AFRICAN SPACE POLICY

(Draft Version 10)

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FOREWARD

The lack of mechanisms for resource mobilisation, integrated ownership and leadership, as well as the lack of a significant industrial sector on the African continent, is a critical impediment that hinders inclusive economic growth and social development. Unblocking these impediments requires a paradigm shift in the way we think, plan and execute. However, this reform must be contextualised in a collective vision and, for this purpose, the African Union (AU) vision provides a good starting point, namely:

"An integrated, prosperous and peaceful Africa, driven by its own citizens and representing a dynamic force in the global arena."

The realisation of the AU vision must be premised on self-reliance, regional integration, industrialisation and enhanced partnerships. A useful framework for this purpose is Agenda 2063, wherein the key drivers are the following:

- Promoting science, technology and innovation.
- Investing in human capital development.
- Managing natural resource endowments in a sustainable manner.
- Effective private and public sector development.
- Innovative resource mobilisation.

In driving the AU vision, within the context of the key drivers highlighted above, it is imperative that any plans of action must be undertaken in a sustainable manner and address the challenges of transforming its output and trade, broaden and strengthen its weak infrastructural and human resource base, as well as significantly strengthen and modernise its science and technology capability.

I here recognise the role space science and technology has played in providing a tool for ensuring the sustainable use of our natural resources and the creation of a high-tech industrial sector. Furthermore, it has made considerable contributions towards creating an enabling environment for a wide spectrum of pressing priorities that include job creation, poverty reduction, sustainable resource management and rural development. Hence, the manifold benefits that accrue to society at large from a formal space sector will assist us to translate the vision for a *united, prosperous continent at peace with itself* into reality.

It therefore gives me great pleasure to introduce the African Space Policy, which is the first in a series of instruments that will help us to formalise Africa's space programme. This policy provides the guiding principles that should be adhered to in order to ensure a sustainable and fully effective space programme that will serve the needs of the African continent.

Chair of the African Union

GLOSSARY OF DEFINITIONS

Data democracy

Provision of wider and easier access to geospatial data, **software tools for manipulating data and capacity building, education and training**

Data integrity

Maintaining and assuring the accuracy and consistency of data over its entire life cycle

Earth observation**s**

Gathering of **data and** information about Earth's physical, chemical**, meteorological** and biological systems **using in-situ, aerial and space-borne platforms to monitor and assess the status of, and changes in, the natural and built environment.**

Global navigation satellite system

Constellations of Earth-orbiting satellites that broadcast their locations in space and time, of networks of ground control stations, and of receivers that calculate ground positions by triangulation

Navigation and positioning

Skill or study involving the determination of position and direction

Remote sensing

Acquisition of information about an object or phenomenon without making physical contact with the object

Satellite communications

Artificial satellites placed in space for the purpose of telecommunications

Satellite systems

Artificial objects comprising computer-controlled systems that attend to many tasks, such as power generation, telemetry, altitude control and orbit control

Space exploration

Exploration and discovery of outer space **using a variety of technologies**

1   INTRODUCTION

1.   Africa presents a significant growth potential, especially given its disparate socio and economic lag compared to other developed regions of the world. However, this growth potential needs to be realised in a sustainable manner when drawing on the people and the abundant resources of the continent. The prime intention in realising this potential on the African continent should always be directed toward the improvement of the quality of life and the creation of wealth for all its citizens, **through knowledge generation and exploitation and the development of congruent economic activities. Based on examples from other parts of the world, space science and technology provides an ideal sphere of endeavour for knowledge-based development.**   For example, in the United Kingdom, space services **are used to address a number of societal benefits and** currently generates £7 billion annually and supports over 70 000 jobs[1].

2.   Space science and technology, and the many practical benefits that can be derived from its utilisation, has played a significant role in the international, regional and national economic and social development efforts. Space presents a unique opportunity for cooperation and sharing of enabling infrastructure (including data) in proactively managing, among other things, disease outbreaks, our natural resources and the environment, our response to natural hazards and disasters, weather forecasting, climate-change mitigation and adaptation, agriculture and food security, peacekeeping missions and conflicts.

3.   Satellites, as tools for peace, have over 60 years now been very instrumental in resolving major differences among nations, and thus continue to contribute to the reduction of tensions that could lead to wars. Satellite derived information also formed the back-bone of the United Nations Security Council decisions on several conflicts, such as in Bosnia, Liberia, Republic of Congo (former Zaire), Rwanda, Sierra-Leone, Somalia, Sudan and Yugoslavia.

4.   Space-derived services (Earth observation, satellite communication, navigation and positioning, space science and astronomy) are crucial for the economic development of the continent. While some of these products and services have helped to **meet** the social and economic needs of the continent, Africa cannot boast of possessing the technical know-how to participate independently in **these** space-related activities. If Africa is to leapfrog effectively into the technological advancements of the 21st century, the continent needs to develop an indigenous critical mass of trained space scientists and engineers **and related professionals** who **will** contribute actively to the solution of the continent's problems.

5.   New applications of space science and technology are constantly being discovered, and spin-offs from space technologies have led to advancements in such diverse fields as medicine, materials science and computers. Exploiting these applications and technological advancements for Africa's social and economic development provides for immeasurable benefits. However, the high cost of participating in space activities has hindered the ability of many countries, particularly those on the African continent, from fully taking advantage of the practical benefits that space science and technology offers.

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[1] Extracted from Satellite and Space Services – Intellect Technology Association, UK, Intellect Publication, 2013

6.   Space is benefiting Africa and its people in a number of ways. Space applications are effective tools for monitoring and conducting assessments of the environment, managing the use of natural resources, providing early warnings of and managing natural disasters, providing education and health services in rural and remote areas and connecting people around the world. Space-related applications are widely used in agriculture, which remains an important economic sector in much of Africa. Space-based information systems play a significant role in risk reduction and disaster management on the African continent, which is heavily affected by natural and man-made disasters. Space-related applications are heavily employed in transportation services, which is another essential field that contributes to the achievement of sustainable development in Africa. Access to transport allows mobility, promotes commerce and fosters education and health. In many African countries, transport access rates and network quality are low[2].

7.   It is imperative that the benefits accruing from Africa's participation in continental level space activities must promote the empowerment of women and youth. Women and youth who are healthy, educated and confident contribute to the health and wellbeing of whole families, communities and their nations. The promotion of the political, economic and social status of women and youth is a critical precursor for advancing the development of the African continent. Accordingly, priority attention must be given to ensuring gender equality and the involvement of the youth in space activities, both in terms of participation and being the recipients of associated benefits. This imperative will be driven across all policy principles advocated for in this document.

8.   Africa has to build its capabilities in constellation programmes, Earth observation systems, navigation and positioning applications, satellite systems, communications and education programmes within a global context. In the process of developing a continental space programme, Africa will not reinvent the wheel. There are some leading African countries that are in the process of developing their own space-related capabilities and programmes, and have proceeded to build institutions to manage these programmes. These national efforts collectively represent the seed that could be nurtured toward a continental programme, without devolving the focus of the national space programmes.

9.   Currently there are a number of fragmented initiatives that have a regional dimension. The pragmatic challenge is to bring all of these pockets of excellence together so that we can create programmatic synergies and complementarities to foster our collective actions towards Africa's development, which will eventually enable the continent to be a global space player. There are only a few countries on the African continent that have **established** national space programmes. In many African countries there is limited appreciation of the potential role and benefits of space in socio-economic development. There is thus a clear and urgent need to build awareness among the collective political, scientific and industrial leadership of African countries on the critical need to develop space **programmes** and **related industries**.

10.   The use of space for development presents many opportunities that cannot be ignored, and Africa has to respond to these challenges and opportunities. Hence, in this context, there is a critical need to make the benefits of space science and technology available to all African

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[2] Extracted from Space Benefits for Africa, draft report of the United Nations Inter-Agency Meeting on Outer Space Activities, 2009

countries. There is a growing need for Africa to adopt a policy framework that guides the implementation of a continental space programme that will enable the continent to **develop and** exploit its space resources in a more coordinated and systematic manner with the overarching objective of contributing to Africa's socio-economic development.

2   BENEFITS OF SPACE SCIENCE AND TECHNOLOGY

11.   Humanity is facing major challenges in ensuring the adequate provision of basic necessities, such as food, shelter, a clean and healthy environment and proper education for the growing population. Only through sustainable development can one hope to address these challenges – otherwise we expose ourselves to additional challenges. Political, social and economic commitments are only effective if there is a global partnership for sustainable development and to ensure the equitable allocation of available resources.

12.   Earth observation/remote sensing satellites use **sophisticated** instruments to gather information about the natural resources and the condition of Earth's **inter-related** land, sea, and atmospher**ic systems**. Located in various orbits, these satellites use sensors that can "see" a broad area and report very fine details about **these systems and their interactions to provide information on, amongst others** weather, the terrain, and the environment. The sensors receive electromagnetic emissions in various spectral bands that show objects that are visible, such as clouds, hills, lakes, and many other features. These instruments can **also** detect an object's temperature and composition, the wind's direction and speed, and environmental conditions, such as erosion, fires, and pollution.

13.   Satellite navigation uses satellites as reference points to calculate positions accurate to within a meter. With advanced techniques and augmentations, satellite navigation can make measurements down to centimetre levels. Navigation and positioning receivers have been miniaturised and are becoming economical, making the technology accessible to everyone. For example, Global Navigation Satellite System (GNSS) receivers are currently built into cars, boats, planes, construction equipment and even laptops. Navigation and positioning, **such as provided by the COSPAS-SARSAT System**[3] is the main element of the international air traffic management system, providing worldwide navigation coverage to support all phases of flight. With appropriate augmentation systems, navigation and positioning satellites will enable gate-to-gate navigation and all weather capabilities for suitably equipped aircraft. GNSS **is** also **being used for** the surveillance **and monitoring** of illegal shipping activities, such as unlawful fishing, and extended to monitor oil spills and the ensuing environmental damage.

14.   Satellite communication is a key technology that could enable developing countries to participate in the build-up of the global information infrastructure. Research indicates that satellite-based wireless systems are the most cost-effective way to develop or upgrade telecommunications networks in areas where user density is lower than 200 subscribers per square kilometre. Such wireless systems can be installed five to 10 times faster and at a 50%

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[3] **COSPAS-SARSAT is an international satellite-based search and rescue distress alert detection and information distribution system, established by Canada, France, the United States, and the former Soviet Union in 1979. Five (5) African member States (Algeria, Madagascar, Nigeria, Tunis and South Africa) currently provide location-related space-based search and rescue services particularly for people and transportation systems in danger, e.g. air crashes, shipwrecks and automobile accidents.**

lower cost than landline networks. Technologies for education and training, in particular distance learning and multimedia, may be instrumental in meeting the needs of African countries that have to train and integrate a large number of workers in widely dispersed and **under-served** areas. Many African countries have to cope with large-scale disease outbreaks, and telemedicine may help to meet these challenges by improving the organisation and management of health care delivery.

3   POLICY GOALS

15.   The policy drivers for an African Space Programme are expressed through high-level policy goals, which are as follows:

3.1   **To create a well-coordinated and integrated African Space Programme that is globally competitive, but yet responsive to the needs of the continent.**
3.2   **To create a regulatory environment that promotes and supports an African agenda, but yet ensures that Africa is a responsible user of outer space.**

4   POLICY PRINCIPLES

4.1   ADDRESSING USER NEEDS

16.   *To harness the potential benefits of space science and technology in addressing Africa's socio-economic opportunities and challenges.*

4.1.1   **To improve Africa's economy and the quality of life of its people.** Although Africa is one of the wealthiest continents in terms of natural resources and has a relatively high economic growth, it is, however, one of the poorest in terms of per capita income, with a relatively low level of Gross Domestic Product. **Space applications will** be used to address the socio-economic developmental needs of Africa **by providing critical information for evidence-based management of human habitats, ecosystems and natural resources**.
4.1.2   **To address the essential needs of the African market.** Space-derived services and products **will be applied to** address the essential **information** needs of the African market. The space resources **of the** few African space-**faring** nations **should** be used to provide technological know-how and knowledge transfer on data and information dissemination, and operational services and products to non-space nations in Africa in order to leverage the full socio-economic benefits.
4.1.3   **To develop the requisite human resources for addressing user needs.** Africa has the challenge of sustaining its space **efforts** and promoting the use of space technology services among all African nations. **Meeting these challenges** requires significant capacity building of human resources. **Accordingly,** Africa must **develop and** adopt **critical/essential** learning programmes**/tools needed** to build its capacity and maintain the widespread use of space **technologies for its development**.
4.1.4   **To develop services and products using African capacities. Space derived services and products have to be developed primarily** through African capacity so as to ensure sustained ownership of the space resources managed by Africans. This will ensure timely responses to the essential user needs to improve sustainable

development in Africa and thereby promote its economy, alleviate poverty and reduce risk hazards.

4.1.5 **To establish communities of practice.** For each of the space application areas, it will be necessary to establish communities of practice for the sharing of experiences and best practices. These communities of practice will also assist in articulating the user needs and technical requirements for each of these areas. Such communities of practice will ensure the facilitation of space applications at grass roots level, where it is needed most.

4.1.6 *To develop and enhance early warning systems on the continent.* As a continent Africa is subjected to various extreme weather, climate, ecosystem and geological events such as tropical cyclones, heavy or a lack of precipitation, heat waves, dust storms, red tides, and tsunamis, which can lead to loss of life and property, and critical services. A combination of space applications will be used to improve, amongst others, weather forecasts to develop a range of early warning systems (such as flood, drought and health early warning systems).

4.2   ACCESSING SPACE SERVICES

17. *To strengthen space mission technology on the continent in order to ensure optimal access to space-derived data, information services and products.*

4.2.1 **To use existing space infrastructure. Existing infrastructure will be used as a base for the development of new capabilities to support the delivery of services and products, R&D and human capacity building. Such capabilities will be established in a complementary manner to reduce unnecessary duplication, provide a full range of space-related services, and at the same time ensure equitable access across the continent.** This will enhance our technical development, technology transfer, management of intellectual property rights and international and intra-continental cooperation.

4.2.2 **To coherently develop, upgrade and operate cutting-edge African space infrastructure.** As we develop the indigenous space industrial capability, we need to ensure the coherent development, upgrading and operation of cutting-edge African space infrastructure that ensures optimal coordination, utilisation and cost-effectiveness. For this purpose, a technology roadmap needs to be identified for the development and strengthening of the industrial capability, underpinned by an appropriate governance structure that draws on both national and regional capabilities in a seamless manner.

4.2.3 **To promote capacity-building for the development of space services.** The development of **capabilities and capacities** in space science and technology **through existing related-institutions must be supported to** create an enabling environment for knowledge generation and exploitation, which will ensure optimal access to space services on the continent. **The Pan African University for Space Science must be strengthened to cater for the space human resource requirements on the continent.**

4.2.4 **To develop and increase our space asset base.** The current space asset base on the continent is limited and therefore there is a need to develop and increase this asset base to ensure optimal accessibility and interoperability. Any extension of our current space asset base must be premised on ensuring complementarities and minimising duplication. This core capability can only be optimally achieved if we nurture a culture

of collaboration rather than competition, and, where possible, we need to draw on the competencies of existing national space programmes on the continent.

4.2.5 **To establish regional and sub-regional centres.** In order to ensure that the continent is appropriately capacitated and serviced in space science and technology, it is important that the varied interests of all regions of the continent are catered for. This will be accomplished through the establishment of regional and sub-regional centres that have a localised span of control that links up with the continental space agenda. **Priority should be given to the revitalisation and rationalisation of existing institutions and the optimal shared use of these assets must be promoted.**

4.2.6 **To adopt data-sharing protocols.** In line with the spatial data infrastructure (SDI) framework, data-sharing protocols need to be **developed**, adopted and implemented to ensure equitable access and data democracy that is cost-effective and acceptable to all member states. The protocols will encourage member states that have space assets to share data services and products with member states that do not presently have such capacity **and ensure that data services and products are interoperable**. Furthermore, this will encourage the commitment of all member states to data gathering and sharing **that facilitates the reuse of data in multiple applications**.

4.3 DEVELOPING THE REGIONAL MARKET

18. *To develop a sustainable and vibrant indigenous space industry that promotes and responds to the needs of the African continent.*

4.3.1 **To create an industrial capability.** As African countries embark on the development of an indigenous space capability, **supported by robust R&D initiatives,** it is imperative that the core focus remains a people-centred, market-based industrial capability. Rightsizing the market-based industrial capability with the relevant human expertise and skills will ensure a cost-effective continental space programme. Free-market transactions should be encouraged on the African continent in order to effectively use the core industrial and human capability.

4.3.2 **To develop a globally competitive African space programme.** Appropriate interventions must be put in place to ensure the global competitiveness of African space technologies, products and services. In order to achieve this, the quality and process maturity of an indigenous space industry must meet the globally accepted space industry standards. The African space industry must demonstrate its ability and successes by ensuring a formidable space heritage that will serve as an attractor for pursuing and capturing a market share of the global space market.

4.3.3 **To promote public-private partnerships.** Public-private partnerships must be pursued in developing an innovative indigenous and sustainable space industry. These partnerships must draw on the complementary capabilities and expertise through effective technology transfer and intellectual property management arrangements, at an intra-continental level. These partnerships must also be bolstered in collaborative R&D efforts that focus on the development of space services and products in response to market needs. In this regard, appropriate commercialisation frameworks and agreements must be put in place to service the regional and foreign export markets.

4.3.4 **To promote R&D-led industrial development.** The technical capability and infrastructure must be used to support R&D and, in so doing, promote an innovative indigenous space industry. The space asset base is a precondition for a fully sustainable, efficient and effective industry, which also forms the basis for cutting-edge R&D that further promotes industrial development. **Knowledge generated through**

R&D must also be translated through support of an innovation value chain into services and products for either commercial use or the broader public good.

4.3.5 **To use indigenous space technologies, products and services.** Development of an African space market will be both through the development of public good products and services and the commercialisation of indigenous space technologies, products and services. In order to achieve this, it is imperative that we become intelligent users of **space-acquired** data, where such a use reflects and responds to the user needs of the continent. Hence, the development of technologies, products and services must respond to the African space market and be largely market-driven.

4.4 ADOPTING GOOD GOVERNANCE AND MANAGEMENT

19. *To adopt good corporate governance and best practices for the coordinated management of continental space activities.*

4.4.1 **To establish an organisational framework.** African states will have to establish an organisational framework that will **coordinate** all African space capabilities and assets to serve the goals of this policy in an efficient and cost-effective manner. African countries with space science and technology experience will help less experienced African countries to access space services and applications, develop their space capabilities and promote human resources in space science, technology and applications. The organisational framework must organise and allow equal opportunities for all African states for accessing space services and products.

4.4.2 **To financially support the African space programme.** Funding schemes of space activities must preserve the independence of the African space programme and thus guarantee the orientation of space activities with user needs. **In order to develop and enhance its space capabilities, Africa should welcome collaboration and co-operation at the international level. However, Africa should not expect any other country/region to subsidise its space ambition, since by its own committed space efforts, Africa stands to compete, in the immediate future, with these same collaborators in the international market, including our own African market.** Therefore, African governmental financial support will be the main funding source for space activities.

4.4.3 **To maintain an efficient and sustainable African space programme. There is a need for efficient monitoring and evaluation during the implementation phase of an African space programme. Africa must therefore adopt key performance indicators for regular reviews to ensure best-fit capability building initiatives, as well as up-to-date services and products to address user needs.**

4.4.4 **To promote knowledge sharing.** Knowledge sharing is one of the main strategic tools that will ensure the sustainability of an indigenous space sector. Knowledge must be disseminated over the African continent in a non-contradictory way that will promote the development of an African space market. On the other hand, space-based intellectual property exchanges will have to be controlled by the same framework to assure proper usage and avoid improper dissemination.

4.4.5 **To maintain an awareness campaign.** Space technology, applications and services and the related socio-economic benefits are not generally appreciated by all African member states. Hence, there needs to be a significant awareness campaign that will educate and inform African decision makers, politicians and the public. It is vitally important that such an awareness campaign promotes collective buy-in and ownership of an African space programme.

4.4.6 **To monitor and evaluate space activities.** The organisational framework to be adopted must firmly state the monitoring and evaluation procedures that will ensure compliance and achievement of the broad objectives set for an African space agenda. The procedures must set and monitor proper return on investment, significant investment in people, best resource utilisation, proper funding approaches, and an efficient risk management and mitigation strategy.

4.5   COORDINATING THE AFRICAN SPACE ARENA

20.   *To maximise the benefit of current and planned space activities, and avoid or minimise duplication of resources and efforts.*

4.5.1 **To commit funds to optimise and improve effectiveness.** Space technology has many benefits, but the high capital cost is a significant barrier to entry. Therefore, the African space-developed nations have to make available their assets and space resources, and African member states need to commit funds to optimise and improve the required operational and envisaged services and products.

4.5.2 **To harmonise and standardise [standards rather] all infrastructure.** African member states will need to harmonise and standardise all infrastructure to ensure interoperability and seamless integration of data, data integrity and data security/protocol. It is only through such harmonisation and standardisation that the maximum benefits of space applications could be appreciated by all African member states, as it provides a platform for sharing of experiences, knowledge, and technology transfer.

4.5.3 **To regulate space activities.** The African space programme will need to be regulated in order to guarantee attainment of the strategic objectives. Conflicts of interest will need to be managed. A regulatory environment will need to be **established** to allow industrial entities to access space technology and promote African commercial private sector participation in the space arena. **A regulatory framework will need to be developed and implemented to ensure effective compliance with international treaties and conventions.** The indigenous space programme must be compliant with national, continental and international laws and regulations.

4.5.4 **To secure the space environment for Africa's use.** A prime responsibility in relation to continental space activities is to ensure that assets related to space such as spectrum, orbital locations, quiet areas for radio-astronomy and other rights are secured for current and future use by continental and national space activities in Africa. Representation on international bodies such as the ITU would be important.

4.5.5 **To preserve and maintain the long-term sustainability of outer space.** During the implementation phase of continental level space activities, it is prudent that we exercise commitment and act responsibly in preserving and maintaining the long-term sustainability of outer space. Transparency and confidence building measures must be enforced to minimise the effects of space debris, thus preserving the space environment for future generations.

4.6   PROMOTING REGIONAL AND INTERNATIONAL COOPERATION

21.   *To promote the African-led space agenda through mutually beneficial partnerships*

4.6.1 **To promote intra-continental partnerships.** Intra-continental partnerships must be promoted to leverage national strengths, activities and programmes. Such partnerships

remain central to endeavours relating to human capital development, infrastructure development and the development of an indigenous space industry sector. These partnerships would also need to foster regional collaboration, where the regional needs are primarily addressed.

4.6.2 **To forge international partnerships. Space science and technology is a global endeavour and therefore Africa must strive to be involved in mega international projects from which new knowledge can be acquired and exploited. In addition, where capability gaps exist, these must be accessed through international partnerships either through technology know-how and transfer and/or the use of international facilities. Joint research, development and innovation initiatives must be a core focus of international partnerships.**

4.6.3 **To foster partnerships across all sectors.** Joint collaboration and synergy among academia, industry and government in all fields of space science and technology in Africa must be fostered in order to ensure comprehensive involvement by all sectors. All sectors will need to work in concert in order to deliver an efficient and effective African space programme. **An enabling environment must be created to effect a fluid transfer of scarce skills and knowledge between different economic sectors.**

4.6.4 **To facilitate partnerships on a principle of equal partners.** A key driver to ensure the development of an indigenous space capability and capacity will be the level of independence maintained by an African space programme. This principle should be pursued in developing the African market, and also taken into account when leveraging strategic international partnerships to address technological gaps.

4.6.5 **To ensure a reasonable and significant financial and/or social return.** All international partnerships should be based on a fair and mutually beneficial approach and should ensure acceptable socio-economic returns for the African continent. Such strategic partnerships must be premised on the notion of mutual benefits, but must help to further strengthen the African space asset base.

4.6.6 **To observe international agreements.** In our pursuit of an indigenous space capability, it is important that we observe all appropriate international treaties, conventions and agreements. Where such international agreements are considered for implementation, it is crucial that a consolidated African position be heard that best serves an indigenous African space programme.

5   CONCLUSION

22.   This African Space Policy identifies the key policy drivers (goals) that will inform the agenda for any formal space initiatives on the continent. The policy drivers are supported by a set of principles that emulate the critical aspects that need to be addressed in developing and maintaining a viable and sustainable space programme. These policy principles form the basis of all decisions and actions that inform the core building blocks of the African Space Programme.

23.   The African Space Policy is thus a guiding framework for the formalisation of the African space agenda and will be complemented by an African Space Strategy and an associated Implementation Plan that will give rise to an effective African Space Programme.