abundant natural and human resources and great potential for development.

II. RELATED ISSUES

At a variety of international and regional conferences, such as the United Nations Conference on Environment and Development, held at Rio de Janeiro, Brazil, from 3 to 14 June 1992, the Regional Symposium on Telematics for Development, held at Addis Ababa in April 1995, the fifth Third World Academy of Sciences General Conference on Science and Technology for Development, held at Abuja, Nigeria, in September 1995, and the twenty-first and twenty-second meetings of the Conference of Ministers of the Economic Commission for Africa (ECA), held in 1995 and 1996, it has become apparent that, as we approach the twenty-first century, most of Africa remains the last global frontier to be positively impacted by the wave of science and technology developments that are bolstering social and economic growths in other lands, due to a wide range of factors, including the following:

- Inadequate awareness by key decision makers of the value of space technology and its impact on social and economic development;
- Inadequate awareness of technology already in use, either nationally or regionally;
- Poor availability of technical support within many countries;
- Insufficient coordination of telematic services and other space technologies;
- Inadequate telecommunication infrastructure;
- Inadequate funding of relevant national institutions;
- Preoccupation with transfer of technology from other lands for applications at home;
- Little inclination towards indigenous research and technology development programmes;
- Poorly defined science and technology policies that can take advantage of the unfolding developments in space science and technology;
- Disabling regulatory policies.

III. THE NEEDS OF AFRICA

The basic needs of Africa and its peoples include not only housing, clothing, health, food, education and many others, but also the need to address participatory democracy, human rights, gender issues, environmental protection, cultural heritage and accessibility of Africans to total and global information. Adequate information is a major prerequisite to gaining knowledge in any field of human endeavour. In Africa, adequate information is urgently needed to help cure illness, bring food, bolster production, foster education about the latest technological development, research trends and results, applications products, services and equipment and formulate social and economic policies.

In order to respond to these human needs as well as to translate related human endeavours into economic productivity in Africa, science and technology have become an indispensable tool.

It should be emphasized that, today, one of the greatest challenges for Africa and its peoples is the provision of an enabling environment that will support the nurturing and development of science and technology in each African country.

IV. PRIORITY NEEDS WHICH CAN BE ADDRESSED USING SPACE TECHNOLOGY

Several development needs in Africa that could be addressed using space technology are: communication and information technology, disaster prediction and management, education, energy development, environmental management, food security, health care, rural development, transportation and urban management.

V. AFRICA'S EXPERIENCE WITH SPACE TECHNOLOGY

With a few exceptions, Africa has not shared in the telecommunication boom being experienced in other developing regions of the world. Over the past decade, the annual growth rate in main telephone lines has remained static at 8 per cent per year while it has increased to about 25 per cent in Asia. As an example, Africa has 12 million telephone lines that have been installed since Alexander Graham Bell invented the telephone in 1876. By comparison, in 1995 alone, China installed 20 million telephone lines and it plans to continue at this rate in order that, by the year 2000, 100 million lines will have been installed in China. This is reflected in the observed fast economic growth in Asia compared with that in Africa and its greater participation in the new global economy.

A few African countries are connected to the global Internet system using available space technologies. However, because of the poor state of communication in most of Africa, many of Africa's educational and research institutions only have limited, indirect and unreliable access to Internet and its associated World Wide Web.

In a very limited number of African countries, significant strides are being made in the areas of space science and technology development, particularly in telecommunication and space services such as satellite tracking, telemetry and control, Earth observation and the utilization and commercialization of the data thereof, microelectronics and its applications in commercial markets and tele-education.

In the area of space-related education, the exposure of most African countries to utilize existing technology to date is limited to training. However, their participation in the evolution of the technology itself is for the most part insignificant.

In the area of health care, a number of African countries are carrying out studies to understand vector-borne diseases, such as schistosomiasis (river blindness), water-borne disease and malaria prediction.

A number of medical institutions are also using space capabilities available worldwide to seek health-related services such as diagnosis, prescription, training and advice from their counterparts abroad. Examples are Internet and HealthNet.

VI. THE WAY FORWARD: THE NEXT STEPS

In acknowledgement of the prevailing conditions and with a determination to rectify it, the Conference recognized that a core of expertise exists at home and abroad, around which substantial development of indigenous African capacity can and should be built. This is urgently required if

Africa is to have any relevance in the emerging technologies of the fast-approaching twenty-first century.

The Conference identified as a major catalyst the political will of the leadership to champion the cause of scientific and technological development in Africa and to provide it with appropriate policies, financial and other resources and an enabling environment.

For Africa to develop a competitive competence in the global arena requires enlightened and exemplary leadership committed to science and technology. Such a leadership should support the creation, throughout the continent and at the national level, of a space science and technology consciousness not only in the application potential of the technology but also in the understanding of the technology itself; that is, how and why the technology works the way it does.

Africa's Governments should support indigenous science and technology initiatives, such as Afrispace, the Regional African Satellite Communications Organization (RASCOM) and Telecom Africa and the initiatives of the United Nations on (a) the centres for space science and technology education and (b) the cooperative information network linking scientists, educators, professionals and decision makers in Africa (COPINE), and should marshal all necessary resources to translate such initiatives into viable and enviable programmes. A significant aspect of the leadership effort is improvement of collaboration at the national, subregional and continental levels in the following areas:

- Joint technology development;
- Capacity development with a focus on the utilization of African institutions;
- Sharing of knowledge across professional and sectoral boundaries;
- Increase in the role of the Africa private sector;
- Focus on broader science and technology programmes.

In order to promote cooperation among African countries, a greater understanding of the following cooperation issues is necessary:

- Who is really driving cooperative initiatives in Africa and how much African money is being used in such efforts?
- Are we effectively using cooperative opportunities to build African capacity?
- Are we making the best use of our resources in cooperative ventures through focused and coordinated activities?
- Are we using African resources effectively to jointly develop world-class technologies?
- Are we using space technologies effectively to enhance collaboration?

There are many compelling advantages to improving the level of collaboration among African nations. These include:

- An ability to pool resources and reduce costs for technology development (e.g. the undertaking of joint projects);

- The acquisition of technology solutions which are relevant to Africa;

- The ability to share lessons and experience;

- An improved ability to negotiate international agreements (e.g. trade and technology agreements).

The Conference further recognized that:

- There is now a very urgent need for national leadership in Africa to adopt space technology as a tool for meeting national development needs, particularly in the following areas: resource management and the environment, information and communications, food, health and capacity-building;

- National leadership should understand the technology and commercial trends and opportunities pertinent to development in their countries;

- National leadership should promote the use of space technology to enhance communication and understanding among the leaders of Africa, which is a key element to promoting peace and co-development on the continent.

In consideration of the above, the Conference recommended that:

- The United Nations should take steps to organize a joint leadership conference with a focused agenda to acquaint decision makers with space technology pertinent to development issues in their countries;

- A national and regional strategic framework in which specific actions may be carried out in each nation should be established by ensuring that an entity exists, preferably in the office of the highest governmental authority in each country, to coordinate space-related activities;

- Each national entity should not only inventory the state of technology and policy development in its country, but also follow trends in the use of technologies elsewhere in the region and in the world. In addition, the entities should conduct necessary research on space-related opportunities and relevant spin-off products of potential value to their countries. The entities should ensure that policies exist that would ensure that space technology is included in the educational process, particularly in national academic programmes.

The strategic national framework should specifically:

- Identify short- and long-term goals and strategies for meeting national needs within the areas identified above;

- Include users, academy, industry and state;

- Develop, adopt and implement a regulatory framework for the effective use of space communications and information policies;

- Identify and strengthen elements of endogenous and indigenous capability building areas, such as human resource development with the participation of private industry;

- Identify and empower centres of excellence that would be responsible for the implementation of these national space policies. In the immediate future, they should build databases that would facilitate networking;

- Find ways and means of promoting public awareness of and the importance of science and technology, in particular space technology;

- Evaluate and demonstrate the cost-effectiveness of space technologies and spin-offs;

- Promote, through a variety of public awareness programmes, the use of space-related technologies;

- Facilitate, by way of incentives, the involvement and investment of the private sector in the exploitation of opportunities involving space technologies.

Regional cooperation should be encouraged through the development of a common strategic framework for the exploitation of opportunities involving space technologies to meet regional needs, including the networking of existing and planned national and regional centres of excellence.

Countries in Africa should continuously monitor and take advantage of developments in space technology within the framework of international cooperation, with the assistance of the Office for Outer Space Affairs of the United Nations Secretariat, if necessary.

II. ACTION PLAN

11. The Conference recommended that the following actions be undertaken within the framework of the Pretoria Memorandum on Space Technology for Africa:

(a) The Office for Outer Space Affairs should communicate the Memorandum to all African Governments and relevant institutions, including the Economic Commission for Africa, the UNDP Regional Bureau for Africa, the Organization of African Unity, the African Development Bank and the Association of African Universities;

(b) The Office for Outer Space Affairs should organize, within a year, a joint leadership conference at which decision makers would be invited to discuss Africa's need to understand space technology, its role in national, social and economic development and the political will and national commitment needed to accomplish these;

(c) The Office for Outer Space Affairs should set up working groups of Africans in relevant space-technology-related disciplines. The working groups should work with the Office for Outer Space Affairs in preparing for the above-mentioned joint leadership conference. Relevant regional and international organizations should also be fully involved in the organization of the conference.

Annex

PROGRAMME OF THE CONFERENCE

Date/Time	Subject	Speaker
Monday, 4 November 1996		
0830-0930	Registration	
0930-1030	Opening ceremony	Alec Erwin (Minister of Trade and Industry of South Africa) G. Calabresi (ESA) A. A. Abiodun (Office for Outer Space Affairs of the United Nations Secretariat)
1030-1120	Keynote address	
	Local development needs in Africa	B. M'Poko (UNDP)
	Plenary session I	
1140-1230	The potential contribution of space technology in meeting local needs	A. A. Abiodun (Office for Outer Space Affairs)
	Plenary session II: E. Amonoo-Neizer (Ghana), Chairman	
1400-1440	Trends in space technology with emphasis on Africa - I (health, education and communication)	I. Amuah (South Africa)
1440-1520	Trends in space technology with emphasis on Africa - II (natural resources and the environment)	G. Calabresi (ESA)
1520-1600	Communications policies and regulations and their impact on Africa's social and economic development	H. Chasia (ITU)
1600	Opening of commercial and non-commercial exhibition	
Tuesday, 5 November 1996		
	Plenary session III: M. S. Jeenah (South Africa), Chairman	
0900-0940	Satellite and global information society for Africa's development	D. Piaggesi (Nuova Telespazio)

Date/Time	Subject	Speaker
	Concurrent session I-A: Communications for development; H. Chasia (ITU), Chairman	
0950-1230	Commercialization of communication services in Africa	J. Mutai (Kenya Posts and Telecommunications)
	Mobile satellite services for telecommunications development in Africa	O. Taylor (Inmarsat)
	Building indigenous communications capacity in Africa	J. Okpaku (Okpaku Communications)
	Satellite communications: its future direction and potential impact on Africa	A. J. Roberts (Matra Marconi)
	Concurrent session I-B: Environment and food security; A. Toure (Senegal), Chairman	
0950-1230	Agro-meteorological programmes in Africa and their impact on food security	I. Alfari (Agrometeorology and Operational Hydrology and Their Applications (AGRHYMET))
	Space techniques to combat drought and desertification	C. J. Chetsanga (Scientific and Industrial Research and Development Centre (SIRDC), Zimbabwe)
	Enhanced utilization of remote sensing technology in environmental management in the Western Indian Ocean region	I. Fagoonee (Mauritius)
	METEOSAT: an operational tool for Africa	J. Lafeuille (EUMETSAT)
	Plenary session IV: V. Odenyo (Kenya), Chairman	
1400-1440	Africa's environment and natural resources management needs	A. Zevenberger (EOSAT)
	Concurrent session II-A: Space technology: research and applications; M. El Kadiri (Morocco), Chairman	
1450-1730	Understanding our atmosphere: case histories from Nigeria	O. Ojo (University of Lagos)
	COPINE: a satellite-based information exchange network for Africa	H. George (Office for Outer Space Affairs)
	Harnessing solar power for Africa's	F. Stewart (United States development Department of Energy)

Date/Time	Subject	Speaker
	Micro-satellites: a key to technology development and knowledge sharing in Africa	G. Milne (South Africa)
	Concurrent session II-B: Land-use management; P. Adenyi (Nigeria), Chairman	
1450-1730	Space technology for surveying, mapping, and resolving land tenure issues	R. Balt (South Africa)
	Relevance of ESA's Earth Observation Mission for Africa's land-use management	G. Calabresi (ESA)
Wednesday, 6 November 1996		
	Plenary session V: L. Kaabi (Tunisia), Chairman	
0900-0940	Potential impact of Mission to Planet Earth on Africa's development	S. Kamm (NASA)
	Concurrent session III-A: Earth observation data gathering, analysis and applications; I. Fagoonee (Mauritius), Chairman	
0950-1230	Utilizing satellite data to support fishery activities in Africa's coastal waters	M. Hammann (Asesores en Biologia Pesquera)
	Earth observation data gathering, processing, analysis, and distribution in Africa: implications for Africa's development	V. Matooane (South African Council for Scientific and Industrial Research (SAC/CSIR), Spot Image)
	Utilization of radar data for exploring Africa's natural resources	G. Calabresi (ESA)
	Concurrent session III-B: Health care, education and Africa linkage; R. Boroffice (Nigeria), Chairman	
0950-1230	Space technology in the identification of disease vectors	M. C. Jemison (The Jemison Group, Inc.)
	Knowledge transfer between universities and private industry	S. Mosterd (South Africa)
	Linking Africa to itself and the global community	S. Ochuodho (ARCC, Kenya)
	The road to effective rural communications in Africa	G. D. Adadja (RASCOM)

Date/Time	Subject	Speaker
	Plenary session VI: Major General J. Kriel (South Africa), Chairman	
1400-1440	The commercialization of space activities: challenges and opportunities for Africa	K. Calhoun-Senghor (United States Dept of Commerce)
1450-1545	Poster (interactive) session	
1545-1730	Youth programme	M. C. Jemison (The Jemison Group, Inc.)
Thursday, 7 November 1996		
	Technical visit to the satellite tracking and receiving station at Mikomtek	
Friday, 8 November 1996		
	Plenary session VII: D. Benmouffok (International Development Research Centre (IDRC)), Chairman	
0900-0930	How can Africa benefit from India's experience	K. Kasturirangan (ISRO)
0930-0950	Requirements for Africa's effective participation in space technology	A. Silvestrini (EOSAT)
0950-1020	Cooperation among African countries in relevant aspects of space science and technology	D. MacDevett (South Africa)
	Working group sessions	
1030-1230 1400-1530	Critical success factors and approaches for meeting local needs; prioritization of these needs and the elaboration of specific time-bound steps which would eventually improve the effective understanding and utilization of space technology	
	Plenary session VIII: Closing session; A. A. Abiodun (Office for Outer Space Affairs), Chairman	
	Presentation of reports of working groups	A. A. Abiodun (Office for Outer Space Affairs)
	Closing ceremony	G. Calabresi (ESA) A. Minty (South Africa)