SOUTH AFRICA'S SPACE PROGRAMME: PAST AND PRESENT

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ABSTRACT

This article will examine the evolution of South Africa's space programme, from its origins in the security concerns of the *apartheid* government to the developmental ambitions of the contemporary government. It will investigate the links between the past efforts to develop a South African role in space with the current approaches, as well as assess the changing nature of the debate over the importance of space within Africa. It focuses on the space programme's origins in the Cold War, the shift from military applications to civilian commercial concerns during the lengthy political transition, and the rationale for the contemporary revival of the space programme.

1. INTRODUCTION

The launching of a manned space flight by a developing country, the People's Republic of China in October 2004 marked both the dawn of a new century and, arguably, the beginning of a sea change in international politics. The monopoly on the sophisticated technologies needed to embark on space travel, once marked by American and Russian dominance, is gradually being challenged by a host of developed and developing countries who are demonstrating mastery

* The author would like to express his thanks to Prof Mike Hough and Brig Gen (ret) George Kruys for their advice and assistance in the research towards this article.
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of the complexities of rocket science and who are in the process of launching unmanned satellites into to orbit. Alongside China's space programme, the most ambitious plan to emerge so far, are space programmes by the likes of the European Union (EU) states, Japan, India, Brazil and South Africa. Of these, it is the South African programme — Africa's first foray into outer space — that is the least studied amongst political analysts and, for that reason alone, is worthy of closer scrutiny.[1)] For some advocates, if the African continent is to achieve its oft-stated aims of rapid development, it is imperative that South Africa and other states embrace costly technologies involved in promoting their own space programme. For others, however, talk of rocketry and space programmes are merely expensive diversions from the pressing issues of development.

This article will examine the evolution of South Africa's space programme, from its roots grounded in the security concerns of the *apartheid* government to the contemporary developmental ambitions of its democratic heir. It will investigate the links between the past efforts to carve out a South African role in space with the current approaches, as well as assess the changing nature of the debate over the importance of space within Africa.

2. SPACE, THE COLD WAR AND SOUTHERN AFRICA

To understand the development of South Africa's initial push towards instituting its own space programme, it must be placed in the context of the Cold War politics of Southern Africa. South Africa, an ally of the West in the earliest part of the Cold War, was increasingly shunned by Western governments after the Sharpeville massacre in 1960. Its segregationist *apartheid* policies, coupled to the rise in an anti-*apartheid* movement amongst the majority black population centred on the African National Congress (ANC), earned South Africa the opprobrium of much of the international community at the same time that its economic potential attracted significant foreign interest.

The South African space programme developed in the shadow of these events. The founding of a satellite tracking facility, established near Johannesburg in 1958 with a more permanent facility built in Hartebeesthoek in 1961, was funded by the United States

(US) space agency, National Aeronautics and Space Agency (NASA), and manned by South Africans. The Deep Space Implementation Facility (now called the Satellite Application Centre) participated in most of the seminal US space activities including tracking and communication with the Mercury, Gemini and Apollo missions. These initial capabilities, strongly supported by the West and framed within the context of friendly relations, were soon eclipsed by broader political trends in South Africa and the wider region.

Having traditionally relied on Britain, and increasingly after World War II the US, for its security and intelligence gathering needs, the refusal of the Labour Party government to renew the Simonstown Agreement in 1974, came as a blow to the South African security establishment.[2] This was followed by the Soweto uprising of 1976 which, coming on the heels of the collapse of Portuguese rule in neighbouring Angola and Mozambique, put paid to South African government contentions that its domestic policies were unopposed. As South Africa's role and standing came under intense scrutiny, Pretoria's increasingly strained public relations with the West brought about a rethink within National Party (NP) circles as to its own defence needs. P W Botha, the Minister of Defence and later Prime Minister (and State President), promoter of the 'total strategy' doctrine which shaped South Africa's security policy in the 1980s, still looked to the US for support in turning back the tide of communism in the region. However, US initial support turned to prevarication and, after the passage of the *Church Amendment* in 1976, unwillingness to provide the expected financial, military and diplomatic cover for South Africa's intervention into Angola, forcing an untimely withdrawal of South Africa's expeditionary force there.[3]

For the security establishment in South Africa, it was the Soviet Union's growing military presence in Angola which exercised their concerns to the extreme. Recognising that a concerted effort by the Soviet government to overthrow white rule in Namibia and South Africa could not be successfully resisted and, convinced that the Western security umbrella was no longer in effect (if it ever had been), the South African government began to accelerate its own research and development programme into nuclear weapons technology which had started in 1971.[4]

From the outset of the commencement of the South African nuclear programme, the space programme — though it was not

called that at the time — became intimately tied and sub-ordinate to the country's security aims. In this, the South African approach was not particularly different from other national governments who pursued rocketry primarily for its utility as a delivery system for ballistic missiles and spy satellites. Unmanned scientific exploration was promoted by the two superpowers and, eventually, joined by European and Japanese space programmes. At the top of the hierarchy of space-faring states were the manned space programmes which, though they had significant technological and scientific spin-offs, were fundamentally prestige exercises that imposed tremendous financial costs on the US and the Soviet Union.

3. FROM MILITARY APPLICATIONS TO SPACE AMBITIONS

The South African space programme evolved alongside, in many respects in the shadows of, the concerted effort to develop a nuclear capacity and the means to deliver it. By the early 1980s, the South African government had committed itself to developing rocket-based delivery systems and a domestic launching capacity which, though primarily aimed at the military applications, were recognised to have commercial potential as well. The challenges associated with getting these programmes operational were threefold: in the first instance technological, principally involved in devising the rocketry; secondly, creating the facilities necessary to support launches; and thirdly, developing the satellites themselves.

The rocket technology developed in South Africa was tied to the military applications but, as it grew in sophistication, the possibilities of additional applications became apparent. According to sources, external assistance was a crucial component to the development of South Africa's rocket technology.[5)] Certainly the South African rockets bear the unmistakable imprint of Israeli technology, whose influence can be seen in the first two South African rockets which are clearly replicas of the Jericho class ballistic missiles. The RSA-1 was a single-stage intermediate range ballistic missile whose motor bore the hallmarks of the Jericho motor.[6)] Following from this was the development of the RSA-2, another intermediate range ballistic missile with a two-stage rocket. A breakthrough came with

the development of the RSA-3 rocket, a three-stage all-solid orbital launch vehicle. While the former two could be used in the Southern African theatre (presumably against Soviet forces), the latter had genuine sub-orbital capabilities. Indeed, the prototype RSA-3 rocket had the capacity to carry a tactical nuclear weapon, including cluster bombs and neutron bombs. It could also put a small surveillance satellite into a low level orbit around the earth. It was assembled in many different locations and could be transported *via* trucks to the Bredasdorp launch site. The RSA-3 was reportedly successfully tested three times within South African territory during the latter part of the 1980s and early 1990.[7)]

A fourth prototype, the RSA-4, another all-solid orbital launch vehicle, was in the making when the programme was shut down in 1994 (see below). As initially planned it could serve dual purposes: as an intercontinental ballistic missile capable of delivering a payload world-wide or as satellite launch vehicle capable of putting its payload into permanent orbit around the earth. The rocket motor was reportedly never tested.

Over five billion rand was spent on the space programme whose main aim was to enable South Africa to have its own satellite tracking system with specific military applications, and a civilian programme, Greensat, which ran in tandem with the military programme.[8)] Greensat's mandate focused on developing the commercial possibilities of satellite launching services. In particular, vehicle tracking and regional planning were mooted as potentially viable commercial uses of the satellites. During this period, the University of Stellenbosch became the nerve centre for the space programme, having at its disposal the intellectual and financial resources of the South African state.

To provide the necessary testing and launching facilities to support the dual use space programme, a launch site was developed near Bredasdorp, in the Overberg region of the former Cape Province (Western Cape). The 600 hectare site included a rocket launch pad, a runway large enough to handle a 747, a tracking station, an engine testing facility at nearby Rooi Els and other support services necessary to manage the launch and tracking of an orbital satellite.[9)] At its height in 1992, up to 1 500 personnel from 70 different public and private companies were working on projects either on site or scattered around the country.[10)]

4. THE FINAL FRONTIER

F W de Klerk's ascension to power in September 1989, following on Botha's stroke and sidelining by the NP leadership, marked the beginning of a transition which affected both the South African nuclear programme and, with that, its companion space programme. De Klerk's official announcement came on 24 March 1993, when he revealed some details about the South African government's nuclear programme, including a claim that the Government had been able to produce six to seven 'backpack' bombs. All of these were said to have been dismantled and destroyed two years earlier while the plutonium enrichment processing at Pelindaba was halted at the same time. Landsberg suggests that the timing of the announcement was linked to the NP's desire to win international support for its negotiating stance with the ANC.[11] Others have claimed that the decision was aimed at denying a future government access to a nuclear capability.

As many observers have noted, De Klerk's public declaration about the nuclear programme and the South African government's subsequent silence on the issue raised as many questions as it resolved. One of these was the status of the space programme itself which, as noted above, had an explicit commercial orientation. Nevertheless, unlike the other components of South Africa's nuclear programme, the space programme was not initially closed. The prime contractor, Houwteq (as noted above) proceeded with work on the next generation of rockets while shifting the programme's initial military orientation to an explicitly commercial one. However, with government funding for the military dimension of the space programme being cut back after 1992, the commercially-oriented Greensat programme found itself pared down further in 1993.[12]

One last step remained for the De Klerk government which was to influence the shape of South Africa's future endeavours in outer space. In 1993, the Government passed the *Space Affairs Act, 1993* (Act No 84 of 1993) which, amongst other things, formalised South Africa's adherence to an array of international treaties governing outer space as well as outlining the commitments, liabilities and structures of future government-sponsored activities in space. In terms of the Act, a Space Council was to be established and, along

with the Department of Trade and Industry, was charged with serving as a co-ordinating point for the various arms of South Africa's interests in outer space. At the same time, Ian Farr, the manager of the Houwteq Satellite Integration Facility at Bredasdorp, publicly unveiled the South African programme and its achievements at the Paris Air Show in 1993. Farr hoped to attract foreign commercial interests in Houwteq both for its launch record and the fact that it was capable of supporting as many as ten launches a year.[13)]

However, even as these policies and institutions were beginning to take shape — albeit primarily on paper at this stage — the prospects for South Africa's development of a commercially-viable usage of space technology were dealt a final blow. Faced with the enormous developmental challenges of meeting the expectations of millions of black South Africans, the ANC leadership felt compelled to reduce spending on these areas, both for their high price tag and seemingly lack of relevance to alleviating pressing domestic concerns. Another round of budget cuts instigated by the Government of National Unity after May 1994 spelled an end to further development and the programme was mothballed, apparently for good. The hundreds of scientists involved in the project for the most part seem to have scattered, some moving into retirement, others carrying on in a civilian capacity and a minority seeking opportunities overseas. International interest in the latter remains significant, given their expertise and the growing concern with weapons proliferation in countries such as North Korea and Iran.

5. SOUTH AFRICA'S SPACE PROGRAMME: FROM EPILOGUE TO NEW BEGINNING

The ending of *apartheid* coincided with the dismantling of South Africa's nuclear programme and, with that, it appeared to be the ending of its ambitions for a role in outer space. Given the close proximity of military interests in rocketry technology to its space programme, it was perhaps inevitable that the change in government would bring with it a re-evaluation of its role and necessity. Thus as the new authorities in South Africa grappled with the challenges of transition and rule, the remnants of South Africa's space programme were either destroyed, dismantled or converted into civilian uses.

The US had overseen the destruction of the key facilities linked to the missile development and launching in 1993-1994. This included the dismantling of the rockets, solid propellant fuels and casings, engine casting pits and related materials.[14] The signing of the *Missile Technology Control Regime* (MTCR) followed in September 1995. A general 'fire sale' of technological assets from these programmes commenced, with the sale of components of the Pelindaba nuclear facility to China being the most public of these.[15] European governments, interested in the innovations that characterised the development of local technology, reportedly attempted to purchase these from Armscor. The US government blocked this move, part of a general policy of thwarting the South African arms industry's efforts to expand into lucrative markets in Africa, Asia and the Middle East. As one South African businessman associated with the space programme declared:[16]

> Someday the Americans will have to explain why they screwed us over. We had to cancel a strong civil space programme and a pending joint venture with Brazil … and a lot of companies lost business.

At the Houwteq facility, with the ending of government financial support, the hundreds of scientists and engineers had been reduced to just over two dozen. Farr continued his attempt to market South Africa's commercial space programme for a few more years before it was effectively closed down. As for the rocket itself, a prototype of the RSA-3 sits in a corner of the South African Air Force museum near the newly named Thaba Tshwane military base.

Finally, the legal instruments for furthering South Africa's aims in outer space, namely the *Space Affairs Act, 1993* (Act No 84 of 1993), were left dormant during the 1990s. Though officially mandated through this legislation, the Space Council was never formed. An office was opened in the Department for Trade and Industry, complementing the research role of the Council for Science and Industrial Research (CSIR), which was charged with assessing the commercial and trade opportunities associated with South Africa's remaining space infrastructure. This mainly meant astronomical activities, exchanging of data and satellite tracking *via* the CSIR's Satellite Application Centre in Hartebeesthoek.

However, declarations of the South African space programme's demise were to prove premature. The first stirring of renewed interest was the launching of a communications satellite, a product of the work begun under the Greensat programme at the University of Stellenbosch. Sunsat 1 was developed and manufactured by students at the university, in conjunction with the CSIR and the Department of Science and Technology. It was launched by NASA (*gratis*) on 23 February 1999 to much public acclaim and carried an imager and a message relay system in its payload.[17)]

The decision of a private entrepreneur, Mark Shuttleworth, to use some of his millions gained through the sale of his software company, Thwate, towards buying a seat on the Russian Soyuz spacecraft bound for the International Space Station, caught the imagination of the South African public. Broadcasting from the space station, Shuttleworth's widely reported activities inspired a debate within élite circles as to South Africa's own interests in outer space. Upon his return, Shuttleworth embarked on a series of public tours of the country, including township areas, which helped underscore the enthusiasm that all South Africans had for the event.

Moreover, domestically the proliferation of cellular telephones in South Africa (as well as the African continent) which rely upon relatively low orbiting micro-communications satellites, global positioning technology as well as the possibilities of managing urban and environmental planning, convinced many that outer space was already an important feature of daily lives in South Africa.[18)] South African business interests in satellite and related technology areas, amongst them Sun Space and Information Systems, MTN, Telkom and Naspers, as well as the traditional mining and engineering firms, provided another constituency of support for the country's 'return to space'.

Surprisingly, the convening of the heralded African Renaissance discourse and its prodigy, the New Economic Partnership for African Development (NEPAD), contributed to the heightening of interest in outer space. At the World Summit on Sustainable Development (WSSD) held in Johannesburg in 2002, the importance of new technology to development was underscored by participants who emphasised the centrality of utilising, for example, new communications technologies to assist in modernisation of African economies. Forecasting of droughts, changing patterns of settlement and envir-

onmental management were all done through use of US or French satellite technology.[19] Commitments were made by leading African states to engage in joint inter-state action towards developing an all African satellite network, the African Resource Management Constellation, to collect environmental data for use in development. Following on the WSSD was the G8 Summit in Evian, to which leading African states were invited and discussions were held about space technology and development, as was a meeting of the Earth Observation Summit in July 2003, where South Africa joined nations in committing itself to co-operate on outer space matters.[20] Emerging from the event was the Global Earth Observation System of Systems (GEOSS) which serves as a co-ordinating body for international monitoring, data collection and analysis of remote sensing information on disasters, disease, climate, water and agriculture.[21] Within South Africa, a National Working Group on Space Science and Technology, organised under the auspices of the Department of Foreign Affairs, was created in 2003 to discuss the way forward.[22]

All of the aforementioned events conspired to raise the profile of outer space within South Africa and, in so doing, lay the foundation for a reassessment of the country's role in this arena. This trend was finally realised with the cabinet level decision to create a South African Space Agency, under the aegis of the Department of Science of Technology, in July 2006. It pulled together the disparate administrative threads of space activities, which had included the Department of Science and Technology, the Department of Trade and Industry and the Department of Communications. In addition, the Department of Trade and Industry was given a regulatory function as well as site for policy formulation.[23] The role of industry was given prominence in the new programme as both a provider and user of space technology, as well as recognising their commercial interests in its development. The incubation of a local high-tech industry was deemed important for achieving international competitiveness as well as national independence.

The decision to establish the South African Space Agency came on the heels of a parliamentary debate on South Africa's space in which the Government committed R26 million towards the building of a second Sunsat satellite with enhanced imagery and capabilities.[24] As part of the rationale for this expenditure, the Minister of Science and Technology, Mosibudi Mangena, pointed out that Algeria

and Nigeria had themselves already procured satellites as part of the African Resource Management Constellation.[25] Another concern, echoing the interests of the past, was the need to develop an independent scientific and technical expertise that would allow South Africa to act without reliance upon external sources. This included the need for a 'spy satellite', which, as one South African government official put it, would allow South Africa and other African states to overcome their current dependency on Western sources in areas such as the contested Democratic Republic of the Congo.[26]

Even the unused facilities at Bredasdorp may yet see a revival. The signing of an agreement between the Russian Aviation and Space Agency in 2005 to allow Russia to launch satellites from South Africa clearly puts the country back on the road to returning to 'launching state' capacity.[27] In this regard, significant challenges however remain. Apparently Eskom and the Department of Water Affairs have committed themselves to guaranteeing the necessary electricity and water to ensure that the effort to rehabilitate the launching site is successful. However, in the case of Eskom, with ongoing power shortfalls in the Western Cape which are said to be set to continue until 2012,[28] there may be need to developing alternative local sources of power that can be brought on line much more rapidly.

6. CONCLUSION

No longer isolated in the international community, South African interests in space and the related technology are part of a growing trend amongst developing countries to embrace the technologies that would allow them to actively participate in outer space. Though still assisted by friendly foreign powers, the South African government is able to build upon the past to revive and re-orient its space programme towards what is primarily a commercial and development focus. The rationale for this step is, as long-time South African space advocate Mothibi Ramusi says: "Space is no longer a luxury: it is a necessity. Space can contribute to our economic growth and development".[29]

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