



**SOUTH AFRICA'S PLACE IN SPACE:**

**A LEGAL COMMENTARY ON SOUTH AFRICA'S OUTER SPACE BILL (2017)**

**JAYMION HENDRICKS**

**STUDENT NUMBER: 17367281**

**SUBMITTED IN ACCORDANCE WITH THE REQUIREMENTS FOR THE DEGREE**

***MAGISTER LEGUM* IN INTERNATIONAL AIR, SPACE AND  
TELECOMMUNICATIONS LAW (LLM)**

**IN THE FACULTY OF LAW**

**UNIVERSITY OF PRETORIA**

**UNDER THE SUPERVISION OF PROFESSOR DR HOBE**

**OCTOBER 2019**



## TABLE OF CONTENTS

Declaration.....	4
Acknowledgement.....	5
Abstract.....	6
<b>CHAPTER ONE: INTRODUCTION TO THE RESEARCH</b>	
1.1 Background.....	7
1.2 The need for National Space Legislation.....	9
1.3 Research question.....	10
1.4 Research methodology.....	10
1.5 Research objectives and relevance of the study.....	12
1.6 Chapter outline for the remainder of the research.....	13
<b>CHAPTER TWO: SOUTH AFRICAN POLICY CONTEXT</b>	
2.1 Introduction .....	15
2.2 South Africa's space activity.....	17
2.3 South Africa's Space Policy context.....	19
2.4 The South African Space Agency.....	21
2.5 Conclusion.....	22
<b>CHAPTER THREE: THE SOUTH AFRICAN OUTER SPACE BILL 2017 WITH REFERENCE TO KEY UN TREATIES, UN RESOLUTIONS AND RECOMMENDATIOS</b>	
3.1 Introduction.....	24
3.2 National Space Law Recommendations from relevant UN treaties, Resolutions and the ILA Model Law.....	24



3.3	Space Affairs Act 1993.....	31
3.4	Preamble and Objects: Space Draft Bill 2017 and 1993 Act.....	31
3.5	South African Space Regulatory Council.....	33
3.6	Definitions.....	36
3.7	Key Provisions of the Outer Space Bill 2017.....	43
	3.7.1 Scope of Activities.....	43
	3.7.2 Supervision and Control.....	44
	3.7.3 Application of the Act.....	45
	3.7.4 Authorisation and Licensing.....	46
	3.7.5 Categories of Licenses.....	47
	3.7.6 Registration.....	49
	3.7.7 Transfer of License or Change of Ownership.....	50
	3.7.8 Safety and Environmental Considerations.....	50
	3.7.9 Amendment, Suspension and Revocation of Licenses.....	52
	3.7.10 Liability and Insurance.....	53
	3.7.11 Surrender of License.....	54
3.8	Conclusion.....	55

#### **CHAPTER FOUR: RECOMMENDATIONS**

4.1.	Recommendation I – Purpose and Objects of the Act.....	57
4.2.	Recommendation II – Scope of Activities.....	58
4.3	Recommendation III- Definitions.....	59
4.4.	Recommendation IV- Scope of Application.....	61
4.5	Recommendation V – Conditions for Authorisation.....	62
4.6	Recommendation VI – Space Debris Mitigation.....	63
4.7	Recommendation VII – Liability and Insurance.....	64

#### **CHAPTER FIVE: CONCLUSION** .....

66

#### **BIBLIOGRAPHY**.....

67



## Declaration of Originality

1. I understand what plagiarism is and I'm aware of the University's policy in this regard.
2. I declare that this mini-dissertation is my own original work. Where other people's work has been used (either from a printed source, Internet or any other source), this has been properly acknowledged and referenced in accordance with departmental requirements.
3. I have not used work previously produced by another student or any other person to hand in as my own.
4. I have not allowed, and will not allow, anyone to copy my work with the intention of passing it off as his or her own work.

**Signature:**

A handwritten signature in black ink, appearing to read "Aendnce", written over a horizontal line.



## **Acknowledgement**

I dedicate my LLM to my late dad, Jacobus, who has always inspired me to further my education and to fulfil my dreams. I thank my mom, Sheila, for her unwavering support and sacrifice over the years. I also thank my siblings for the role played by them in my upbringing.

I am grateful to Prof. Dr Hobe for his supervision of my research and for evoking my interest in international space law. He inspires African scholars to contribute to the development of international space law and for Africa to take her rightful place in this field.

I wish to thank Professor Nienaber and Prof Dire Tladi for their excellent teaching and passion for international law.

Also, to Olitha, thanks for your support and for being most excited about celebrating this achievement.

Finally, I thank Nathan for always motivating me and for having been with me throughout this journey.

## Abstract

Following a governmental and stakeholder consultation process, the Department of Trade and Industry (“**the dti**”) has drafted a space bill which seeks to reflect South Africa’s increasing space activities and space ambitions. It is envisaged that the South African Outer Space Bill 2017, once enacted, will repeal the Space Affairs Act, No.84 of 1993. The 2017 Bill departs from the old Act in a number of respects which are discussed in the mini-dissertation.

The mini-dissertation considers the 2017 Bill in the context of relevant United Nations Space Treaties, as well as recommendations for national space legislation as developed by the United Nations Committee on the Peaceful Uses of Outer Space (UNCOPOUS) and the International Law Association Model on National Space Legislation. The dissertation delivers comment on a number of aspects the Bill ought to strengthen, in order to ensure the strictest adherence to safety and environmental considerations for licensees, including the appropriate guarantees in terms of liability to protect the State, a comprehensive definition for space debris and emphasis on safety.

The primary question throughout will be whether the 2017 Bill is a sufficient legal basis for the anticipated space activities by South Africa and whether it embraces international standards. In the final Chapter, a number of recommendations are made which seek to strengthen the Bill so it may become a model piece of national space legislation. The Bill has not yet been publicised for comment and the author is conscious that the Bill may be subject to change. The provisions of the Bill in its current form, provides rich insight into the direction South Africa wishes to take in relation to its space affairs regulatory framework. The recommendations contained in the final chapter of this mini-dissertation may assist the drafters of the Bill to consider strengthening certain provisions of the Bill in line with international developments in space law.



## CHAPTER ONE

### INTRODUCTION TO THE RESEARCH

#### 1.1 Background

With a history of space activity which includes launches from its territory during the apartheid era, South Africa is not a newcomer to the final frontier. In 1993, South Africa adopted the Space Affairs Act, 84 of 1993 (“the 1993 Act”) and continues to rank among a small number of countries with domestic space legislation.<sup>1</sup> In 2016, approximately 27 States had adopted national space legislation<sup>2</sup>. For its time, the 1993 Act was formidable in that it largely reflected the country’s obligations relative to the main international space law treaties. The Act affirms South Africa’s role as a trustworthy and peaceful user of outer space with no express contemplation of commercial, private space activity. In 2012, the South African government through the Department of Trade and Industry (“the DTI”) embarked on its first consultation workshop at the University of Pretoria to review its national space legislation.<sup>3</sup> The workshop comprised domestic stakeholders, academics and government departments. Following the consultations, the University of Pretoria in conjunction with the Council for Scientific and Industrial Research (CSIR), was tasked with compiling a report on the review of South Africa’s national space legislation. The report was released in 2013 and a second workshop was held in 2014 to “further

---

<sup>1</sup> Kuan-Wei Chen and Tanveer Ahmad (2016) ‘Promotion for Development of National Space Legislation in Developing States to Ensure Global Space Governance [PowerPoint presentation]: <http://www.unoosa.org/pdf/SLW2016/Panel5/2. Chen Ahmad National space Legislation Presentation Ch en.pdf> (accessed: 15 May 2019).

<sup>2</sup> The states are: Australia, Austria, Argentina, Belgium, Brazil, Canada, Chile, China, France, Germany, Japan, Kazakhstan, India, Indonesia, Iran, Italy, Netherlands, Nigeria, Norway, South Korea, the Russian Federation, South Africa, Spain, Sweden, Ukraine, the United Kingdom (UK), and the United States (US), <http://www.unoosa.org/pdf/SLW2016/Panel5/2. Chen Ahmad National space Legislation Presentation Ch en.pdf> (accessed 15 May 2019).

<sup>3</sup> Nomfuneko Majaja and Ms Pontsho Maruping (2017) ‘Repeal of the Space Affairs Act No.84 of 1993 by the South African Outer Space Bill’ [PowerPoint presentation, 1 -26] available at: [https://www.thedti.gov.za/parliament/2017/Space\\_Draft\\_legislation.pdf](https://www.thedti.gov.za/parliament/2017/Space_Draft_legislation.pdf) (accessed 17 May 2019).

examine and refine the findings from the UP study to support the legislative review process for the Space Affairs Act”.<sup>4</sup>

Among the key outcomes of the consultations held between 2012 and 2014 are<sup>5</sup>:

- The essential elements for national space legislation as proposed by United Nations Committee on the Peaceful Uses of Outer Space (UNCOPOUS) must be reflected in the national legislation;
- The International Law Association Model National Space Legislation (“ILA Model Law”) should be a guiding document; and
- The current Space Affairs Act “falls short of addressing national developments (policy and strategy) and socio-economic needs” in South Africa.<sup>6</sup>

The National Space Policy (2009) was developed after the 1993 Act was promulgated, and the stakeholders considered that national space legislation must align with the Space Policy and identified that the domestic space activities had grown in recent years and comprises domestic private and international space actors.<sup>7</sup> It appears that much deliberation centred on whether the 1993 Act ought merely to be amended or whether new legislation is required. It was concluded that indeed a new act would be required, one which is reflective of international space law developments, particularly the role of private space actors, as well as the need to align a new act with the UNCOPOUS recommendations.

During 2017, the DTI drafted the South African Outer Space Draft Bill, 2017 (hereinafter referred to as the “OSB 2017” or “the Bill”). The Bill is a proposed new Act which will repeal the 1993 Act. While there are a number of provisions which have been lifted from the 1993 Act and transposed into the Bill, the latter differs significantly in a number of respects. These differences can be found in the definitions, the scope of activities, categories of licenses to be issued, as well as new

---

<sup>4</sup> Ibid, 2.

<sup>5</sup> Ibid, 3

<sup>6</sup> Ibid, 7.

<sup>7</sup> Ibid, 2.

provisions relating to registration and supervision, transfer of ownership or change of license in orbit, as well as liability and insurance requirements.

## 1.2 The need for National Space Legislation

Space exploration and use was almost exclusively in the domain of the nation state in preceding decades. However, private space actors are increasingly in the forefront of space exploration. In this vein, countries with developing economies are able to leverage private investment in their space industries to develop their national space industries which means that less state revenue will be needed for this purpose, placing within reach countries' aspirations of becoming space-faring. The proliferation of private space actors, however, means that it is pertinent to ensure that international space law obligations are fulfilled by nation States which bear international responsibility international responsibility for national activities in outer space and international liability for damage to other States Parties to the Outer Space Treaty ("OST") arising out of space activities.<sup>8</sup> It is crucial that States possess the requisite national legislation which fulfils their obligations in terms of the UN treaties, covering obligations such as liability, registration, control and supervision, peaceful and sustainable use of outer space and mitigating space debris and protecting the space environment.<sup>9</sup>

Since the launch of the Sputnik in 1957, the United Nations (UN) has played a key role in the development of international space law through the setting up of an ad hoc committee to oversee the peaceful use of outer space, which ultimately led to the United Nations Committee on the Peaceful Uses of Outer Space in 1958<sup>10</sup>. The development of national space law has been achieved through the relevant

---

<sup>8</sup> Art VI and VII of The Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and other Celestial Bodies, of 27 January 1967.

<sup>9</sup> Liability Convention (1972); Outer Space Treaty (1967); Registration Convention (1976).

<sup>10</sup> UN Res. 1348, 1958. [https://www.unoosa.org/pdf/gares/ARES\\_13\\_1348E.pdf](https://www.unoosa.org/pdf/gares/ARES_13_1348E.pdf) (accessed 17 May 2019).

resolutions and treaties of the UN which seek to guide countries in the content of their national space legislation.<sup>11</sup>

It is against this background that this paper will analyse the draft OSB 2017 against the recommendations for national legislation by UNCOPOUS and ILA Model Law, with the view to concluding whether the South African Outer Space Bill (2017) goes further than its predecessor, the Space Affairs Act 1993, to provide a solid legal foundation for South Africa's space ambitions in line with its international law obligations.

### **1.3 Research question**

The purpose of the research is to deliver a legal commentary on the OSB 2017. In particular, the question to be answered is whether the South African Outer Space Bill (2017) goes further than its predecessor, the Space Affairs Act 1993, to provide a solid legal foundation for South Africa's space ambitions in line with its international law obligations. It does this through comparative analysis of key provisions of the 1993 Act and the OSB 2017 and the UNCOPOUS and ILA Model Law recommendations.

The Bill has not yet been published for public comment, although it was intended for the Bill to be published for public comment by the end of 2018. In the circumstances, the Bill is subject to change and references to particular sections of the Bill in the mini-dissertation may also change depending on the final version of the Bill.

### **1.4 Research Methodology**

A desktop research methodology will be employed throughout this study. This entails textual analysis and review of existing literature. The research is largely based on primary and secondary sources of international law. The study also considers

---

<sup>11</sup>Yun Zhao, 'Space Commercialization and the Development of Space Law' (Oxford Research Encyclopedias, July 2018, <https://oxfordre.com/planetaryscience/view/10.1093/acrefore/9780190647926.001.0001/acrefore-9780190647926-e-42?print=pdf> (accessed on 1 July 2019)).

UNCOPOUS recommendations such as those contained in Resolution 68/74 of 11 December 2013, as well as draft the ILA Model Law on National Space Legislation.

In the first instance, background to South Africa's policy context is provided. A brief background to South Africa's historical space activities is considered and an analysis of recommendations for national space legislation arising from UN resolutions provides the context for the subsequent chapter which analyses key provisions of the new Bill.

In the second instance, the study considers UN non-binding resolutions as well as the ILA Model Law which provide guidance to States in the provisions to be contained in national space legislation, including the UNCOPUOS Space Debris Mitigation Guidelines.

In the third instance, a comparative research methodology and analysis of key provisions of the 1993 Act and the Bill is conducted to assess the differences between them. These provisions are in some instances compared to relevant articles from primary sources of international space law, namely the five UN space treaties on outer space:

- Liability Convention (1972);
- Moon Agreement (1984);
- Outer Space Treaty (1967);
- Registration Convention (1976); and
- Rescue Agreement (1968)

In the fourth instance, the study provides recommendations on provisions in the Bill that ought to be amended, deleted or inserted, having considered the key provisions of the primary sources of international space law, as well as secondary sources and non-binding resolutions and recommendations on content for national space legislation.



Finally, the study concludes by considering whether the Bill goes further than the 1993 Act, to provide a solid legal basis for space affairs in South Africa, in line with its international obligations.

### **1.5 Research objectives and relevance of the study**

The primary objective of the research is to provide a legal commentary and recommendations on South Africa's new Outer Space Bill, 2017 in the context of South Africa's renewed space ambitions in the last decade (2009 – 2019). The South African Space Affairs Act 1993 which is South Africa's first outer space legislation will be repealed when the Bill is promulgated (initially anticipated toward the end of 2018). The Bill drastically departs from the old Act and for the first time expressly contemplates non-governmental space exploration and use. The research specifically provides recommendations on a number of aspects the Bill ought to strengthen, in order to ensure the strictest adherence to safety and environmental considerations for licensees, including the appropriate guarantees in terms of liability to protect the State, and a comprehensive definition for space debris. The primary question is whether the Bill is a sufficient legal basis for the anticipated space activities in the country and whether it reflects developments in international space law and meets international standards.

The research questions are therefore apt in time, as South Africa and the African continent have shifted gear in an apparent race toward space. It is however necessary for a solid legislative framework nationally to regulate space activity in a manner that will ensure sustainable and safe space exploration, in line with South Africa's international law obligations.

## 1.6 Chapter outline for the remainder of the research

### *Chapter Two: South African Space Policy Context*

This chapter sets out the policy context for South Africa's space ambitions. The country has a long space history and can be categorised into three main epochs. The transition to democracy in 1994 not only changed the political landscape, but also had an impact on South Africa's space programme which was erstwhile active and militaristic in nature, mothballed in 1994 and then revived in the last decade. The Chapter provides the context for the renewed impetus for the development of the domestic space industry leading to the review of its national space legislation in 2017.

### *Chapter Three: Comparative Analysis - The Space Affairs Act, 1993 and the Draft Outer Space Bill (2017)*

In this chapter the main recommendations for national space law as compiled by UNCOPOUS and the ILA are considered as an introduction to the assessment of the OSB 2017 and its key provisions, and provides insight into whether the drafters of the OSB 2017 have sought to reflect the recommendations and non-binding UN resolutions relative to national space legislation. The Chapter then proceeds to compare key provisions of the Bill to the existing 1993 Act. The comparative analysis seeks to provide an overview of the key changes to the national space law framework in the definition list, scope of activities, licensing requirements, liability and insurance, transfer of ownership, safety and environment, as well as the registration and the amendment, suspension and revocation of licenses.

### *Chapter Four: Recommendations*

Chapter Four presents recommendations for the scope of activities, registration, licensing, environment and liability provisions of the Bill. The recommendations are borne from the assessment in previous Chapters, of UN recommendations, treaties and declarations and its purpose is to address the identified shortcomings of the OSB 2017. The recommendations are in line with the ILA Model Law on National Space Legislation as well as independently identified proposals.



### *Chapter Five: Conclusion*

This chapter concludes that the OSB 2017 goes further than the 1993 Act to provide a solid legal foundation for South Africa's space ambitions in line with its international law obligations, although certain provisions in the Bill could be strengthened in line with the recommendations presented in Chapter Four.

## **CHAPTER TWO**

### **SOUTH AFRICAN POLICY CONTEXT**

#### **2.1 Introduction**

It is estimated that the African space economy is in the region of USD 7 billion and that it will exceed USD 10 billion by 2024, with approximately 8,500 people employed in the sector across Africa.<sup>12</sup> A number of countries have in recent years commenced to capitalise on the vast economic potential of the space economy, primarily in the application of space technology. This has resulted in heightened space activity among traditional space farers as well as relatively new space-faring countries. Developing countries are on a quest to transform their economies from resource extraction to knowledge-based economies. Space exploration has the potential to create a new value chain for many such economies and it is on this basis that a number of especially African countries are now in the race to space, South Africa being one of them. In addition, space technology presents many socio-economic benefits for African nations as remote earth sensing plays an important role in the agricultural sector, natural disaster planning and relief as well as in the extraction industries - enabling countries to assess the quantity and exploitation of natural resources, spatial planning and to service rural communities.

In October 2017, the African Union adopted the African Space Agency Statute<sup>13</sup>. According to the Statute, the African Space Agency (aligned with Agenda 2063) will avoid the “duplication of resources and efforts” with the view to maximizing “the benefits of current and planned space activities” on the African continent.<sup>14</sup> The African Union Heads of State and Government during their Twenty-Sixth Ordinary

---

<sup>12</sup>Ibeh, J. ‘African Space Industry Annual Report 2019 Edition’ (Space in Africa, 2019) <<https://africanews.space/product/african-space-industry-annual-report-2019-edition/>> (accessed: 15 March 2019).

<sup>13</sup>Statute of the African Space Agency (2018) <[https://au.int/sites/default/files/treaties/36198-treaty-statute\\_african\\_space\\_agency\\_e.pdf](https://au.int/sites/default/files/treaties/36198-treaty-statute_african_space_agency_e.pdf)> (accessed 18 March 2019).

<sup>14</sup>*Id.* Article 5 ‘Functions of the Agency’.

Session on 31 January 2016 in Addis Ababa adopted the African Space Policy and Strategy (ASP) as the first of the concrete steps to realize an African Outer space Programme, as one of the flagship programmes of the AU Agenda 2063.<sup>15</sup> South Africa plays an active role in the AU space process and is a strong proponent for an African Space Agency. These developments in the AU have undoubtedly influenced the South African domestic space policy environment, and will likely result in more African countries becoming space-faring which means that more national legislation will in the near-future have to be drafted for this purpose. South Africa's space expertise and legislation could serve as an advantage to other African countries.

The 2017 Bill is merely the culmination of a renewed impetus by South Africa since the Administration of Jacob Zuma in 2009, to increase the country's share of the global space economy with the view to reaping socio-economic benefits for the country and the African continent. The South African National Space Agency (SANSA) was established in 2010 and is tasked with developing and growing the South African space industry, gearing the country towards a knowledge-based economy through the use of space applications and technology.

The South African Outer Space Bill 2017 departs from the 1993 Act in a number of ways. It seeks to reposition South Africa's space ambitions to embracing commercial space activity and recognising the role of non-governmental actors in space.

The purpose of the Chapter is to provide brief context to South Africa's space ambitions, outlining the gradual transformation of its space policy context over time and the manner in which the 1993 Act mirrored its general transition in 1994. The policy context is important because it provides rationale for the decision to draft the 2017 Bill and to effect key changes to the national space law framework.

---

<sup>15</sup>African Union, Directorate of Information and Communication, "African Union Heads of State and Government Adopts the African Space Policy and Strategy" 16 January 2016. <https://au.int/fr/node/19677> (accessed 17 May 2019)

## 2.2 South Africa's Space Activity

### *Amateur launches (1947-1962)*

Keith Gottschalk<sup>16</sup> posits that South Africa is not a newcomer to space activities. Home-made rockets were launched as early as 1947 by Desmond Prout-Jones, who had in 1959 established the South African Rocket Research Group (SARRG).<sup>17</sup> The SARRG launched 528 rockets and 102 static firing tests, without any injuries or fatalities.<sup>18</sup> One of the rockets launches reached 40 kms altitude, while a 100 kms altitude flight was planned thereafter.<sup>19</sup> The Government Explosives Inspector, under the auspices of the old apartheid government, however prohibited further rocket flights and the apartheid authorities refused permission for all further civilian amateur launches as the South African military itself commenced with developing tactical surface-to-air missiles.<sup>20</sup>

### *Military missile era (1963 – 1993)*

Although information relating to this period remains limited, it is evident that a number of clandestine space activities took place as the apartheid regime moved towards the military industrial complex<sup>21</sup>. The then Armaments Corporation of South Africa SOC Ltd (ARMSCOR) was the weapons manufacturer for the South African Defence Force (SANDF) at a time when international sanctions against South Africa made it difficult for the country to trade in weapons and it was then forced to produce its own weapons.

It is believed that Israel and South Africa worked closely on a space launcher from 1980, as fabrication and test range infrastructure in South Africa was being rolled out since the 1980s.<sup>22</sup> Two sub-orbital test launches of the space launcher (of the first

---

<sup>16</sup> Keith Gottschalk, 'South Africa's space programme - Past, present, future' (2010), 1- 16 <https://repository.uwc.ac.za/xmlui/handle/10566/155> (accessed: 21 June 2019).

<sup>17</sup> *Id.* at 2.

<sup>18</sup> *Id.* at 2-3.

<sup>19</sup> *Id.* at 2.

<sup>20</sup> *Id.* at 2.

<sup>21</sup> *Id.* at 3.

<sup>22</sup> *Ibid* 3-4.

and second stages) took place on 6 July 1989 and on 19 November 1990 respectively.<sup>23</sup> As apartheid was nearing its end during the latter stages of negotiations - on its way to a democratic transition - South Africa came under pressure to relinquish its space launcher programmes which was terminated in the late 1980s and early 1990s. The period however left behind a sizable space infrastructure from which the country benefits today.<sup>24</sup>

South Africa initiated its first space programme in the 1980s. The objective of this programme was to develop an Earth observation satellite and a launcher, and all the necessary facilities to support these activities. Testing facilities were constructed at Grabouw in the Western Cape while a launch facility was constructed in Arniston, on the Cape South coast which allowed for east to polar launches.<sup>25</sup> Considerable capabilities were developed in the South African industry to support this programme. This programme was discontinued in 1994, before any satellites were launched, and the facilities were instead used for alternative purposes.<sup>26</sup>

#### *Civilian dawn (1994- present)*

The civilian dawn is the period within which South Africa's militaristic perspective on space changed to one in which space was viewed as being important for research and development purposes. In 1993, the country adopted its first national space legislation in the form of the Space Affairs Act 84 of 1993, which to a large extent encapsulated South Africa's international obligations under the aforementioned treaties. The nearly two decades following its democratic transition witnessed a number of important legislative developments in relation to outer space, such as the promulgation of the Astronomy Geographic Advantage Act 21 of 2007 (AGA) which saw the State seek to cap or ban radio and light pollution that could interfere with radio and/or optical telescopes such as the Southern African Large Telescope (SALT) which it heavily invested in and is largest optical telescope in the southern

---

<sup>23</sup> *Id.* at 12.

<sup>24</sup> *Id.* at 12.

<sup>25</sup> University of Cape Town Space Lab, 'Space in South Africa' <http://www.spacelab.uct.ac.za/space-south-africa-0> (accessed: 10 December 2018).

<sup>26</sup> *Id.* at 1.



hemisphere.<sup>27</sup> The world's largest radio-telescope, the Square Kilometre Array (SKA) built in 2012 in the Northern Province, is a major accomplishment in terms of the country's renewed emphasis on space and the AGA prohibits cell phone signal transmissions around the SKA.

The country also ratified a number of important outer space treaties such as the Outer Space Treaty (1967), Liability Convention (1972), Rescue Convention (1968), and the International Telecommunication Convention (1992) - although the country has not yet ratified the Moon Agreement (1979).

It launched its first civilian satellites in 1999, commencing with the SunSat, built by Stellenbosch University and launched by NASA which became the first South African satellite to reach orbit. South Africa's second satellite, SumbandilaSat, was successfully launched from the Baikonur Cosmodrome by Russian space agency Roscosmos, on a Soyuz-2 rocket, on 17 September 2009.

The South African National Space Agency Act, 36 of 2008 ("SANSAct") created the South African National Space Agency (SANSAct) in 2010 which is tasked, *inter alia*, with supporting, guiding and conducting research and development in space science and engineering in South Africa.

These notable developments in the legislative framework and concrete projects became the foundation for an enabling atmosphere for space exploration.

### **2.3 South Africa's Space Policy Context**

As alluded to above, South Africa's space ambitions transformed along with the country's transition from a reclusive pariah state in which space exploration was primarily for military and security purposes, to an open and transparent democracy in which the peaceful exploration of space is promoted in line with its national ideals.

---

<sup>27</sup>Brand South Africa Reporters, 'Southern African Large Telescope: Africa's eye on the universe' *Brand South Africa* (South Africa, 8 December 2009) <<https://www.brandsouthafrica.com/investments-immigration/science-technology/southern-african-large-telescope-africa-eye-on-the-universe>> (accessed 15 January 2019)

Despite this, the 1993 Act does not reflect the more open approach to space exploration for socio-economic upliftment purposes as may have been hoped. Instead, the 1993 Act continued to contemplate mainly State launches and placed emphasis on denuclearization.

In the same year, South Africa adopted its National Space Policy which, *inter alia*, seeks to align the hitherto fragmented approach to scientific study, exploration and utilisation of outer space. It also recognises the contribution of space science and technology in delivering information and services that protect lives and the environment, enhance prosperity and security, and stimulate scientific, industrial and economic development.<sup>28</sup>

For the first time, the Space Policy articulates South Africa's ambitions in space and sets the path for the commercialisation of space and the activities related thereto, and the role to be played by non-state actors in the local space industry. A new Space Programme is now being implemented – the first since the space programme during the military industrial complex of the apartheid regime up to the 1980s. The Space Policy furthermore articulates the need for South Africa's assured access to space which will be a critical capability for the South African Space Programme, to ensure the capability to launch space systems through at least two independent, comparable lines of access to space.<sup>29</sup>

The South African Space Council's members (established in terms of the 1993 Act) were appointed in 2006 and its mandate includes the legal, policy, scientific, technical and advocacy matters related to space. The Space Council is mandated to take on the responsibility regarding compliance with international agreements, conventions and treaties on behalf of the South African Government, as well as to "implement South Africa's National Space Policy through the creation of a supportive regulatory and international business environment for its industry".<sup>30</sup> The DTI houses

---

<sup>28</sup>South Africa National Space policy, 4. < <https://www.sansa.org.za/wp-content/uploads/2018/05/South-Africas-National-Space-Policy.pdf>> (accessed 17 March 2019).

<sup>29</sup>*Id.* at 12.

<sup>30</sup>News24, "SA Space Council Appointed" <https://www.news24.com/scitech/news/sa-space-council-appointed-20101015> (accessed 26 June 2018).

the secretariat which provides operational support to the Space Council so the latter may fulfil its mandate.

Together with the Space Strategy, the Space Policy is clear that South Africa wishes to poise itself as a space-capable country. South Africa is therefore on the cusp of a transition – this time in terms of its space ambitions. The 2017 Outer Space Bill, it appears, seeks to create a conducive legislative environment in order to further the aims and objectives of the policy framework. It is therefore important that the Bill contemplates the increased launching activity and general space activities as a result of more private contenders entering the space commercial aspects.

#### **2.4 South African National Space Agency (SANSA)**

A South African National Space Agency was established in 2010. The Act<sup>31</sup> outlines the objectives of the Agency as follows:

- promote the peaceful use of Outer Space;
- support the creation of an environment conducive to industrial development in space technologies;
- foster research in astronomy, earth observation, communications, navigation and space physics;
- advance scientific, engineering and technological competencies and capabilities through human capital development and outreach programmes; and
- foster international co-operation in space related activities.

SANSA has a total staff complement of approximately 180 employees, with an annual income in the region of R300-million, with R60-million to R90-million from the sale of space services and R125-million from the State.<sup>32</sup>

---

<sup>31</sup> South African National Space Agency Act, 36 of 2008, section 4  
<https://www.unoosa.org/documents/pdf/spacelaw/national/safrica/Act36-2008.pdf> (accessed 18 may 2019).

The global space economy generates approximately \$329 billion worldwide<sup>33</sup>, which has increased from \$323 billion in 2015 largely owing to the growth in commercial space sectors. The commercial space activities sector equated to 76 percent of the global space economy, with an amount of \$253 billion while the U.S. government spent \$44 billion on defence and non-defence space efforts in 2016, a 0.3 percent decrease from 2015.<sup>34</sup>

It is hoped that the creation of SANSA will position South Africa to become a global contender in space related activities. SANSA currently conducts various space operations, including launch and early-orbit support, in-orbit testing, satellite life-cycle support and satellite mission control for national and international space industry clients and governments.<sup>35</sup> SANSA's stated approach is not to compete with the private industry in the country, but rather to work with it to develop the space capability of the country to address national solutions such as natural resource management, climate change and environmental management, disaster management, rural development and urban planning and national safety and security.<sup>36</sup>

## **2.5. Conclusion**

The decision to review South Africa's space legislation coincides with policy developments in the space sector for the reasons highlighted in this Chapter. The legislative review therefore did not occur in a vacuum, but seeks to give effect to the importance attached to the development of the space sector in South Africa.

---

<sup>32</sup>South African space agency mulls future course in rapidly changing sector <http://www.engineeringnews.co.za/article/south-african-space-agency-mulls-future-course-in-rapidly-changing-sector-2016-09-09>

<sup>33</sup>The Space Report 2017 titled The Authoritative Guide to Global Space Activity. <https://www.spacefoundation.org/news/space-foundation-report-reveals-global-space-economy-329-billion-2016>.

<sup>34</sup>The Space Report 2017 titled The Authoritative Guide to Global Space Activity. <https://www.spacefoundation.org/news/space-foundation-report-reveals-global-space-economy-329-billion-2016>.

<sup>35</sup>SANSA 2015-2020 strategic framework, 10. [https://www.sansa.org.za/wpcontent/uploads/2018/05/SANSA-Strategic-Plan-2015\\_20.pdf](https://www.sansa.org.za/wpcontent/uploads/2018/05/SANSA-Strategic-Plan-2015_20.pdf)

<sup>36</sup>*Id.* at 11.



The Government's approach contemplates an active and competitive local industry in relation to space technology, exploration and innovation. This means that the legislative framework must match the policy considerations and be conducive to the participation of non-governmental actors in outer space. The critical question then to be asked is whether South Africa's legislative space framework ensures that the State's international obligations are fulfilled in terms of the open approach to space exploration and activity contemplated by the South African Government.

Apart from policy developments, South Africa has in a relatively short time capitalised on international projects which give effect to its policy emphasis. In particular, the construction of SALT and the successful bid to host the SKA in 2012 propelled a national interest and skills drive in this sector. The establishment of the National Working Group on Space Science and Technology served as an inter-departmental government initiative which included, *inter alia*, the study of the use of outer space. The construction of the Karoo Array Telescope (MeerKat), South Africa's tenure as co-chair of the Group on Earth Observations (GEO) as well as the development of South Africa's first Space Policy were all significant strides during this period.

The subsequent Chapter will attempt to unpack whether the policy context is indeed reflected in the OSB 2017.



## **CHAPTER THREE:**

### **THE SOUTH AFRICAN OUTER SPACE BILL 2017 WITH REFERENCE TO KEY UN TREATIES AND RESOLUTIONS**

#### **3.1 Introduction**

This Chapter will provide an overview of UNCOPOUS and the ILA Model Law recommendations for national space legislation, with the view to assessing, whether the 2017 Bill is reflective of international developments in both international space law, as well as national space legislation recommendations. It will be recalled that the stakeholder workshops on the review of the national space legislation specifically identified the need to align new legislation with UNCOPOUS recommendations and the ILA Model Law. Against this background, the key provisions of the 2017 Bill will also be analysed in the context of the primary sources of international space law through the main UN space treaties.

#### **3.2 National Space Law Recommendations from relevant UN Treaties, Resolutions and ILA Model Law**

As previously mentioned, the United Nations through UNCOPOUS has been instrumental in the development of international space law. There are at least five main UN treaties which govern international space law, with a number of recommendations and resolutions which are non-binding, but nevertheless hold persuasive power. UNCOPOUS has encouraged the development of national space legislation most notably in the form of Resolution 68/74 of 2013, which is titled “Recommendations on National Legislation relevant to the Peaceful Exploration and use of Outer Space”<sup>37</sup>. While in the pre-ambular paragraphs it emphasises and

---

<sup>37</sup>UN Resolution 68/74

[http://www.unoosa.org/oosa/oosadoc/data/resolutions/2013/general\\_assembly\\_68th\\_session/ares6874.html](http://www.unoosa.org/oosa/oosadoc/data/resolutions/2013/general_assembly_68th_session/ares6874.html) (accessed 6 June 2019).

recalls some of the key principles of the UN space treaties, such as the peaceful use of outer space, noting the need to maintain the sustainable use of outer space by mitigating space debris, ensuring safety and providing information and predictability with regard to the authorisation and supervision of space activities, it also sets out eight specific recommendations for States when enacting national legislation.

So called “building blocks” for national space legislation were also adopted in the framework of Project 2001 Plus, as a cooperation exercise between the Cologne Institute of Air and Space Law and the German Aerospace Centre (DLR), and are considered instructive when drafting national space law. The building blocks cover aspects such as:

- authorisation of space activities;
- supervision of space activities;
- registration of space objects;
- compensation, regulation, and;
- additional regulation.

The Sofia Guidelines for a Model Law on National Space Legislation of the ILA<sup>38</sup> can be seen as a guideline and provides additional commentary and proposals to elements that should be contained in national legislation. These guidelines are particularly useful for States that are in the process of drafting new national space legislation, or are in the process of reviewing their existing framework. It is necessary to consider these collective guidelines to assess to what extent the OSB 2017 contains the recommended elements.

---

<sup>38</sup> Information on the activities of international intergovernmental and on-governmental organizations relating to space law, A/AC.105/C.2/2013/CRP.6, [https://www.unoosa.org/oosa/oosadoc/data/documents/2013/aac.105c.22013crp/aac.105c.22013crp.6\\_0.html](https://www.unoosa.org/oosa/oosadoc/data/documents/2013/aac.105c.22013crp/aac.105c.22013crp.6_0.html) (accessed 26 March 2019)

Resolution 59/115<sup>39</sup> titled, “Application of the Concept of the Launching State” furthermore recommends that States conducting space activities, in fulfilling their international obligations under the United Nations treaties on outer space consider:

- enacting and implementing national laws authorizing and providing for continuing supervision of the activities in outer space of non-governmental entities under their jurisdiction;
- States consider the conclusion of agreements in accordance with the Liability Convention with respect to joint launches or cooperation programmes
- Member States to submit information on a voluntary basis on their current practices regarding on-orbit transfer of ownership of space objects;
- on the basis of that information, the possibility of harmonizing such practices as appropriate with a view to increasing the consistency of national space legislation with international law;

The following table (Table 1) contains elements from the main UN treaties and the Resolution on the Recommendations on National Legislation relevant to the Peaceful Exploration and use of Outer Space (“RES 68/74”), which guide States on the possible content for their national legislation. They seek to ensure that the main obligations of States in terms of the relevant space law treaties are adequately covered in their national legislation.

**Table 1:**

UN TREATIES		RES 68/74
<b>SCOPE OF APPLICATION</b>	<ul style="list-style-type: none"> <li>• Launching of objects and their return from outer</li> </ul>	<ul style="list-style-type: none"> <li>• launch of objects into and their return from outer space;</li> </ul>

<sup>39</sup> Resolution 59/115. Application of the concept of the “launching State”, para 1. [http://www.unoosa.org/pdf/gares/ARES\\_59\\_115E.pdf](http://www.unoosa.org/pdf/gares/ARES_59_115E.pdf) (accessed 17 May 2019).

(Article I, VI, VII, VIII OST)	<ul style="list-style-type: none"> <li>space;</li> <li>• Launch site operation;</li> <li>• Operation and control of space objects in Orbit;</li> <li>• Application of space science and technology;</li> <li>• Jurisdiction over national activities in the territory or elsewhere</li> <li>• Launching State: <ul style="list-style-type: none"> <li>- the Launching State;</li> <li>- the State that procures a launching;</li> <li>- the State from whose territory an object is launched;</li> <li>- the State from whose facility an object is launched;</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• the operation of a launch or re-entry site; and</li> <li>• the operation and control of space objects in orbit</li> <li>• design and manufacture of spacecraft, the application of space science; and</li> <li>• technology, and exploration activities and research;</li> </ul>
<b>NATIONAL JURISDICTION</b> (OST, Art I, II VII)	<ul style="list-style-type: none"> <li>• National activities in outer space;</li> <li>• Moon and celestial bodies not subject to national appropriation.</li> </ul>	<ul style="list-style-type: none"> <li>• national jurisdiction over space activities carried out from territory under its jurisdiction and/or control;</li> </ul>
<b>UN TREATIES</b>		<b>RES 68/74</b>
<b>AUTHORISATION AND LICENSING</b>	<ul style="list-style-type: none"> <li>• Competent national authority;</li> </ul>	<ul style="list-style-type: none"> <li>• authorisation by a competent national authority;</li> </ul>

<p>(OST Art VI, VII , UNGA Res 59/115)</p>	<ul style="list-style-type: none"> <li>• Categories of licenses and procedures;</li> <li>• Conditions for granting, modifying, revocation;</li> </ul>	<ul style="list-style-type: none"> <li>• issue authorisations for and ensure supervision over space activities carried out elsewhere by its citizens and/or legal persons established, registered or seated in territory under its jurisdiction and/or control;</li> <li>• conditions for authorisation may reflect the national security and foreign policy interests of States;</li> </ul>
<b>UN TREATIES</b>		<b>RES 68/74</b>
<p><b>CONTINUING SUPERVISION</b>  (Article VI, OST)</p>	<ul style="list-style-type: none"> <li>• Appropriate procedures for inspections, reporting;</li> <li>• Enforcement mechanisms;</li> </ul>	<ul style="list-style-type: none"> <li>• Appropriate procedures should ensure continuing supervision and monitoring of authorized space activities by applying, for example, a system of on-site inspections or a more general reporting requirement.</li> </ul>
<p><b>SAFETY</b>  (OST Art IV, IX, V; UNGA Res 47/68; Space debris mitigation guidelines)</p>	<ul style="list-style-type: none"> <li>• Conditions to verify that activities are carried out in a safe manner;</li> <li>• Minimize risk to persons;</li> <li>• Mitigate space debris;</li> <li>• Mutual assistance,</li> </ul>	<ul style="list-style-type: none"> <li>• Safety and technical standards that are in line, in particular, with the Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer</li> </ul>

	astronauts envoys of mankind;	Space;
<p><b>LIABILITY AND INSURANCE</b></p> <p>(Art VI &amp; VII, OST; Art II LIAB Convention)</p>	<ul style="list-style-type: none"> <li>• International responsibility for national activities in outer space;</li> <li>• International liability for damage to another State Party to the Treaty or to its natural or juridical persons by such object or its component parts on the Earth, in air or in outer space, including the moon and other celestial bodies;</li> <li>• Liability provisions contained for damage, compensation;</li> </ul>	<ul style="list-style-type: none"> <li>• States could consider ways of seeking recourse from operators or owners of space objects if their liability for damage under the United Nations treaties on outer space has become engaged;</li> <li>• ensure appropriate coverage for damage claims, States could introduce insurance requirements and indemnification procedures, as appropriate.</li> </ul>
<b>UN TREATIES</b>		<b>RES 68/74</b>
<p><b>REGISTRATION</b></p> <p>(Art VIII &amp; XI OST; Art II &amp; IV, REG Convention; UNGA Res 1721 (XVI) and RES 62 / 101).</p>	<ul style="list-style-type: none"> <li>• National Registry of Space Objects;</li> <li>• Information submitted to UN Secretary General;</li> <li>• Operators provide information on changes in ownership.</li> </ul>	<ul style="list-style-type: none"> <li>• A national registry of objects launched into outer space should be maintained by an appropriate national authority;</li> <li>• Submit information to the Secretary-General of the United Nations.</li> </ul>

UN TREATIES		RES 68/74
<p><b>ENVIRONMENTAL CONSIDERATIONS</b> (OST Art IX, III)</p>	<ul style="list-style-type: none"> <li>• Conduct exploration of them so as to avoid their harmful contamination and also adverse changes in the environment of the Earth resulting from the introduction of extra-terrestrial matter;</li> <li>• Space debris mitigation;</li> <li>• States Parties to the Treaty shall carry on activities in the exploration and use of outer space, including the moon and other celestial bodies, in accordance with international law</li> </ul>	<ul style="list-style-type: none"> <li>• Space activities are carried out in a safe manner and to minimize risks to persons, the environment or property and that those activities do not lead to harmful interference with other space activities;</li> <li>• conditions could also relate to the experience, expertise and technical qualifications of the applicant and could include safety and technical standards that are in line, in particular, with the Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space.</li> </ul>
UN TREATIES		RES 68/74
<p><b>IN-ORBIT TRANSFER OF OWNERSHIP</b> (Art VI, VII, VIII OST)</p>	<ul style="list-style-type: none"> <li>• Relevant provisions dealing with in-orbit transfer of ownership;</li> <li>• Ownership of objects launched into outer</li> </ul>	<ul style="list-style-type: none"> <li>• Continuing supervision of the space activities of non-governmental entities should be ensured in the event of the transfer of ownership or</li> </ul>

and REG Convention	space, including objects landed or constructed on a celestial body, and of their component parts which the State Party shall retain jurisdiction and control over;	control of a space object in orbit.
--------------------	--	-------------------------------------

### 3.3 Space Affairs Act 1993

Comparing the 1993 Act to the above, reveals that the Act does not contain a number of the main elements. For instance, the 1993 Act does not:

- Contemplate re-entry operations;
- Establish a National Registry or create a duty to register;
- Deal with liability and insurance aspects which instead it delegates to regulations;
- Deal with aspects relating to the protection of the space environment, mitigating of space debris;
- Transfer of ownership;
- Consider jurisdiction and control by the State.

It must be borne in mind, however, that the ILA Model Law and Resolution 68/74 were drafted and adopted – nearly two decades after the enactment of the 1993 Act. It is likely for this reason that the South African Government thought it appropriate to draft new legislation, rather than to amend the existing 1993 Act.

### 3.4 Preamble and Objects of the Outer Space Draft Bill 2017 and 1993 Act

The preamble to the Outer Space Bill sets out broadly the rationale behind the Bill, namely:

- 1) *“To repeal the Space Affairs Act, No. 84 of 1993;*
- 2) *To create a supportive regulatory framework for the industry;*
- 3) *To provide for the establishment of the South African Space Regulatory Council (SASREC) or Space Council and the Outer Space Affairs Chief Directorate;*
- 4) *To provide for a coordinated administration and regulation of space affairs in the Republic;*
- 5) *To ensure compliance with international obligations arising out of treaties, conventions and international agreements that the Republic is party to;*
- 6) *To determine and cause to comply with the National Space Policy of the Republic; and*
- 7) *To promote peaceful use of outer space and to provide with matters related thereto.”*<sup>40</sup>

Under section 4, the Outer Space Bill sets out the “Objects of the Act<sup>41</sup>” which largely mirrors the preamble, but in addition refers to SASREC and the Minister (of Trade and Industry) having an obligation to ensure that the general space policy implementation in the most efficient and cost-effective manner<sup>42</sup>. The language is in part reflective of the National Space Policy. Notably, section 4(f) includes the role of the Act to oversee “the existence of safe and environmentally friendly operations within the space sector”. This is one of the few places in the Bill where the environment is referenced and for reasons discussed later, it is important that environmental protection on earth and in space is reinforced in the OSB 2017.

The above preamble and objectives depart from the 1993 Act in that the latter, although containing a brief preamble, provides primarily for the establishment of the Council (the existing South African Space Affairs Council, or SACSA) which is vested, in terms of the 1993 Act, to “manage and control certain space affairs in the Republic”<sup>43</sup>. It appears that section 2 of the 1993 Act serves as further enunciation of

---

<sup>40</sup> Preamble, Outer Space Bill (2017), pg. 22.

<sup>41</sup> Outer Space Bill 2017, section 4.

<sup>42</sup> Section 4(d) OSB (2017)

<sup>43</sup> Preamble, 1993 Act.

the policy considerations for the Act, under the title “determination of policy”. In that section, the Minister may, by notice in the Gazette, determine the general policy to be followed and mentioned two specific aspects in this regard:

- (a) International commitments and responsibilities of the Republic in respect of the peaceful utilization of outer space, in order to be recognized as a “responsible and trustworthy user of outer space”; and
- (b) Controlling and restricting the development, transfer, acquisition and disposal of dual-purpose technologies.

The 2017 Bill expands significantly on the policy considerations for space affairs in line with the National Space Policy. It also retains the country’s commitment in Chapter 8 of the Bill to restrict the development, transfer, acquisition and disposal of dual-use technologies and furthermore affirms the commitment of the country to being a responsible and trustworthy user of outer space.

### **3.5 South African Space Regulatory Council (SASREC)**

Table 1 includes the relevant treaty provisions and recommendations for the establishment of an authority to authorise and issues licenses for space activities. The OSB 2017 provides for the establishment of a Space Council, as well as the Outer Space Affairs Chief Directorate to be housed within the Department of Trade and Industry. The 1993 Act equally established the South African Council for Space Affairs which has been the main regulatory council for Space Affairs in South Africa. Its website reveals some of the activities of the Council in recent years and provides a link to the National Space Registry. An example of the registry entries are contained in Figure 1.1 below.

*Figure 1.1.: Extract from the National Registry of Objects*

#### **National Registry of Objects Launched into Outer Space**

SA designator	Intl. designator	Name	Launch Date	Apogee (km)	Perigee (km)	Inclination (deg)	Period (min)	Epoch (YY-DDD)	Function
ZA-003	2013-066B	ZACUBE-1	21/11/2013	676	590	97.76	97.37	14-352	Space science.
ZA-002	2009-049F	SUMBANDILA	17/09/2009	457	453	97.15	93.69	14-353	Earth observation with additional experimental payloads.
ZA-001	1999-008C	SUNSAT	23/02/1999	848	641	96.49	99.70	14-353	Earth Observation with additional experimental payloads.



The National Registry of Objects contains the launches of the SUNSAT in 1999, the SUMBANDILA in 2009 and the ZACUBE-1 in 2013. The country has since launched a number of satellites, in particular nano-satellites which are not contained in the registry. For example, in 2018 South Africa launched the ZACube-2 with the Russian Soyuz Kanopus mission from the Vostochny spaceport which is its second nanosatellite to be launched into space and three times the size of its predecessor, TshepisoSat. In 2019, the Pheonix-1B developed by researchers from the University of KwaZulu-Natal's (UKZN) Aerospace Systems Research Group (ASReG), failed to launch from the Denel Overberg Test Range<sup>44</sup>. This entry is not contained in the National Space Registry and while the writer searched the United Nations Registry, only the Tshepiso Sat was notified to the Secretary General by means of a Note Verbale from the Permanent Mission of South Africa to the United Nations (Vienna) dated 4 April 2017. Under the Registration Convention it would be up to the launching state and state that procured the launch to decide on whose registry the space object would be entered and it may be for this reason that more recently launched (and attempted launches) do not appear on the National Registry. A search of the motivations to on the Secretary-General of the United Nations Registry reveals that neither South Africa nor the Russian Federation notified the Secretary General of the ZA2-Cube launch. This could signal that South Africa and/or the launching State is in violation of the obligation to report in terms of Art XI of the OST.

The Council is currently responsible for issuing licenses and to appoint inspectors to conduct inspections of licensed activities and unlicensed activities deemed to fall within the scope of the Act. In addition, the Council is the national focal point for registration of space objects.

Similar to the Space Council established in terms of the 1993 Act, SASREC is to provide oversight in the implementation, in the most efficient and economical manner possible, the regulatory aspects of the National Space Policy of the Republic. Almost verbatim from the 1993 Act, SASREC shall “on behalf of the State, take care of the

---

<sup>44</sup> “Reason for failed SA rocket launch probed”, IOL news, (19 February 2019), <https://www.iol.co.za/capetimes/news/reason-for-failed-sa-rocket-launch-probed-19383227>

interests, responsibilities and obligations of the Republic regarding its space activities, international conventions, treaties and agreements entered into or ratified by the Government of the Republic”.

The composition of the Council remains mostly unchanged, save for minor changes such as the removal of the requirement for the Council to be composed of knowledgeable persons from government institutions and the space industry as members of committees, reducing the number of persons from the space industry from 2 in terms of the 1993 Act, to 1 in the 2017 Bill. The Bill also places a limit of 12 persons to serve on the Council, while the 1993 Act is silent on this aspect. A good development and new in the Bill, is the requirement that the composition reflects the demographic diversity including gender and persons with disability. This addition places a statutory obligation on the Council to be comprised of persons from various racial backgrounds, genders and disabilities, in line with South Africa’s Constitution. The positive step will also contribute to space affairs becoming more accessible to South Africans.

Section 12 of the 2017 Bill also establishes the Outer Space Affairs Chief Directorate within the DTI. In the 1993 Act, the Space Council falls under the Minister of Trade and Industry and is responsible for regulating the space activities of all space actors, be it the space agency, or industry or academic and research institutions. Article 2 of the 1993 Act empowers the Minister of Trade and Industry "to determine the general policy to be followed with a view to:

- a) meeting all the international commitments and responsibilities of the Republic in respect of the peaceful utilization of outer space, in order to be recognized as a responsible and trustworthy user of outer space; and
- b) controlling and restricting the development, transfer, acquisition and disposal of dual-purpose technologies, in terms of international conventions, treaties and agreements entered into or ratified by the Government of the Republic."

The 2017 Bill contains no similar provision in terms of which the DTI is empowered to fulfil its regulatory role. It could be argued that Article 12 which deals with the

establishment of the Outer Space Affairs Chief Directorate in the Department of Trade and Industry subsumes this role and that the Department's regulatory role as a whole, is in implicit.

Section 22 of the 2017 Bill refers to the National Space Registry and states that "The Space Council shall maintain a national registry with information concerning space objects that are licensed in connection with space activities as referred to in section 5". This provision is at odds with section 12(1)(h) which grants the same powers to the Chief Directorate which shall "maintain the National Registry of space objects". This role is duplicative and the intention by the drafters may have been for the Chief Directorate to assist the Council to maintain an updated Space Registry. If this is indeed the intention, this should be more unequivocally expressed.

### **3.6 Definitions**

The Outer Space Bill introduces a number of new definitions and in certain instances retains definitions from the 1993 Act, albeit with minor amendments. There are also some definitions from the 1993 Act which the Outer Space Bill has removed entirely. This section will deal with the most important additions, amendments or omissions in this context.

In relation to the new additions, the OSB 2017 includes the definition "**damage**"<sup>45</sup> and defines this to mean "*loss of life, personal injury or other impairment of health; or loss of or damage to property of States or of persons, natural or juridical, or property of international intergovernmental organizations; arising out of space activity..*". Reference to environmental damage, both on earth and in space is lacking in the definition. It will be recalled that the OST places an obligation on States Parties not to adversely contaminate the space environment while subsequent resolutions and guidelines encourage space debris mitigation. Damage in this context therefore also applies to the environment on earth, the space environment as well as damage to other space objects whilst in orbit. The drafters ought to consider expanding this definition in this respect.

---

<sup>45</sup> Outer Space Bill 2017, section 1.

Whereas the 1993 Act did not contain a definition for “**liability**”<sup>46</sup>, the Bill defines liability as “...*responsible for and answerable in law because of the fault-based legal obligations attached to any eventuality of damage arising out of any space activity*”. Art. II of the Liability Convention foresees strict liability of the launching State for damages caused by space objects in airspace or on Earth while Art. III foresees fault-based liability of the launching States. The definition for liability as it currently stands, refers only to liability in space which is fault-based. It therefore misses a crucial aspect – namely international liability, or no-fault liability for damage on earth or in the air. To this end, the drafters ought to reconsider this phrasing to more accurately reflect the international law definition for liability.

The definition for “**outer space**” is kept the same as in the 1993 Act and the drafters did not take the opportunity to introduce delimitation for outer space. It is generally accepted that 100kms is the altitude from which outer space is reached. The National Space Policy contemplates space tourism as a component of South African space activity. The introduction of a delimitation for outer space may be apt in this context, as it would create regulatory certainty in respect of the liability regimes of air and space law which, if the National Space Policy is to be fully implemented, will become relevant in the future.

While the 1993 Act contained a definition for “**launching**”, the 2017 Bill incorporates similar wording in the definition for “**space launching**” as follows: “...*means the placing or attempted placing of any object into a sub-orbital trajectory or into outer space, or the testing of a space launch vehicle in which it is foreseen that the launch vehicle will lift from the Earth’s surface*”. A crucial difference between the wording of the 1993 Act is that the 2017 Bill definition refers to the “...*placing of any **object**...*” whereas the 1993 Act referred to the “*placing or attempted placing of a **spacecraft***” in its launching definition. The Bill replaces “spacecraft” with the term “**space launch vehicle**” in the same definition, which in turn is defined as “...*any vehicle used to send artificial satellites or spacecraft or any space object into outer space*”. “Object” is not defined but can be construed as being a “space object”, as defined. It

---

<sup>46</sup> Outer Space Bill 2017, section 1.

appears that the launching definition in the Bill widens the scope to include space objects being launched as opposed to only spacecraft.

Noteworthy is the inclusion of the definition “**re-entry**”<sup>47</sup> in the OSB which is defined as, “*the re-entry activity of bringing back a functional or defunct space object into the atmosphere of the Earth*”. This inclusion is important and it reflects technological advancements with re-usable rockets and the increased re-entry of space objects into the earth’s atmosphere. This development is also important for space tourism, in line with the aspirations of the National Space Policy.

The Bill also introduces a new definition, namely “**safety**”<sup>48</sup> and defines it as “*...safety of public health, property, national security and any interests of the Republic*”. It is to be noted that the definition does not refer to environmental safety and presents a missed opportunity for the drafters to reflect environmental considerations in this regard.

The Bill expands significantly on the definition for “**space activities**”<sup>49</sup> and is much broader than the space activities contemplated in the 1993 Act. Space Activities in the Bill is defined as “*activities directly contributing to the manufacture of a space object, launching of a space object and the operation or control of such object in outer space, atmospheric re-entry of a space object, operation of a launch facility, space applications and space exploration”*”. The underlined portions above are brand new inclusions which did not exist in the definition contained in the 1993 Act. The definition is broader than the proposed definition for space activities by the ILA Model Law. With these inclusions, the Bill brings within the domain of “space activities” for licensing the manufacturing of space objects, the operation and control of such object, re-entry, operation of a launch facility, space applications and space exploration.**

The definition in the 1993 Act was limited only to “*the activities directly contributing to the launching of spacecraft and the operation of such craft in outer space*”. It is

---

<sup>47</sup> Outer Space Bill 2017, section 1.

<sup>48</sup> Id. at section 1.

<sup>49</sup> Id. at sec 1.

evident that the latter definition is wholly insufficient if regard is had to the types of space objects that are being launched. These are no longer limited to manned space-craft, but include nano-satellites and unmanned spacecraft for example. While the ILA Model Law recommends a definition for “**commercial space activity**”<sup>50</sup> the drafters of the Bill did not include one. It may be argued that the above definition for space activities is wide enough to contemplate commercial space activity, particularly through the inclusion of space applications and space exploration in the definition. The definition should however make reference to governmental and non-governmental actors or a separate definition for “operators” as recommended by the ILA Model Law, should be considered. Such an inclusion will reflect the increased role of private actors in space activities.

The definition for “**space industry**”<sup>51</sup> includes reference to “*non-governmental actors that are not only involved in space activities, but also space related activities*”, “**space related activities**”<sup>52</sup> being defined as “*all activities supporting or sharing mutual technologies with space activities*”. The 1993 Act did not expressly refer to non-governmental space actors and the purpose of the proposed definition in the Bill is to address the lacuna that the 1993 legislation had; namely, to reflect the growing number of space actors. Aligned with its space policy, such recognition seeks to create regulatory certainty that will contribute positively to the development of its space industry. The addition also brings the Bill in line with international developments.

The Bill expands largely on the definition for “**space affairs**”<sup>53</sup> compared to the 1993 Act. A lengthy definition, it refers to “*the policy, legislation, regulation, authorisation, licensing and supervision of all space activities which are contributing to the manufacture and provision of services arising from space infrastructure, the launching of a space object, operation or control of such object in outer space, and operation of a launch facility carried out by governmental and non-governmental*

---

<sup>50</sup> Id. at section 1.

<sup>51</sup> Id. at section 1.

<sup>52</sup> Id. at section 1.

<sup>53</sup> Id. at section 1.

*actors under the jurisdiction and/or control of the republic*”, The definition in the 1993 Act deals only with the activities directly contributing to the launching of spacecraft and the operation of such space craft in outer space. The Space Council being responsible for coordinating all “space affairs”, means that the listed aspects in the definition fall under the purview of the Council which has a duty to regulate these.

“**Space exploration**”<sup>54</sup> is a new definition and the 1993 Act contains no equivalent. The term deals with the “*ongoing discovery and exploration of celestial structures in outer space by means of continuously evolving space technology, including but not limited to, the physical exploration of space which is conducted both by unmanned robotic space probes and human spaceflight*”. Accordingly, the Bill brings into its fold space exploration which broadens the scope of space activity in that exploration seeks to uncover potentially economic benefits but also in terms of research and development. The terms appears only once in the Bill, namely in Article 5 under the heading “scope of activities” and in this context refers to the Act regulating, *inter alia*, “space exploration through regulations for attainment of the objects of the Act”. An expanded definition could be considered to reference principles of exploration, such as it being for the common benefit of all mankind (Art. I para. 1 OST), non-appropriation (Art. II OST), the peaceful uses of outer space (Art. IV OST), with due regard to environmental protection (Art. IX OST). These principles are fundamental in terms of the space treaties and South Africa should reflect its commitment to these principles by including them in the definition.

The Bill defines the various licenses for space activities. To this end “**space license**”, “**space launch license**”, “**space facility license**”, “**re-entry license**”, “**special license**” and “**space licensee**” are all defined. While the 1993 Act defines “license” and “licensee” only, the Bill introduces the various categories of licenses (these categories of licenses are expanded upon under a separate heading). For current purposes, it is worth noting that three categories of licenses are introduced, namely: (1) a license to undertake space launching (space launch license); (2) the license to operate a space facility (space facility licence); (3) a license to conduct a

---

<sup>54</sup> Id. at section 1.

re-entry activity or a return of a space object to earth a defunct or functional – re-entry license) and; (4) a special license that can be issued by the Space Council for an already authorized operation by legislated entities.

“**Space object**”<sup>55</sup> is defined as “*an object or spacecraft launched or intended to be launched into outer space*”. It is noteworthy that the 1993 Act did not include such a definition, although “**space craft**”<sup>56</sup> was defined as “*any object launched with the purpose of being put and operated in outer space*”. This definition brings into its purview the actual spacecraft or object to be launched but fails to include its component parts. Article 1(b) of the Registration Convention defines the term “space object” as including its component parts, as well as its launch vehicle and parts thereof. Article VIII of the OST states that “such objects or component parts thereof...” . The definition for space objects is an important notion because the duty to register and the international responsibility and liability as well as questions of jurisdiction and control heavily depend on the character as a space object.

A shortcoming in this definition is that it fails to include component parts, which, in terms of both the Liability and Registration Conventions in the former attracts liability and the latter a duty to register. According to Frans G. von der Dunk<sup>57</sup>, a “space object effectively triggers application of much of the 1967 Outer Space Treaty & the 1968 Rescue Agreement”. It is recommended that the definition be amended to reflect the OST treaty definition. This recommendation is contained in Chapter Four.

It is a glaring omission in the writer’s view, that the drafters of the OSB did not include a definition for “**space debris**”<sup>58</sup>. It is defined as “all man-made objects, including fragments and elements thereof, in Earth orbit or re-entering the atmosphere, that are non-functional”<sup>59</sup>. Protection of the space environment is a fundamental principle and the golden thread which runs through a number of space

---

<sup>55</sup> Id. at section 1.

<sup>56</sup> Id, at section 1.

<sup>57</sup> Frans G. von der Dunk, “2nd ICAO/UNOOSA Symposium” ‘SPACE 2016’ Abu Dhabi, <https://www.icao.int/Meetings/SPACE2016/Presentations/1%20-%20F.%20VonDerDunk%20-%20University%20of%20Nebraska-Lincoln.pdf> (accessed 17 May 2019).

<sup>58</sup> Outer Space Bill 2017, section 1.

<sup>59</sup> Committee on the Peaceful Uses of Outer Space UN / IADC Debris Mitigation Guidelines, 7-12. [https://www.unoosa.org/pdf/publications/st\\_space\\_49E.pdf](https://www.unoosa.org/pdf/publications/st_space_49E.pdf) (accessed 18 may 2019)

treaties. Space debris or “space junk” as it is commonly called, has received increased attention in recent years as they pose a real risk to astronauts and space objects. The mitigation guidelines hold persuasive power for States to do more to ensure that technical and operational specifications mitigate space debris. Space being the province of humankind, South Africa has a responsibility to ensure that its space activities are not adverse to the space environment and a definition for space debris with a concomitant provision dealing with the environment, would reflect this responsibility.

The definition for “**weapons of mass destruction**”<sup>60</sup> in the 1993 Act, is not contained in the Bill. The Bill has removed this definition together with “dual purpose technologies”, although the latter concept is contained section 35 of the Bill which deals with the determination of policy. It is not clear why the drafters of the Bill have removed all reference to non-peaceful uses of outer space and that it fails to expressly prohibit the nuclearization of space. A plausible reason may be that the State seeks to avoid the blurred lines between the militarisation and weaponization of space. It is common knowledge that a number of countries are utilizing space for military purposes which is not prohibited in terms of the space treaties. The pronouncement by President Trump to create the US “Space Force” is one such example. Satellites and other space applications have long been used for military purposes, including intercontinental ballistic missiles. The outer space treaties are explicit only in their prohibition of the placement of weapons of mass destruction in outer space. To this end, it falls upon States to ensure that this express prohibition is contained in their national legislation. The drafters should at the least consider a prohibition to place into the orbit around the Earth or to deploy in outer space otherwise nuclear weapons and any other kinds of weapons of mass destruction or to test nuclear weapons and any other kinds of weapons of mass destruction in outer space.

---

<sup>60</sup> Outer Space Bill 2017, section 1.

It may be prudent to consider incorporating definitions for “**authorisation**”<sup>61</sup> and “**supervision**” which is not currently contained in the Bill. The ILA Model Law recommends these definitions which are important obligations for States in terms of Article VI of the OST.

### **3.7 Key Provisions of the South African Outer Space Bill 2017**

The following sub-headings set out the key provisions of the OSB 2017 as they relate to the recommendations and treaty provisions in Table 1 above. Specific comment is delivered after each provision, with a view to assessing the adherence / reflection of the UN space treaties, ILA Model Law and Resolution 68/74 in the provisions as contained in Table 1.

#### **3.7.1 SCOPE OF ACTIVITIES**

The OSB 2017 contains the following scope of activities in section 5<sup>62</sup> of the Bill:

- Launch of space objects into outer space;
- Operation and control of space objects in orbit;
- Operation of a space facility and/or a controlled re-entry operation;
- Manufacturing of space objects;
- Re-entry of space objects;
- Space applications; and
- space exploration, through regulations, for attainment of the objects of the Act.

**Comment:** When compared to Table 1, significantly, the OSB 2017 reflects the important tenets of the scope of application which national legislation ought to regulate. To this end, the drafters have incorporated the recommendations of resolution 68/74 and the treaty provisions in Table 1 above, insofar as the scope of

---

<sup>61</sup> Id at section 1.

<sup>62</sup> Id. at section 5.

activities is concerned. Manufacturing of space objects was not covered in the 1993 Act, nor were space applications or space exploration. The scope of activities have accordingly been widened to cover these aspects.

### **3.7.2 SUPERVISION AND CONTROL**

Supervision and control are reflected in section 7 of the OSB 2017, under the heading “Establishment of the South African Space Regulatory Council (SASREC)”, while additional elements of supervision and control are contained in sections 24 and 25 which deal respectively with “supervision of space activities” and “duties and obligations of licensees”.

Read in conjunction, the OSB 2017<sup>63</sup> therefore regulates supervision and control in the following manner:

- It establishes of the South African Space Regulatory Council (SASREC) which is responsible for the oversight and implementation of regulatory aspects of the National Space Policy;
- Appropriate procedures for continuing supervision and monitoring of authorized space activities through safety inspectors who may conduct on-site inspections;
- A more general reporting requirement is established in terms of the requirement in section 25(2)(d) for information regarding the operational status of the space object on an annual basis or any loss of operational control, including end-of-life disposal plans.
- Section 24 similarly creates a reporting requirement to register space capabilities with the Space Council through a Space Council Compliance Register.
- Space Council is to undertake on an ongoing basis supervision through receiving annual declarations on operational status of any licensed space object and scrutinise such accordingly – sec 26(1)(a).

---

<sup>63</sup> Outer Space Bill 2017, section 7, 24, 25 and 26.

**Comment:** Read together, sections 7, 24, 25 and 26 of the OSB 2017 create a supervision and control mechanism. The Outer Affairs Chief Directorate is tasked to provide continuous supervision and monitoring of compliance of all space affairs in the Republic in terms of section 12(f). Accordingly, the OSB 2017 establishes appropriate procedures to ensure continuing supervision and monitoring of authorized space activities through site inspections and more general reporting requirements, in line with resolution 68/74, as well as the Article VI of the Outer Space Treaty which requires appropriate procedures for inspections and reporting (Table 1).

### 3.7.3 APPLICATION OF THE ACT

Section 3 of the OSB 2017 sets out the application of the Act as follows<sup>64</sup>:

- The Act is applicable to all space activities stipulated in section 5:
- By a natural or juristic person under the jurisdiction or control of the Republic;
- From the territory of the Republic by any vessel registered in the Republic, or owned by a natural or juristic person under the jurisdiction and/or control of the Republic;
- From the territory of another State by any vessel on behalf of a natural or juristic person incorporated or registered in the Republic.

**Comment:** While the inclusion of a launch from a vessel is a new and important inclusion in terms of the Bill, the current wording suggests that the application of the Act is triggered only when a launch from a vessel takes place from the territory of the Republic. This wording does not address the issue of launching from the high seas because of the precondition that a launch occurs from the “territory” of the State by any vessel.

---

<sup>64</sup> Outer Space Bill 2017, section 3.

Table 1 in Chapter Three contains the treaty and resolution recommendations for the scope of application in national legislation. When section 3 is read with section 5, the scope of application and scope of activities address the recommendations as set out in Table 1.

### 3.7.4 AUTHORISATION AND LICENSING

The general requirements for the issuing of space licenses are set out in Chapter 4 of the OSB 2017 and are extensively contained in sections 13-20 of the Bill.

The main elements from the Chapter are as follows:

- The Space Council issues licenses;
- Section 14(1) contains the general requirements for issuing of a space license and section 15 sets out the specific requirements for each of the categories of licenses.

The general requirements are as follows<sup>65</sup>:

- Financial status, technical qualifications and expertise of the Applicant;
- The nature of the proposed space activity;
- The national interests of the Republic and foreign policy objectives;
- Compliance with international obligations and responsibilities;
- Insurance cover for the proposed activity;
- Safety and environmental considerations;
- Observance of codified international standards and best practices for the safe and sustainable conduct of space activities.

**Comment:** The Bill departs significantly from the 1993 Act in respect of authorisation and licensing. This is a welcome and progressive development. Technical standards and environmental aspects while mentioned, are not comprehensively dealt with. For instance, the general requirements should consider the mitigation of space debris. While this could be implicit in the reference to “observance of codified international

---

<sup>65</sup> Outer Space Bill 2017, section 14(1) (a)-(g).

standards and best practices for the safe and sustainable conduct of space activities”, the writer’s view is that space debris mitigation and technical standards in this regard, should be referenced explicitly.

Viewed in the context of the recommendations set out in Table 1, the OSB 2017 incorporates the recommendations in that: a competent national authority issues the licenses, categories of licenses and their procedures are set out, and the conditions for granting, modifying and revoking licenses are contained in the proposed national legislation.

### **3.7.5 CATEGORIES OF LICENSES**

The OSB 2017 sets out the following categories of licenses in section 15 of the Bill<sup>66</sup>:

#### **a) Space Launch License (section 15(1)(a)-(e).**

- Applicants must meet the prescribed financial and technical requirements;
- the space launch vehicle and space object must comply with the prescribed minimum technical standards; both space object and launch vehicle must have the necessary approvals from the relevant authorities under applicable legislation;
- the operational plan must not violate minimum safety standards and any other relevant guidelines or principles; and
- granting the license will not adversely affect national security, foreign policy interests or violate international obligations.

#### **b) A space facility license (section 15(2)(a)-(e)**

- The applicant must demonstrate that it is competent to operate the space facility;
- The applicant is financially capable to operate one;
- All the necessary approvals have been obtained under the environmental protection legislation;

---

<sup>66</sup> Id. at section 15(1)(a)-(e).

- The operation of the space facility does not pose a danger to public health, safety or has a potential to cause substantial damage to property or interference with other lawful activity under related legislation; and that
- the facility meets the prescribed minimum standards as prescribed by the regulations under the Act.

**c) Atmospheric re-entry of a space object (section 15(3(a)-(d))**

- The applicant to be competent to conduct the return or re-entry of the specified space object;
- there is adequate insurance cover for the return or re-entry activity;
- All necessary environmental impact approvals have been obtained and an environmental impact assessment plan has been submitted; and
- the return or re-entry does not pose a “danger to public health, safety or has a potential to cause substantial damage to property or interference with other lawful activity under related legislation.

**Comment:** The Bill introduces three different categories of license for (1) space launch; (2) operating a space facility; and (3) atmospheric re-entry. These categories of licenses are on par with international developments<sup>67</sup>.

The drafters, through setting out the specific requirements for each license category, seek to create certainty about the specific considerations it will take into account when granting a license, which is a positive step for space actors who seek to obtain a license. Foreign policy and national security interests are for the first time mentioned in the provisions dealing with licenses and is a factor that space actors must take into account.

The requirements in respect of the three licensing categories are comprehensive and are in line with the UN space treaty provisions and resolution 68/74 set out in Table 1 under the heading “authorization and licensing”. To this end, the OSB 2017 contains

---

<sup>67</sup> Id. at section 15(1)–(3).

model provisions on this aspect, which will create certainty for applicants and the Space Council.

### 3.7.6 REGISTRATION

Section 21 of the OSB 2017 deals with the registration requirements. The Space Council, once it has granted a license authorizing the launch of a space object from a space facility, must allocate a registration number to the space object by which it can be identified and recorded on the National Space Registry; and which registration number may not be altered as long as it remains in the Space Registry. Section 22, in turn, mandates the Space Council to maintain a national registry with information concerning space objects that are licensed in connection with space activities. In terms of section 23, the “Space Council shall initiate the registration and it will, through the appropriate government channels, transmit information of all space objects that are licensed and operated under the responsibility of the Republic to the Secretary-General of the United Nations”.<sup>68</sup>

**Comment:** Curiously, the 1993 Act did not contain provisions relating to the registration of objects are required in terms of the Registration Convention. In terms of the OSB 2017, the Space Council, once it has granted a license authorizing the launch of a space object from a space facility must allocate a registration number to the space object by (a) which it can be identified and recorded on the National Space Registry, (b) which registration number may not be altered as long as it remains in the Space Registry.<sup>69</sup> The registration number may be recorded in an alternative “popular” designator with the official registration number and information as provided by the licensees which may be changed upon the change of ownership.

The registration provisions are comprehensive and in line with international developments in this regard. Compared to the provisions dealing with registration in

---

<sup>68</sup> Id. at section 23.

<sup>69</sup> Id. at section 21.

Table 1, the OSB 2017 meets the two important requirements, namely: (a) that a national registry of objects launched into outer space be maintained by a competent authority and (b) the information is submitted to the Secretary-General of the United Nations.

### **3.7.7 TRANSFER OF LICENSE OR CHANGE OF OWNERSHIP**

Section 20 states that a license issued may not be assigned, ceded or transferred to any person without prior written permission from the Council. An application to assign, cede or transfer a license must be made to the Space Council and once the change is effected, the ownership of registered space objects must be reflected in the National Registry in accordance with section 21(1).

**Comment:** The Bill introduces a section dealing with the transfer of license or change of ownership for the first time. This is an important provision, as jurisdiction and control in terms of international conventions is to be exercised by the State.

This inclusion reflects the Outer Space Treaty and Registration Convention provisions as contained in Table 1, under the heading “In-Orbit Transfer of Ownership”. This gives effect to the continuous sip[version of the space activities of non-governmental entities as required in terms of the space treaties.

### **3.7.8 SAFETY AND ENVIRONMENTAL CONSIDERATIONS**

Section 4(1) of the OSB deals with the Objects of the Act and includes the provision in 4(1)(f), the aim to “*oversee the existence of a safe and environmental friendly operations within the space sector*”.

Section 15 of the Bill likewise requires that all necessary approvals have been obtained under relevant environmental protection legislation in order to for the Space

Council to issue a space license. Section 28 of the OSB deals with “Safety Standards and Environmental Considerations”<sup>70</sup>.

The section grants the Space Council oversight functions for developing, implementing and enforcement of safety standards of all outer space activities, space objects and space facilities through recommending to the Minister requirements to address safety and reliability of outer space activities through all stages of a mission’s life cycle “including any other relevant international guidelines of principles”<sup>71</sup>.

**Comment:** Glaringly, and despite its headings, the section does not refer to environmental considerations but deals only with safety aspects. While safety is undoubtedly an important consideration, States are under an obligation in terms of Article IX of the OST, to “conduct exploration so as to avoid their harmful contamination and also adverse changes in the environment of the Earth...and shall adopt measures for this purpose”.<sup>72</sup>

The Space Debris Mitigation Guidelines can serve as a guideline to especially States that are in the process of drafting space legislation. Space debris has increased exponentially in recent years and poses a real risk to satellites, as well as manned and unmanned flights.

The European Space Agency estimates that as of January 2019, the estimated total of space debris are as follows: 34 000 objects larger than 10 cm in diameter; 900 000 objects ranging from 1 cm to 10 cm in size; 128 million objects from 1 mm to 1 cm.<sup>73</sup> The international development has been for States to pay more attention to

---

<sup>70</sup> Id. at section 28.

<sup>71</sup> Section 28(1)(b), OSB 2017.

<sup>72</sup> Outer Space Treaty, Article IX, 1968.

<sup>73</sup> “Space Debris by the numbers”, European Space Agency

[https://www.esa.int/Safety\\_Security/Space\\_Debris/Space\\_debris\\_by\\_the\\_numbers](https://www.esa.int/Safety_Security/Space_Debris/Space_debris_by_the_numbers) (accessed 27 May 2019)

space debris and mitigating same and the drafters have missed an opportunity to reflect this development in the Bill.

Compared to the recommendations set out in Table 1 under the heading “Environmental Considerations”, the OSB 2017 provisions relating to the space environment are lacking. A definition for space debris is lacking in the OSB 2017, as are provisions relating to the conduct of space activities so as to avoid harmful contamination of the space environment. It may be that the regulations to the OSB 2017 will comprehensively deal with this aspect, as appears to be implicit in the wording of section 28 of the Bill.

### **3.7.9 AMENDMENT, SUSPENSION AND REVOCATION OF LICENSES**

Amendments to space licenses in terms of section 18 of the Bill can be effected in circumstances where:

- a) The Space Council is convinced that the amendment is necessary to achieve the objects of the Act; and;
- b) If the amendment is in pursuance of and in accordance with the regulations as prescribed.

Section 18 further sets out conditions for the suspension of licenses, including the provision that a licensee may itself request the suspension, alternatively, the Council may unilaterally suspend the license if it believes that a condition was or is being violated, or facts become known which in its opinion points to an unacceptable safety risk.

**Comment:** A near-identical provision relating to the amendment, suspension and revocation of licenses was contained in the 1993 Act. A stark difference between the wording of the 1993 Act and the Bill, however, is that under “amendment”,

“suspension” and “revocation” the Bill elaborates on the anticipated causes or grounds which would necessitate these.

The 1993 Act contemplated only unilateral amendments to the conditions of a license by the Council, whereas the Bill anticipates that the licensee may itself seek to vary the conditions of the license.

Notably, the Bill removes the 1993 Act prerogative of the Minister to at any time order the Council to suspend or revoke the license issued by the Council, if, in the opinion of the Minister, the licensed activity is in conflict with the interests of the State.

### **3.7.10 LIABILITY AND INSURANCE**

Section 32 of the OSB sets out the provision relating to liability for damage as follows:

*32(1) Any person who conducts space activities provided for under this Act is liable for damage caused by a space object;*

*32(2) The State Liability for damages attaches irrespective of whether the space activity in question was authorised or not, in compliance with the Liability Convention as listed in Schedule 1.*

**Comment:** The liability in terms of the Liability Convention is as follows, i.e.:

- strict liability for accidents through space objects on Earth and in airspace (Art. II)
- and fault-based liability for accidents of space objects in outer space (Art. III);
- joint and several liability (Art. V) in the case of more than one launching State upon through agreement.

The current provision fails to distinguish between these forms of liability. It is submitted that the liability provision in terms of the Bill could be expanded to more closely reflect the international liability regime. The proposed ILA model law on national space legislation is also a good guideline on this important aspect of the proposed national space legislation. In the first instance, section 32(1) does not mention “absolute liability” for any person who causes damage by a space object on earth or in the air. The definition for “liability” in the Bill refers to “fault-based” liability. It cannot be the intention of the drafters to limit space actors’ liability only to damage which occurs in space.

### 3.7.11 SURRENDER OF LICENSE

Section 19 of the OSB 2017 contains the provisions relative to the Surrender of a License:

- 19(1) *A licensee may at any time, in writing, surrender the license or request the Space Council to revoke the license; provided that-*
- (a) *the Space Council may determine such conditions with regard to the surrender or revocation, as the case may be, as it may deem necessary or expedient;*
  - (b) *the Space Council may determine the date of surrender or revocation; and*
  - (c) *the obligations and liabilities of the licensee in terms of sections 25(4)(b), 32 and 33 shall remain in force.*

**Comment:** The Bill creates a separate heading for “Surrender of License” which was not contained in the 1993 Act. It is noteworthy is that the Bill affirms that the duties and responsibilities of the licensee remain in force, notwithstanding the surrender of the license.

In the writer's view, this should also be the case in the provision dealing with the amendment, suspension and revocation heading. It should be unequivocal that any changes to the conditions of the licenses do not absolve licensees from their duties and obligations in terms of the liability provisions contained later in the Bill.

No specific insurance cap is mentioned. The Bill in section 33(1) – (3). requires any person who conducts space activities to obtain and maintain liability insurance against any liability for maximum probable loss and to pay compensation to third parties that the launch, operation or return causes.

At the same time, the provision also allows for exemption applications in respect of insurance requirements (or any other provision(s) of the Act. It is evident that the intention of the drafters is to ensure that space actors possess the necessary insurance at the maximum probability, enabling the State to have recourse and recover any compensation it may have to pay in the event of damage.

On the other hand, subsection 2 allows for flexibility in that a licensee may apply for an exemption following a recommendation by the Space Council to the Minister. It appears that the exemption could apply in respect of insurance cover waiver (although not likely considering the risk of space activities) although it is probable that maximum insurance cover may be waived and an agreement entered into in respect of the insurance amount.

In the South African space policy context the latter is especially important if the space industry is to grow. High insurance premiums may be a deterrent for the space industry to increase launching activity, whether from the territory of South Africa or elsewhere.

### **3.8 Conclusion**

The legal commentary relative to the key provisions of the 2017 Bill reveal that a number of new provisions have been introduced in the Bill, when compared to its

predecessor, the existing 1993 Act. UNCOPOUS and ILA Model Law recommendations are for the most part reflected in the 2017 Bill in key aspects such as the following:

- scope of activities
- authorisation of space activities;
- supervision of space activities;
- registration of space objects;
- compensation, regulation;
- national jurisdiction
- in-orbit transfer; and
- re-entry operations.

The definitions in the Bill also depart largely from those contained in the 1993 Act. Despite this, a few definitions do not comprehensively reflect aspects contained in the relevant UN treaties, and/or are omitted. Notably, the definition for “space objects” does not contain reference to its component parts or space vehicle and no definition is contained for “space debris”. In this context, there are aspects of the Bill which require further scrutiny.

Chapter Four seeks to remedy the identified shortcomings of the Bill with the view to ensuring that the Bill is strengthened and takes into account UNCOPOUS and ILA Model Law recommendations (as highlighted as one of the aspirations by the drafting stakeholders).

## CHAPTER FOUR:

### Recommendations

This chapter lifts certain provisions from the OSB 2017 Bill and puts forth specific recommendations on how each of the provisions could be improved, in the light of the conclusions reached in the preceding chapter. The recommendations proffered are contained in bold and are underlined in the text of the OSB 2017 provisions, as they appear in this chapter. Proposed deletions from current wording are struck through in the text.

Each recommendation is followed by comment, providing the rationale for the proposed additions. In total, eight (8) specific recommendations are provided which seek to strengthen the Bill in a manner that will align it with the recommendations for national space legislation and UN treaty provisions, as contained in Table 1, in Chapter 3.

#### **4.1 Recommendation I - Purpose and Objects of the Act<sup>74</sup>:**

- 1) *To repeal the Space Affairs Act, No. 84 of 1993;*
- 2) *To create a supportive regulatory framework for the **national space** industry;*
- 3) *To provide for the establishment of the South African Space Regulatory Council (SASREC) or Space Council and the Outer Space Affairs Chief Directorate;*
- 4) *To provide for a coordinated administration and regulation of space affairs in the Republic;*
- 5) *To ensure compliance with international obligations arising out of treaties, conventions and international agreements that the Republic is party to;*
- 6) *To determine and cause to comply with the National Space Policy of the Republic;*
- 7) **To promote international cooperation in the field of space exploration and use; and**

---

<sup>74</sup>Preamble, Outer Space Bill (2017).

8) *To promote peaceful use of outer space and to provide with matters related thereto.*

### **Comment**

The intended Act seeks to create a supportive regulatory framework for the national space industry in line with the National Space Policy. International cooperation is a principle of the OST (Art II) and is the golden thread which runs throughout the main space treaties. International cooperation is necessary to ensure that outer space is used for the benefit of and in the interests of all countries, to promote international peace and security, to promote the sustainable and peaceful use of outer space, and to share information on space activities.

### **4.2 Recommendation II - Scope of Activities**

- (a) By a natural or juristic person under the jurisdiction or control of the Republic;*
- (b) From the territory of the Republic by any vessel registered in the Republic, or owned by a natural or juristic person under the jurisdiction and/or control of the Republic;*
- (c) From the territory of another State by any vessel on behalf of a natural or juristic person incorporated or registered in the Republic; or*
- (d) From the high seas, by a vessel on behalf of a natural or juristic person incorporated or registered in the Republic.***

### **Comment:**

While the inclusion of a launch from a vessel is a new and important inclusion in terms of the Bill, the current wording suggests that the application of the Act is triggered only when a launch from a vessel takes place from the territory of the Republic. The proposed addition in bold fills this lacuna and creates certainty in respect of launches from vessels in the high seas.

### 4.3 Recommendation III - Definitions

4.3.1 “**Authorisation**” means a space license obtained in written from Space Council to conduct space activities.

4.3.2 “**Supervision**” means a system established for permanent observation and tracking space activities.

#### **Comment**

Definitions for authorisation and supervision are not contained in the Bill. The Bill contains appropriate procedures for continuing supervision and monitoring of authorized space activities through safety inspectors who may conduct on-site inspections. A more general reporting requirement is established in terms of the requirement in section 25(2) (d) for information regarding the operational status of the space object on an annual basis or any loss of operational control, including end-of-life disposal plans. Section 24 similarly creates a reporting requirement to register space capabilities with the Space Council through a Space Council Compliance Register. It follows that definitions for authorisation and supervision be contained in the Bill.

4.3.3 “**damage**” - “*loss of life, personal injury or other impairment of health; or loss of or damage to property of States or of persons, natural or juridical, or property of international intergovernmental organizations; or to the environment on earth or the space environment arising out of space activity.*”

#### **Comment**

It will be recalled that the OST places an obligation on States Parties not to adversely contaminate the space environment while subsequent resolutions and guidelines encourage space debris mitigation. Damage in this context therefore also applies to the environment on earth, the space environment as well as damage to other space objects whilst in orbit. Liability should ensue for space actors who cause damage to the environment (on earth and in space) and because States are

internationally liable for damage, including damage to the environment, the proposed additions to the definition for “damage” seeks to create a right of recourse from private space actors whose space activities may lead to compensation sought for environmental damage. Environmental law is implicit in terms of States Parties obligations space activities in terms of Art III of the OST.

**4.3.4** “**Commercial space activity** means *“space activity for the purpose of generating revenue or profit whether conducted by a governmental or by a non-governmental entity”*”.

#### **Comment**

The ILA Model Law recommends the inclusion of a definition for commercial space activity. The National Space Policy anticipates commercial space activity, including space tourism. The drafters may consider including delimitation of 100kms here or in the definition for outer space.

**4.3.5** “**Space object**” is defined as *“an object or spacecraft launched or intended to be launched into outer space including its component parts as well as its launch vehicle and parts thereof.”*

#### **Comment**

The OST and Liability Convention define “space objects” as including component parts and launch vehicle and parts thereof. The definition is important as it triggers the majority of the provisions in the space treaties. The above definition is in line with the ILA Model Law recommendations.

4.3.6 “Space debris” **means all man-made objects, including fragments and elements thereof, in Earth orbit or re-entering the atmosphere, that are non-functional**.

#### Comment

The Bill does not contain a definition for space debris. In light of the ILA recommendation to include a provision on the mitigation of space debris, it is necessary for the concept to be included in the list of definitions.

4.3.7 “liability” means *responsible for and answerable in law **due to damage caused by governmental or non-governmental actors arising from any space activity, including commercial space activity;** because of the ~~fault-based legal obligations attached to any eventuality of damage arising out of any space activity~~*”

#### Comment

The above proposal seeks to correct the incorrect reference to fault-based liability. It is common cause that the Liability convention creates no-fault, fault-based and joint and several liability. To reference only fault-based liability as contained in the original definition, would imply that liability is only attached for damage in outer space, which is a fault-based liability.

#### 4.4 **Recommendation IV - Scope of Application**

(1) *This Act regulates the following space activities:*

- (a) *launch **or attempted launch** of space objects **or a space launch vehicle** into outer space;*
- (b) *operation and control of space objects in orbit **including transfer of ownership**;*
- (c) *manufacture of space objects;*
- (d) *operation of a space facility and/or a controlled re-entry operation;*
- (e) *re-entry of space objects;*
- (f) *space applications; and*

(g) *space exploration through regulations for attainment of the objects of the Act.*

The above additions will bring the scope of activities in line with the definition for “space activities” contained in the OSB 2017. For instance, it is not only the launch but also an attempted launch which triggers the provisions of the Act and requires licensing. Space objects and space launch vehicles are separately defined in the OSB 2017 and in terms of the definition for “space object” in the OST and Registration Convention, include a space launch vehicle and its component parts. It is also necessary to include “transfer of ownership” in the scope of activities as the proposed Act will have a specific provision regulating the transfer of ownership of space objects while in orbit.

#### 4.5 **Recommendation V - Conditions for Authorisation**

Section 14(1) contains the general requirements for issuing of a space license and in Section 15 sets out the specific requirements for each of the three abovementioned categories.

The general requirements are as follows:

- (a) Financial status, technical qualifications and expertise of the Applicant;
- (b) The nature of the proposed space activity;
- (c) The national interests of the Republic and foreign policy objectives;
- (d) Compliance with international obligations and responsibilities;
- (e) Insurance cover for the proposed activity;
- (f) ~~Safety and environmental considerations;~~
- (g) The space activity is compatible with public safety standards;**
- (h) The space activity does not cause environmental damage to the Earth and outer space in accordance with section XY;**
- (i) The space activity is undertaken in such a manner as to mitigate to the greatest possible extent any potential space debris in accordance with section XY**

- (j) Observance of codified international standards and best practices for the safe and sustainable conduct of space activities.

### **Comment**

It is submitted that the reference merely to safety and environmental considerations are wholly insufficient and should be expanded on. It should deal separately with complying with public safety standards, emphasis environmental protection and mitigate any potential space debris. It is proposed that new provisions (reflected as XY) are introduced which deal with the environment and space debris respectively. The recommendations are in line with the ILA Model Law.

#### **4.6 Recommendation VI - Space Debris Mitigation [New provision proposed]**

1. Space activities should be carried out in such a manner as to mitigate to the greatest possible extent any potential space debris in accordance with article 14(i).
2. The obligation of paragraph 1 includes the obligation to limit debris released during normal operations, to minimize the potential for in-orbit break-ups, to prepare for post-mission disposal and to avoid in-orbit collisions in accordance with international space debris mitigation standards.

### **Comment**

This is a proposed new provision which is recommended by the ILA Model Law. The Bill fails to address the important issue of space debris mitigation and the above inclusion seeks to remedy this gap.

#### 4.7 **Recommendation VII -**

##### **Protection of the Environment [New proposed provision]**

1. Space activities shall not cause environmental damage to the Earth and outer space or parts thereof, either directly or indirectly.
2. An environmental impact assessment is required before the beginning of a space activity.

##### **Comment**

While in section 28 of the Bill contains the heading “Safety Standards and Environmental Considerations”, it fails to deal with environmental protection but focuses mainly on safety considerations. It is proposed that a separate provision dealing with the environment as outlined above (an ILA Model Law provision), will remedy the omission. Environmental law is considered to be a component of States’ obligations in terms of the space treaties.

#### 4.8 **Recommendation VIII - Liability and Insurance**

[Current wording in section 32(1) and 32(2) of the OSB 2017]:

32(1) *any person who conducts space activities provided for under this Act is absolutely liable for damage caused by a space object;*

32(2) *The State Liability for damages attaches irrespective of whether the space activity in question was authorised or not, in compliance with the Liability Convention as listed in Schedule 1.*

[The writer proposes the following provision instead]:

1. The licensee is absolutely liable to pay compensation for damage caused by a space object on the surface of the Earth or to aircraft in flight.
2. For damage caused elsewhere, the licensee is liable only if the damage is due to its fault or the fault of persons for whom it is responsible.

3. Liability according to paragraph (1) is the duty to pay compensation for the maximum probable loss for damages caused to third parties in terms of section 33(1) (b).
4. When the Republic has paid compensation to third parties for damage caused by a space activity in fulfilment of its international obligations, the Government is entitled to recourse against the licensee.
5. The State liability for damages attached irrespective whether the space activity in question was authorised or not and the State shall retain its right to recourse from the natural or juristic person which conducted the unauthorized space activity, in compliance with the Liability Convention as listed in Schedule 1.

### **Comment**

The ILA Model Law liability provision contains a comprehensive overview of the liability regime in terms of the space treaties, the Liability Convention in particular. Including a more comprehensive provision will create legal certainty for space actors and will more adequately protect the State. The above recommendation is a combination of the ILA Model Law, the existing provision and independent amendments proposed by the writer.



## **CHAPTER FIVE:**

### **CONCLUSION**

The 2017 Bill is a significant departure from the 1993 Act as it contains numerous provisions that seek to affirm South Africa's space ambitions in line with its policy ambitions, while reflecting the country's intention to respect and uphold the international law obligations placed States Parties in terms of the relevant UN space law treaties. The Bill is largely reflective of international developments in national space law and reflects for the most part, the UNCOPOUS recommendations relative to content for national space legislation.

Having considered the key provisions of the 2017 Bill, it becomes apparent that the new Bill is apt and required – giving credence to the view of South African stakeholders that a new Act should be drafted, as opposed to amending the 1993 Act. Key aspects such as supervision and control, registration, liability and insurance and the specific and general requirements for the various license categories are all new inclusions which give effect to regulatory certainty, safety and obligations for all stakeholders. Key developments in the Bill are the regulation of re-entry operations as well as launches from vessels from the territory of the Republic.

Despite the abovementioned notable improvements, there are some aspects in the Bill which require further consideration. These include more explicit provisions relating to the environment and space debris mitigation. Additionally, the liability regime could be strengthened to create certainty on this crucial aspect. International cooperation and non-nuclearization should feature more prominently in the preamble and objects of the intended Act. Chapter Four presents recommendations which the drafters may consider for strengthening an relatively sound Bill.

In the above context, the 2017 Bill certainly goes further than its predecessor, the 193 Act, to create a solid legal foundation for South Africa's Space in Place. With the necessary adjustments which will likely follow the public consultations, the country may be in a position to adopt an exemplary piece of national space legislation.



## BIBLIOGRAPHY

### **Primary Sources**

The Convention on International Liability for Damage Caused by Space objects 1972

The Convention on Registration of Objects Launched into Outer Space; Agreement Governing the Activities of States on the Moon and Other Celestial Bodies 1975.

The Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space 1968.

Treaty on Principles Governing the activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies 1967

Resolution 1721 A and B (XVI) of 20 December 1961: International cooperation in the peaceful uses of outer space

Resolution 55/122 of 8 December 2000: International cooperation in the peaceful uses of outer space

Resolution 59/115 of 10 December 2004: Application of the concept of the “launching State

Resolution 62/101 of 17 December 2007: Recommendations on enhancing the practice of States and international intergovernmental organizations in registering space objects

Resolution 68/74 of 11 December 2013: Recommendations on national legislation relevant to the peaceful exploration and use of outer space

Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space

### **POLICIES**

**South Africa’s National Space Policy, (2009)**



(<https://www.sansa.org.za/wp-content/uploads/2018/05/South-Africas-National-Space-Policy.pdf>) (Accessed 23 February 2020)

### **South Africa's National Space Strategy, (2008)**

(<https://www.sansa.org.za/wp-content/uploads/2018/05/National-Space-Strategy.pdf>) (Accessed 23 February 2020)

### **SANSA Strategic Plan, (2015 – 2020)**

([https://www.sansa.org.za/wp-content/uploads/2018/05/SANSA-Strategic-Plan-2015\\_20.pdf](https://www.sansa.org.za/wp-content/uploads/2018/05/SANSA-Strategic-Plan-2015_20.pdf)) (Accessed 23 February 2020)

## **STATUTES**

Statute of the African Space Agency (2018) <https://au.int/en/treaties/statute-african-space-agency> (accessed 17 June 2019)

## **ONLINE SOURCES**

John Ibeh. 'African Space Industry Annual Report 2019 Edition' (Space in Africa, 2019) <<https://africanews.space/product/african-space-industry-annual-report-2019-edition/>> (accessed: 15 March 2019).

Keith Cambell, 'SA satellite finally lifts off' *Engineering News* (South Africa, 15 September 2009) <http://www.engineeringnews.co.za/article/sa-satellite-finally-lifts-off-and-enters-orbit-2009-09-15> > (accessed 10 December 2018).

Keith Gottschalk, "South Africa's space programme - Past, present, future" (2010). ASTROPOLITICS, 8- 35  
<http://repository.uwc.ac.za/xmlui/bitstream/handle/10566/155/GottschalkAstropolitics2010rev%202011.pdf?sequence=5&isAllowed=y> (accessed 15 March 2019)



Kuan-Wei Chen and Tanveer Ahmad (2016) 'Promotion for Development of National Space Legislation in Developing States to Ensure Global Space Governance [PowerPoint presentation] available at:

[http://www.unoosa.org/pdf/SLW2016/Panel5/2.Chen\\_Ahmad\\_National\\_space\\_Legislation\\_Presentation\\_Chén.pdf](http://www.unoosa.org/pdf/SLW2016/Panel5/2.Chen_Ahmad_National_space_Legislation_Presentation_Chén.pdf) (accessed: 15 May 2019).

News24, "SA Space Council Appointed" <https://www.news24.com/scitech/news/sa-space-council-appointed-20101015> (accessed 26 June 2018)

Nomfuneko Majaja and Ms Pontsho Maruping (2017) 'Repeal of the Space Affairs Act No.84 of 1993 by the South African Outer Space Bill' [PowerPoint presentation] available at: [https://www.thedti.gov.za/parliament/2017/Space\\_Draft\\_legislation.pdf](https://www.thedti.gov.za/parliament/2017/Space_Draft_legislation.pdf) (accessed 17 May 2019).

Satellite Finally lifts off and enters orbit, Engineering News.

<http://www.engineeringnews.co.za/article/sa-satellite-finally-lifts-off-and-enters-orbit-2009-09-15> (accessed 8 March 2018)

South African space agency mulls future course in rapidly changing sector

<http://www.engineeringnews.co.za/article/south-african-space-agency-mulls-future-course-in-rapidly-changing-sector-2016-09-09>(accessed 8 March 2018).

The Space Report 2017 titled The Authoritative Guide to Global Space Activity.

<https://www.spacefoundation.org/news/space-foundation-report-reveals-global-space-economy-329-billion-2016>(accessed 8 March 2018).