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The Cost, Politics and Controversy of Human Space Flight in Nigeria or How to Put the First African Astronaut into Space

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THE COST, POLITICS AND CONTROVERSY OF HUMAN SPACE FLIGHT IN
NIGERIA

or

HOW TO PUT THE FIRST NIGERIAN ASTRONAUT INTO SPACE

by

DESIREE WINNS

Thesis Chair: Dr. Roger Handberg, Ph.D.

ABSTRACT

Throughout history, humans of all nations have been drawn to stars, space, and the celestial bodies above our heads. We have evolved technologically from viewing and studying them to finally launching ourselves into the expanse to meet them. However, is this venture into space only beneficial or logical to certain countries? The most pressing barriers between reality and the dream of the first African astronaut in space are a lack of resources, cooperation, and support. Nigeria presently suffers from the threat of famine, inter-communal violence, and population displacement as a result of terrorism and food insecurity. The reliance upon humanitarian aid from countries such as the United States and international NGOs creates a question of whether Nigeria should even be considering exploration of space. A low-cost, high capacity investment into the Nigerian program that collaborates effectively and efficiently with other space programs in Africa or beyond is one way to justify the project. Economically, the benefits of sending an African into orbit reap effects such as a significant return in investment for the space sector of the continent. Socially, cultural and national pride, international respect, and historical reverence are certainly guaranteed by this accomplishment. The ownership of African spaceports, with the provision of access to partnering countries, would give the continent leverage in international affairs, grant jobs to African citizens, and grant a prosperous stake in the future colonization and exploration of space.

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INTRODUCTION

For all of human history, there has been an innate and consistent fascination with the celestial bodies of the sky. From the invention of the telescope to the first space shuttle, humans have sought to find answers for our place and destiny in space. This passion to explore the final frontier is a global commonality that transcends race, culture, and time. However, the venture into space is not only an existential, political, or philosophical ambition. A national space program provides economic opportunity, astronomical research, and broadband access for its citizens. Satellites can observe the impact of climate change or predict devastating disasters, allowing poorer countries to prepare and prevent. Furthermore, a country's stake in space can create a rippling effect across the social and cultural mentality of its people (Dick 2008).

A launch into space is not solely reliant upon scientific and technological ability. Bureaucratic elements, government support, and sufficient funding are necessary for space initiatives to take flight. The politics behind human space flight create debates of whether the pursuit is worthy or even necessary for certain countries. The question arises if human space flight should be a priority when a country's human rights still remain an ignored or neglected issue on Earth. In recent years, companies such as Blue Origin and SpaceX have erupted as powerhouses of commercial space flight. It appears that in a few decades human space flight will become fairly normalized, thanks to these independent vendors who work in tandem with national space programs, with plans for colonization of the moon and Mars in the works. The monetary investment into a space program is indicative of a self-sufficient and economically independent nation. It becomes easy to assume that if a country can afford to send people into space, or even collaborate with an independent commercial spaceflight company, it no longer needs international aid or assistance.

For developing countries, should space only be an opportunity for economic advancement, monitoring disasters, or climate change prevention?

In Africa, the most prominent space programs in Nigeria, Morocco, Algeria, Egypt, and South Africa have each succeeded in several satellite endeavors. Presently, the continent has sent a total of forty-one satellites into space, and twenty since 2016 (SGAC 2020). The launches of these satellites required assistance on behalf of international collaborators such as Russia and China. At the moment, foreign rockets and launch sites are necessary for African satellites, but recent plans for developing a continental program for African space affairs could lay the groundwork for independent missions. A statute for an African Space Agency was adopted by members of the African Union in Addis Ababa, Ethiopia, on January 29, 2018. Objectives listed in the treaty are as follows:

- a. [harnessing] the potential benefits of space science, technology, innovations, and applications in addressing Africa's socio-economic opportunities and challenges
- b. [strengthening] space missions on the continent in order to ensure optimal access to space-derived data, information, services, and products.
- c. [developing] a sustainable and vibrant indigenous space market and industry that promotes and responds to the needs of the African continent.
- d. [adopting] good corporate governances and best practices for the coordinated management of continental space activities
- e. [maximizing] the benefits of current and planned space activities and avoid or minimize duplication of resources and efforts
- f. [engaging] with its users through the establishment of Communities of practice for each of the identified user requirements; and
- g. [promoting] an African-led space agenda through mutually beneficial partnerships (African Union 2018).

While these objectives do not explicitly mention an agenda for crewed space travel or tourism, it is possible that investment in this regard could contribute to these ultimate goals. But what are the best ways to bring Africans to space, and what would it take to get to a point where crewed missions from Africa are normalized? Is a continental program, which requires cohesive effort between the self-concerned and busy African nations, essential to sending the first African astronaut into orbit? Or is a commercial space flight onboard another nation's rocket the most efficient method? What are the political and cultural implications and impacts of the first African astronaut? Presently, Nigeria's plans to send one of their citizens into space appears to be one composed of wishful thinking. However, the accomplishments of its fairly recent space program demonstrate potential for greater projects.

Nigeria stands out amongst its space-faring peers for this particular goal on its space program's current agenda. The National Space Research and Development Agency, or NASRDA of Nigeria, was established in 1999 with the mission to "pursue the development and application of space science and technology for the socio-economic benefits of the nation" (International Aeronautical Federation). Since its creation, NASRDA has launched six satellites with the help of Chinese and Russian rockets, three of which are still working in orbit. NASRDA has announced its plans to send an astronaut into space by 2030 (Monks 2016). This has brought understandable skepticism from other countries, who deem the idea ridiculous and the very act impossible. The likelihood of this occurring is contingent upon several political, economic, and international factors, which will be explored further in this thesis. If such a feat is to be accomplished, it must first be determined if the benefits of Nigeria's first astronaut are worth the costs and risks.

BACKGROUND: THE HISTORY OF SPACE ASPIRATIONS IN AFRICA

Nigeria's bold goal to send an astronaut into space by 2030 is only the most recent announcement of African ambitions to explore the universe. During the height of the Cold War, Zambia's infamous schoolteacher, Edward Mukuka Nkoloso, recruited twelve "Afronauts" for his mission to the moon. His first astronaut class, mostly composed of high school students, were trained for missions to the moon and Mars by spinning in oil drums and learning to walk on their hands (Serpell 2017). While his efforts were ridiculed as excessive daydreaming, naivety, or even madness, the desire to go to space still persists with government-funded initiatives across the African continent. Plans for a continental agency are revered for the opportunities such an administration could create. Agencies in South Africa, Egypt, Morocco, Algeria, and Rwanda have stepped further into the realm of space by designing, constructing, and sending satellites into orbit on Russian and Chinese rockets. As of 2022, Nigeria is the only African country to have officially announced a plan to send a person into space within the next decade. Considering Nigeria's human rights issues, poverty rates, and relatively low budget for its space agency, the idea to send a manned mission into space somewhat resembles the manic and unrealistic idea of Nkoloso. Additionally, the argument of whether Nigeria should continue to receive humanitarian aid arises. When Nigeria can send its own people to space, is there any need to continue sending funds to the ones left on earth?

On September 30, 2021, the United States Agency for International Development published a report on Nigeria. The report described the situation in Nigeria as a "complex emergency," with approximately 8.7 million citizens of Northeast Nigeria estimated to be in need (USAID 2021). A complex emergency, as defined by the Food and Agriculture Association of the

United Nations, is defined as “a major humanitarian crisis that is often the result of a combination of political instability, conflict and violence, social inequities and underlying poverty.” (Food and Agriculture Organization of the United Nations).

In the fiscal year 2021, USAID provided \$316,704,165 in humanitarian aid to Nigeria. This aid was contributed towards countrywide food assistance, economic recovery, and shelter. The greatest amount of aid was applied in collaboration with several implementing partners (IPs) to the states of Adamawa, Borno, and Yobe in the northeast region, and amounted to \$174,374,000. This amount was purposed for Agriculture; Economic Recovery and Market Systems; Food Assistance–Cash Transfers, Vouchers; Health; Humanitarian Coordination, Information Management, and Assessments (HCIMA); Humanitarian Policy, Studies, Analysis, or Applications; Multipurpose Cash Assistance; Nutrition; Protection; Shelter; WASH (water supply, sanitation, and hygiene). Food insecurity and famine were predicted to affect approximately 12.8 million people in northern Nigeria, and intercommunal violence between agriculturist and pastoralist communities is a looming threat in the states of Katsina, Sokoto, and Zamfara. Terrorism ignited by groups such as Jama’atu Ahlus-Sunnah Lidda’Awati Wal Jihad, ISIS-WA, and Boko Haram has also displaced populations in the north, causing tensions between evacuated groups and the locals of their host communities (USAID 2021).

With this in mind, it is obvious that a manned mission to space should not be Nigeria’s first priority. Any government backing of a crewed space mission would be a careless misuse of government funds and a definite opportunity for public and international backlash. Of course, other nations have endured local political strife and still pursued space. Is there a double standard when it comes to African nations aiming for the stars? The answer to this question lies not in

racial prejudice or ethical debate, but in money. The space industry is a promising well of influence, economic opportunity, and investment, and is certain to expand further in the coming decades as advancements in technology improve. In recent years, companies such as Blue Origin and SpaceX have thrived with their suborbital flights for an exclusive list of wealthy or influential passengers. If Nigeria could take advantage of the next stage of the modern space race, by producing parts for manned rocket systems or providing launch sites for international or domestic purposes, there could be a significant return on the investment into human spaceflight.

LITERATURE REVIEW

Considering the fairly recent developments in the African space sector, the sources for this review have been evaluated by their reliability. Space in Africa, an offshoot webpage of the Africa News website, is managed by Dr. Temidayo Onioson. Much of the research used in this thesis has been gathered from government-backed websites such as NASRDA, NASA, and the United Nations Office on Outer Space Affairs. Details from international treaties such as the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, and government documents such as the NASRDA Act of 2010 were analyzed to determine the standards and laws established for space travel both internationally and domestically. Information about Nigeria's politics was gathered from reliable sources such as the CIA World Factbook and reputable sites like BBC, CNN, and the Council on Foreign Relations. The primary resources for my research involved an analysis of the administrative politics of several international spaceflight programs. To determine where the money is most needed to send an astronaut into space, I examined the budgets of NASA, ISRO and NASRDA to compare and con-

trast the percentages funding separate directives. These budgets are updated on a yearly basis and were taken from their websites or other sources that analyzed them.

METHODOLOGY

This thesis will examine several levels of international, continental, and commercial efforts towards space travel, as well as the political requirements and consequences of any concentrated ambitions to human space flight in Nigeria. By conducting interviews with professionals in the United States and reading recently updated resources from both countries, I have been able to gather facts about international space administration. Throughout this thesis, I have used information about non-Western human spaceflight programs such as India, China, and Russia to assemble a comparative measure of the economic and political requirements necessary for Nigeria to create a self-reliant program of its own. Furthermore, I will make an assessment of how Nigeria's present space program budget could be used to begin its own human spaceflight directorate. This hypothetical evaluation will be concluded from comparisons made to similar programs pursuing crewed spaceflight, ISRO in particular.

POLITICAL AND ECONOMIC SETBACKS

The aforementioned countries in Africa have made significant achievements in developing and launching satellites from their international partners. Naturally, the next step in advancing African capabilities is not human spaceflight, but gaining independence by establishing self-reliant programs with fruitful international interactions. This advancement would be a process composed of several steps. First, government and public support must be acquired for the monetary investment into expanding Nigeria's present space program. The budget must be enough to support expansion or elaboration upon one of NASRDA's existing departments. Public relations is also an important factor at this stage. There must be a sufficient and employable benefit to human spaceflight that will guarantee a significant economic return, and these must be successfully promoted domestically and internationally.

Secondly, NASRDA must be independent enough to maintain a variety of projects that consistently provide a visible or tangible benefit to the Nigerian people. This agenda can include tasks that have already been accomplished by NASRDA, such as continuing the manufacturing and launching of satellites, the training of engineers and potential astronauts, and further advancements in telemedicine, weather monitoring, and climate observation. These tasks are currently administrated and carried out by the seven departments of NASRDA; Engineering and Space Systems, Administration and Finance, Strategic Space Applications, International Cooperation, Policy, Planning and Research, Mission Planning and Satellite Data Management, and Procurement. The NASRDA Act of 2010 outlines these departments and elaborates upon their responsibilities toward Nigeria in Part II of this document, entitled "Functions of the Agency". This section describes NASRDA's mission to improve the economy of Nigeria with space-fo-

cused initiatives, to “enhance the development and entrenchment of research... to achieve a high output and make the desired output on national, economic and social development... to develop space technologies of direct relevances to national objectives... [and] promote private sector participation in the space industry” (NASRDA Act of 2010).

It is clear that NASRDA has devoted itself to improving space technology that will bring long-lasting benefits to the people of Nigeria. This should be the first priority of any space program; to bring positive and active results to humanity on Earth. Therefore, the implementation of any budget or policy aimed at the goal of spaceflight should keep this in mind above all else.

Nigeria’s idealistic ambition to send an astronaut to space by 2030 is rivaled by its current economic, political, and technological setbacks. Their reliance on other countries for satellite launches, as well as their lack of a national launch site, creates a heavy dependence on international assistance for space exploration. Furthermore, human rights violations in the country, as well as its history of political corruption, create a tricky foundation for spaceflight to occur. There are potential opportunities for Nigerian space travel through collaboration with commercial or international programs, such as SpaceX, Blue Origin, or the China National Space Administration (CNSA). The delay in officially establishing the African Space Agency has prevented an independent continental program for space initiatives in Africa. The question of what it will take to send an African astronaut into space, as well as the political and economic necessities to accomplish it, requires an analysis of the historical, political, international, and economic factors currently in place in Nigeria.

The corruption perceptions index of Transparency International currently ranks Nigeria as 154 out of 180 countries (Obadare 2022). Corruption’s deep-rooted entanglement in the history

and politics of Nigeria makes the enforceability of anti-corruption methods difficult. A 2016 survey conducted by the National Bureau on Statistics and the United Nations Office on Drug and Crime reported that bribery “seriously threatens the integrity of public services and thus Nigerian citizens’ faith in the administration and even the Government” (UNODC 2019). Citizens of Nigeria have a fair amount of access to public officials, which provides opportunities for government-civilian discussions as well as bribery. The survey noted this open relationship between the government and the people and estimated that a “total of roughly NGN 675 billion was paid in cash bribes to public officials in Nigeria in 2019, corresponding to 0.52 percent of the entire Gross Domestic Product (GDP)” (UNODC 2019).

Because of the great risk of bribery and corruption, NASRDA itself was developed with anti-corruption strongholds within its recruiting measures to ensure that its highest offices could not be manipulated or exploited by advantageous figures. These measures include articles describing cessation of membership in the case of corruption (specifically if the member has become bankrupt or engaged in misbehavior that suggests unsound body and mind), as well as set four-year terms for Council members that may only be renewed once (NASRDA Act of 2010).

If measures were already taken to ensure that the leaders of the national space agency were not influenced by external factors, then there must be other issues that are preventing any opportunities for the agency to become self-reliant. It must also be mentioned that the leaders of NASRDA have been changed since the initial announcement of a plan to send a Nigerian astronaut into space by 2030. As a result, the mission of the Nigerian agency is likely to have different priorities. However, the agenda of NASRDA is still primarily focused on establishing and maintaining an independent space program. In 2005, a plan was announced by the Nigerian Federal

Executive Council for NASRDA to develop its own rocketry and spaceport within 25 years (Space in Africa 2019). Prior to his appointment as Director-General of NASRDA in April 2021, Dr. Halilu Shaba Ahmad presented plans to UNOOSA in 2012 to train Nigerian astronauts and develop a rocketry and propulsion system. This presentation also mentioned that the priorities of NASRDA primarily concerned e-agriculture, improvements in satellite technology, and telemedicine. This evidence shows that human spaceflight is still an aspiration of the Nigerian program, even if it will not culminate in immediate results.

SOCIAL, CULTURAL AND ECONOMIC BENEFITS OF SPACEFLIGHT

From an American perspective, it is a common fact in our collective memory that the landing of Neil Armstrong on the moon in 1969 was a significant moment for our country and our planet. Although a Nigerian might not reach the moon within the next decade, even a low-orbit mission could present a new cultural mood in the country. Granted, the current struggles of the people in Nigeria include terrorism by cells such as Boko Haram, poverty, political violence, and of course, long-lasting political corruption. The sending of a Nigerian astronaut into space may not directly benefit people struggling in the country, but it could open doors to future opportunities for its youth and even its current working class. In 2016, the Nigerian space program employed approximately 2,000 workers (Giokos and Whiteside, 2016). Long-term investment into a human spaceflight program could grant a plethora of jobs in the country; from engineers, to public relations officers, to astronaut candidates, the range of opportunity for employment are expansive and applicable to a variety of skills. Furthermore, the first African astronaut would represent a giant leap in international significance, respect, and accomplishment for the African

continent. How this can be realistically and economically accomplished, with acknowledgement of potential risk and financial loss, can be answered by examining the histories, budgets, and plans of its and other space programs.

NASRDA'S CURRENT BUDGET AND PRIORITIES

The greatest hindrance to the Nigerian space program is the lack of resources available to it. In 2021, NASRDA's budget was increased by 54% to 86.5 million USD (Space in Africa 2021). In spite of its fairly small budget, NASRDA's satellites have served various functions. NigeriaSat-1, launched in 2003, was one of five satellites in an international collaboration known as the Disaster Monitoring Constellation, or DMC. Before its retirement in 2012, NigeriaSat-1 was the first to capture images of the devastation of Hurricane Katrina. These wide-area images showed cracks in the levee system to U.S. disaster responders (Surrey Satellite Technology Ltd). Their first communications satellite, NigComSat-1, was launched from China in 2007 and de-orbited in 2008 after an issue with its solar array. It was designed with twenty-eight transponders to address the needs of "telephony, broadcasting, direct-to-home television, Internet and other services" across the sub-Saharan region of Africa (Pike 2011).

Given that only a third of people across the continent have access to broadband services, NASRDA's focus on communications satellites is certainly a worthy investment (The World Bank 2019). These are benefits that could support climate change initiatives, monitor drought and famine, and provide broadband services to people across the African continent. Is anything similar offered by the prospect of human spaceflight?

Human spaceflight has been heralded as a triumph of our evolution, and is seen as the next step in an expansion of human capability across our solar system. The benefits it brings to earth seem to be primarily its potential to take us away from it. However, human spaceflight is not merely an overfunded attempt to leave most of humanity behind. When astronauts go into space, they can perform experiments that are unique to the anti-gravity environment, and bring back new discoveries in health, technology, and agriculture. For example, many studies have been completed on the International Space Station to research human physiology and neurology. Such benefits of human spaceflight have already been granted to the European Space Agency and NASA in these ways.

Support of such an initiative can be attained from within the country, the continent, or the international community. The price of sending a payload or a person into space is a factor that is currently being adapted for a lesser cost. The accessibility of space is entirely dependent on the money provided to get there. According to NASA's Marshall Space Flight Center, it costs approximately \$10,000 USD to send a payload into space (NASA). Efforts are presently being made to lower the costs of launch. With lower costs, space certainly becomes more accessible. African countries have already used the cheaper option of sending their satellites into space on foreign rockets; this greatly reduces the need for launch costs. Approximately 44.9% of NASA's 2020 budget was spent on its human spaceflight program, however, most of its total allotted budget is spent on earth to afford its 17,000 employees and many contractors (The Planetary Society).

A similar mindset can be embraced for the Nigerian agency, for which concerns arise about the responsible use of government funds. Most of the budget for a space program should

be spent on Earth, with the employed people in mind. Even if a Nigerian human spaceflight program does not send an astronaut into orbit within the next decade, the establishment of such a program procures an array of jobs that can support and encourage the people in pursuit of a larger goal. Money spent on Earth will help put Nigeria into orbit. Most importantly, it will feed and pay the people of Nigeria as a greater goal is worked towards. Granted, the Nigerian space program's budget is significantly smaller than that of India, China or Russia. However, a careful allocation of resources to the right initiatives could create clever and cost-efficient routes to space. Nigeria's satellites have varied in cost over the past twenty years. NigComSat-1, Nigeria's first communications satellite, had an overall cost of 300 million USD, including construction, launch and insurance, when it launched in 2007, and its EduSat-1, a nanosatellite, launched in 2017 from Kennedy Space Center for 500,000 USD (Space in Africa 2021). NigComSat-1 was manufactured by the China Academy of Space Technology (Pike 2011). EduSat-1 was also manufactured by foreign engineers, assembled by the Japanese Kyushu Institute of Technology (Kulu 2021). This shows that Nigeria has long relied on cheaper means to bring satellites to space, and that the international option is often the least expensive.

An independent attempt to develop Nigeria's space program will certainly be more costly, and require Nigeria to establish an infrastructure and budget that will provide a sturdy foundation for projects. A local program in rocketry and/or propulsion may be a promising means for future launches. As aforementioned, the Nigerian Federal Executive Council planned to have its own self-sustained rocketry and spaceports within 25 years. This aligns with their proposal to send an astronaut into space by 2030, and shows evidence that they are aware of the resources needed to accomplish that goal. If Nigeria could make itself a competitive manufacturer of reliable and

durable rocketry and propulsion, it could sell itself as a valuable ally in this new era of space venturing.

First, a decision must be made as to how the astronaut candidates will be sent into space; will Nigerian astronauts take flight on a Soyuz or other foreign rocket, or is it possible, realistic or logical to invest in a local rocket program? The implications and economics of both options must be considered. If a Nigerian astronaut takes flight on another country's mission, there must be a legal and diplomatic relationship established to ensure cooperation on earth and in space. However, this might also come with the cost of a relationship with other countries who may not condone or appreciate Nigeria's chosen ally in space.

Article 1 of the Outer Space Treaty of 1967 states that “the exploration and use of outer space, including the moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind” (UNOOSA 1967). The Treaty was signed by Nigeria the same year it was ratified, long before the country developed its space program. Similar international agreements, including the most recent Artemis Accords of 2020, were signed by Australia, Canada, Italy, Japan, Luxembourg, the United Kingdom, the United Arab Emirates, Ukraine, and the United States. The Accords are founded in the original principles of the 1967 treaty, and establish a precedent of international partnerships that will help the next steps of space exploration back to the Moon and finally to Mars. The treaty highlights the importance of transparency, peace, interoperability, emergency protocols, registration of space objects, release of scientific data, protecting human heritage in space, preventing conflict in off-planet ventures, allocation and protection of space resources, and managing orbital debris (Artemis Accords

2020). In 2020, Jim Bridenstine, the administrator of NASA, stated in a briefing to the Foreign Press Centers at the U.S. Department of State that the Artemis Accords will “have nations join in a very robust way where they can come onboard with whatever they can contribute now and they can grow their programs in the future, because the architecture is open and there’s room for more countries than ever before... that’s really what the Artemis program is all about” (State Department 2020).

Global collaboration has brought astronauts of many nationalities to the International Space Station. NASA, European Space Agency, Canadian Space Agency, Russian Federal Space Agency, and the Japanese Aerospace Exploration Agency have each sent crewed missions to the ISS. On New Year’s Eve of 2021, the service of the ISS was extended to 2030 by the Biden-Harris administration, and the cooperation of participating partners is necessary to effectively put this plan in motion (Pearlman 2021).

Whether or not this is enough time for a Nigerian astronaut to come aboard the ISS one day depends on how Nigeria plans to make itself a contender in the space industry. Any project aimed towards space requires a fairly large budget to ensure a return that will be beneficial to the overall cost. Sending a person to space and returning them safely is not an effort that can afford cut corners or rushed delivery. The failures of the past have shown us that time and attention towards proper engineering, training, and preparation should be absolutely prioritized above all else in human space travel. Given the United States’ current plans to go to the moon and Mars, it is likely there will be further accidents and tragedies because of the unexplored frontier. The cost of human space travel is not only counted in dollars and cents, but in life and blood. It is often said that safety rules are written in this tragic ink. For the first African astronaut in space, a fail-

ure as extreme as this would result in intense international scrutiny and further skepticism towards a continental program. Therefore, the utmost precautions must be taken. This begins with a proper budget.

Firstly, an objective must be identified. The budget proposal should have a clear and focused mission statement that aims for a tangible result. For example, if Nigeria wants its first goal to be joining the Artemis Accords, then the proposal should uplift plans and programs to develop and contribute means that will be most beneficial to the international treaty. The first step to Nigerians in space is not the recruitment of astronauts, but the foundations of equipment that will get them there. In doing so, the Nigerian space agency must acknowledge what it already has to leverage with other countries also competing for outer space ventures. Human capital is one resource that it could contribute; scientists, researchers and potential astronauts could become useful to other nations with the same priorities. A mechanical advantage in the production of rocket parts and propulsion equipment, an initiative that has already gained NASRDA's interest, could also work. If countries witness and know of Nigeria's capabilities in human groundwork and rocket part production, then a partnership with them would be most valuable. In this regard, Nigeria should focus on designing and maintaining a low-cost, high capacity budget could grant the agency many avenues with which it can interact with other spacefaring countries.

On the other hand, agencies like ISRO have decided to create their own spaceflight programs for low costs. Over the past few years, ISRO's budget has increased steadily from 840 million USD to 1.89 billion USD (Bommakanti 2020). In comparison, NASRDA's budget for 2020 was approximately 44.48 million (USD), which is 75% of the 59.26 million allocated to Nigerian space activities by the government (Aerospace Security 2020). A majority of ISRO's

budget goes to its space technology initiatives, a financial strategy that increases the capability of the overall program, and subsequently reduces the amount of total launches. Something similar can be attempted by NASRDA, and is already being pursued as NASRDA seeks to improve its rocketry and propulsion capabilities. However, this solo route to space may not be the fastest. If speed for the sake of maintaining a competitive edge is a priority for Nigeria, it must be determined how the astronaut will get to space- a commercial flight to low-orbit, a continental agency's collaboration, or a flight to another nation's space station?

HUMAN SPACEFLIGHT IN INDIA, CHINA AND RUSSIA

Nigeria is not the first developing state to pursue manned spaceflight initiatives. Presently, the Indian Research Space Organization, or ISRO, has a budget of approximately two billion USD, and is known as one of the most cost-efficient space agencies in the world. Despite their small budget and humble beginnings in 1969, ISRO has launched 112 spacecraft, with only 9 being unsuccessful (ISRO). ISRO established a Human Spaceflight Program in 2007, and plans to test two uncrewed missions with its Gaganyaan program by late 2022 or early 2023. If these are successful, it will begin manned missions shortly after (Rao 2021). Given ISRO's cost-efficient success, it certainly serves as a respectable model for the Nigerian program.

If Nigeria does pursue an international route to space, should they focus on bigger countries that have already succeeded in orbit, such as China and Russia? Interactions with both of these countries would certainly be alarming for observing nations wary of these superpowers' capabilities. Such collaboration could possibly isolate Nigeria from the West. The People's Republic of China became the third country to send humans into space after the United States and

the Soviet Union. Since China was not invited as a signatory for the International Space Station, the Chinese National Space Administration (CNSA) created and launched its own space station, Tiangong, in 2021. Representatives of CNSA have also announced that they are open to inviting international astronauts onto their space station.

Russia's space expeditions were witnessed by the world during the Space Race throughout the 1960s. Competition between the United States and Soviet Union produced an array of successful firsts, including the first man in space, the first dog in orbit, and eventually, the first man on the moon. While the competition has given way to collaboration between the two nations, with the participation of both countries leading to the building of the International Space Station, Russia still maintains a productive space agency that interacts with smaller countries. However, as of March 2022, interactions with Russia have been more sensitive due to ongoing tension between the West, NATO and Russia's intentions towards maintaining sovereignty within itself and surrounding states. The most recent threat to leave an American astronaut behind on the International Space Station aroused controversy and brought the question of continued collaboration into a severe state of consideration. Although presently, Russia has a wavering relationship with NASA of the United States, Roscosmos has managed to maintain a collaborative relationship in spite of political differences.

Nigeria's communications satellites have been launched by China and Russia, so it is evident that a relationship between these three countries, at least in terms of their space-related diplomacy, already exists. However, the international reaction to such teamwork would also affect other relationships. Given that China was excluded from the International Space Station and Russia still maintains a position there, interactions with one country and not another, or vice ver-

sa, could suggest support or complacency with certain political leanings. For example, Russia's invasion of Ukraine in February 2022 has had an impact on its collaboration with the United States on the International Space Station. In the midst of the tension, the director of Roscosmos "threatened to leave [an American astronaut] behind in space and detach Russia's segment of the space station altogether" (ABC News 2022).

Although working with one country may not completely condemn Nigeria by correlation, consideration of how the relationship may be perceived by other countries must come before these strategic partnerships. For example, current tensions between Russia and the United States as a result of the war in Ukraine have placed the fate of the International Space Station and the future or further collaboration in jeopardy. The question of what Nigeria has to offer to foreign partners must also be asked. It is one matter to send a satellite into orbit; what benefit would Russia, China, or India gain by granting a Nigerian astronaut a seat on one of their spacecraft?

Nigeria has worked with Russia and China in the past for the launches of its satellites. In October of 2021, China sent its second crewed mission, the Shenzhou 13, to its space station Tiangong. The China Manned Space Program began to build its own space station in the spring of 2021, launching its first module in April. This space station was built after the nation was barred from joining the International Space Station by an American law that would require NASA to receive congressional approval before inviting Chinese astronauts aboard. China has mentioned that it is looking forward to inviting researchers to perform experiments on Tiangong. In fact, the Chinese ambassador to the United Nations, Shi Zhongjun, has stated that the "Chinese space station does not only belong to China, but to the world" (Grush 2018). A Nigerian re-

searcher could certainly be brought onto Tiangong, given the two nations' collaborations in the past. But how would this agreement move forward?

Space travel is not an all-inclusive market for free rides. First, we must distinguish what types of astronauts are typically onboard space missions. This will determine who the Nigerians could select to participate in a foreign expedition. In the United States, the early missions were heralded by test and fighter pilots who became the first official American astronauts. Within the first few months of testing the safety, cost, and durability of human space flight, payload specialists such as John Glenn were launched in the Mercury-7 program. The three-man crews of the Apollo missions consisted of a Commander, a Command Module Pilot, and a Lunar Module Pilot. These roles were created and assigned in accordance with their missions to the moon. The Space Shuttle program, designed for low-earth orbit, granted greater opportunities for “unofficial” astronauts to venture into space. Where previously, only former military-trained pilots had been the heroes of the space program, now stood an array of scientists, researchers, and even civilians. The Space Shuttles held seats for pilots, mission specialists, who operated arm deployment and spacewalks, and payload specialists. Even international experiments could be brought into space within the shuttles, such as the European Spacelab. These experiments varied from the study of plasma to the survival of microorganisms in space and significantly benefited scientific knowledge on earth (ESA 2003). If payload specialists are encouraged members on future missions to space, it might be possible for a Nigerian scientist to come aboard and perform experiments that would be of interest to participating countries.

The United States is both the oldest and most recent example of a developed nation hosting citizens of another country on their spacecraft. To use it as an example is to illustrate that the

common goal of low-orbit research can result in foreign astronauts being invited onto space missions. However, the politics, culture, and missions of the United States space administration do not directly resemble those of India, Russia, or China. The manned crafts of these countries only hold so many seats. India's Gaganyaan and China's Shenzhou-5 crew modules only have a capacity for three members. It is unlikely that these precious seats would be given to a foreign commander. However, during the Space Shuttle program at NASA, foreign payload specialists, such as Israeli pilot Ilan Ramon, were invited for diplomatic significance or science experiments. Although payload specialists did undergo basic flight training to understand and recognize the systems of their aircraft, they were not formally trained as astronauts were. Upcoming missions funded by the United States have grander destinations in mind, such as the Moon and Mars. Will there be room for payload specialists or civilians on these initial flights? Most likely, these first few flights will not be open to nations not aligned with the Artemis Accords. Perhaps in the future, as efficient travel between Earth, the Moon and Mars occurs, opportunities may arrive for other nations to sign on to Artemis and contribute their own astronauts.

AFRICAN EFFORTS FOR A CONTINENTAL SPACE PROGRAM

The concept for an African Space Agency provides an opportunity for African nations to begin independent ventures into space. As aforementioned, a statute was written in 2017 establishing the objectives and intentions of such an agency. The unification of the Egyptian, Nigerian, Algerian, and South African space programs, arguably the most influential on the continent, could provide future opportunities for independent African launches. However, legislative actions towards establishing a physical continental space agency have been delayed for the inde-

terminate future. The existence of a statute is proof that African nations have a clear desire to create their own agency, however, desire alone is not enough to get Africa off the ground. If a continental space program was made, there could also be an opportunity for other nations to launch from Africa. In this case, other countries could benefit from an independently African program as well. Money invested into African space efforts would stay within Africa instead of being spent in other countries. A plethora of jobs in administration, manufacturing, public relations, and even tourism could open up to people and inspire students across the continent.

What exactly is preventing the successful start of an African Space Agency concerns the turbulent political and economic climates of the countries that would be its frontrunners. Although there are several space agencies on the African continent, including Morocco, Algeria, Egypt, and South Africa, collaboration between them has not become a priority as of late. Individual goals, such as satellite initiatives, as well as political setbacks unique to each country (such as terrorism, inter communal conflict, and corruption), budget obligations, and internal conflict have prevented and prohibited a greater African agency.

COMMERCIAL OPPORTUNITIES FOR SPACE FLIGHT

In the past ten years, independent companies such as SpaceX and Blue Origin have worked in collaboration with larger national space programs to send people into space. Arguably, a person does not even have to be a fully trained astronaut to join such a mission. Actors such as William Shatner and even affluent businessmen like Amazon founder Jeffrey Bezos have donned space suits and launched into suborbital flights. The current rate of civilian access to space could increase astronomically in the next few decades. Space may not only be a resource for scientific

research, but an opportunity for tourism, and even a chance to accomplish national triumph. SpaceX has had international passengers on its vessels, so those who can afford it are granted the opportunity to go to space, regardless of where they are from. If Nigeria only wants to send its most affluent to space, it would be a matter of personal desire on behalf of any member of their wealthy class. For this thesis, the possibility of the first Nigerian or African citizen in space will be focused on the prospect of longevity and not one-time success. Furthermore, a flight on one of these space tourism rides is not as simple as buying a ticket. Spots on a low-Earth orbit flight are typically bought and reserved years in advance (Forbes 2022). To send a wealthy person into space would not guarantee a continued crewed program that would be reliable and beneficial for the future.

Nigeria could certainly take advantage of this surge in space tourism. Additionally, this tourism reserved for elites could potentially expand to include a wider audience. Just as air travel was once deemed a luxury for the wealthy, we could very easily see a similar expansion to the public for spaceflight. If Nigeria is able to implement a low-cost, high-capacity budgetary plan, it can contribute necessary items such as rocket parts, propulsion equipment, even human capital such as scientists and astronauts to other countries eager to collaborate. The first step to this is establishing credibility by seeking entry into the Artemis Accords and/or other international agreements towards peaceful spacefaring. Training and certifying engineers and future astronauts should be the next goal of the budget. Sending students abroad on scholarship so they can return and engineer parts for NASRDA is one suggestion of a financial investment that will have great social and economic return. By investing in what is possible now so the impossible becomes inevitable, Nigeria can use its own potential as leverage for the future.

CONCLUSION

The political controversies of human spaceflight in any country often question why explore space when there are already so many problems on Earth. Nigeria's history, corruption and human rights concerns make the nation a curious candidate for a crewed space mission. In fact, human space travel is quite a large leap for a West African agency that was only established twenty-two years ago. However, given the expanding opportunities across the globe, from commercial launches for leisure to plans for bases on the moon, human access to space is the next step to utilizing the final frontier for all mankind. There is always a risk in human space flight, be it political or economic investment. There is the risk that the country would be scrutinized for looking to the stars instead of to their own conflict-riddled soil. There is the risk that if a mission fails, money will be wasted and lives needlessly lost. There is a risk that success in the sky will be short-lived, or that political corruption may collapse the foundations of this venture. However, where there is risk, there is also opportunity. There is an opportunity to create stronger diplomatic relationships with other space-interested nations who seek to invest in Africa as a launching point for their own expeditions. There is an opportunity to begin an economic and cultural legacy of African-based space exploration, a legacy that provides secure jobs and education to African citizens and invites international investment and interest. And of course, there is opportunity to put the first African astronaut into space.

Conclusively, the quickest and most cost-efficient method to launch an African astronaut into space is by international collaboration on a lunar mission, a space station, or low-earth orbit. This, however, is a short-term solution. For a long-lasting investment into space, the true answer is to create a continental space agency for Africa that would permit its countries to embark on

space-faring journeys at their own will. Reliance on foreign countries can solidify or promote diplomatic relations, but it will not improve the local situation in Africa. This requires the collaboration of involved African countries as well as a feasible economic plan to maintain such an organization.

REFERENCES

"Achieving Broadband Access for All in Africa Comes With a \$100 Billion Price Tag."

World Bank, 17 Oct. 2019, www.worldbank.org/en/news/press-release/

[2019/10/17/achieving-broadband-access-for-all-in-africa-comes-with-a-100-](http://www.worldbank.org/en/news/press-release/2019/10/17/achieving-broadband-access-for-all-in-africa-comes-with-a-100-billion-price-tag)

[billion-price-tag.](http://www.worldbank.org/en/news/press-release/2019/10/17/achieving-broadband-access-for-all-in-africa-comes-with-a-100-billion-price-tag)

"Africa." *Space Generation Advisory Council*, 19 July 2020, spacegeneration.org/regions/africa.

African Union.

Bommakanti, Kartik. "ISRO And Satellites Launches – Why The Economic Survey Is

Misleading." *SpaceWatch.Global*, 25 Feb. 2020, [sp8acewatch.global/2020/02/](http://spacewatch.global/2020/02/spacewatchgl-op-ed-isro-and-satellites-launches-why-the-economic-survey-is-misleading/)

[spacewatchgl-op-ed-isro-and-satellites-launches-why-the-economic-survey-is-](http://spacewatch.global/2020/02/spacewatchgl-op-ed-isro-and-satellites-launches-why-the-economic-survey-is-misleading/)

[misleading/](http://spacewatch.global/2020/02/spacewatchgl-op-ed-isro-and-satellites-launches-why-the-economic-survey-is-misleading/)

Brooksbank, Schlosberg, Yamada, Benitez and Sunseri. "International Space Station

Caught in Crosshairs of Geopolitical Tensions." *ABC News*, 9 Mar. 2022, [abc](http://abcnews.go.com/International/us-russian-international-space-station-partnership-jeopardy-geopolitical/story?id=83343874)

[news.go.com/International/us-russian-international-space-station-partnership-](http://abcnews.go.com/International/us-russian-international-space-station-partnership-jeopardy-geopolitical/story?id=83343874)

[jeopardy-geopolitical/story?id=83343874.](http://abcnews.go.com/International/us-russian-international-space-station-partnership-jeopardy-geopolitical/story?id=83343874)

"Challenges and Opportunities of Nigeria's Space Program." *Aerospace Security*, 24

June 2020, [aerospace.csis.org/challenges-and-](http://aerospace.csis.org/challenges-and-opportunities-of-nigerias-space-program/)

[opportunities-of-nigerias-space-program/.](http://aerospace.csis.org/challenges-and-opportunities-of-nigerias-space-program/)

"Complex Emergencies : FAO in Emergencies." Home | Food and Agriculture Orga
nization of the United Nations, [www.fao.org/emergencies/emergency-types/
complex-emergencies/en/](http://www.fao.org/emergencies/emergency-types/complex-emergencies/en/) .

"Corruption in Nigeria: Patterns and Trends." United Nations Office on Drugs and
Crime, Dec. 2019, [www.unodc.org/documents/data-and-
analysis/statistics/
corruption/nigeria/Corruption_in_Nigeria_2019](http://www.unodc.org/documents/data-and-analysis/statistics/corruption/nigeria/Corruption_in_Nigeria_2019)

De Selding, Peter. "Nigcomsat-1R Launched Successfully by Long March."
SpaceNews, 21 Dec. 2011, [spacenews.com/nigcomsat-1r-launched-successfully-long-
march](http://spacenews.com/nigcomsat-1r-launched-successfully-long-march).

Dick, Steven J. "The Societal Impact of Space Flight." *Ask*, pp. 57-59, [appel.nasa.gov/wpcontent/
uploads/2013/05/NASA_APPEL_ASK_32i_societal_impact.pdf](http://appel.nasa.gov/wpcontent/uploads/2013/05/NASA_APPEL_ASK_32i_societal_impact.pdf). Accessed 11 Nov.
2021.

Drachlis, Dave. "Advanced Space Transportation Program Fact Sheet." NASA, [www.nasa.gov/
centers/marshall/news/background/facts/astp.ht](http://www.nasa.gov/centers/marshall/news/background/facts/astp.ht)

Giokos, Eleni, and Logan Whiteside. "Nigeria: Our Space Program is Not an 'ego Trip'." CNN
Money, 7 June 2016, [money.cnn.com/2016/06/07/news/nigeria-space-program/in
dex.html](http://money.cnn.com/2016/06/07/news/nigeria-space-program/index.html).

Grush, Loren. "China Invites International Researchers to Do Science on Its Future Space Sta
tion." *The Verge*, 29 May 2018,
[www.theverge.com/2018/5/29/17404896/china-space-station-international-cooperation-
united-nations](http://www.theverge.com/2018/5/29/17404896/china-space-station-international-cooperation-united-nations).

"International Participation in Artemis – An Update from NASA." United States Department of State, 1 Dec. 2020, 2017-2021.state.gov/briefings-foreign-press-centers/international-participation-in-artemis-an-update-from-nasa/index.html.

International Astronautical Federation. "IAF : National Space Research and Development Agency (NASRDA)." *IAF: International Astronautical Federation*, [www.iafastro.org/membership/all-members/national-space-research-and-development-agency-\(nasrda\).html](http://www.iafastro.org/membership/all-members/national-space-research-and-development-agency-(nasrda).html).

Kulu, Erik. "Nigeria EduSat-1 @ Nanosats Database." Nanosats Database, 2 Aug. 2021, www.nanosats.eu/sat/nigeria-edusat-1.

"List of Spacecrafts." *ISRO - Government of India*, www.isro.gov.in/list-of-spacecrafts.

Monks, Kieron. "Nigeria Plans to Send an Astronaut to Space by 2030." *CNN*, 6 Apr. 2016, www.cnn.com/2016/04/06/africa/nigeria-nasrda-space-astronaut/index.html.

"NASRDA Act of 2010." UNOOSA, Federal Government Printer of Abuja, Nigeria, 30 Aug. 2010, www.unoosa.org/documents/pdf/spacelaw/national/NASRDA_ACT

"Nigeria - Complex Emergency." U.S. Agency for International Development, 30 Sept. 2021, www.usaid.gov/sites/default/files/documents/2021-09-30_USG_Nigeria_Complex_Emergency_Fact_Sheet_4.pdf

Obadare, Ebenezer "Nigeria's all too familiar corruption ranking begs broader questions around normative collapse." *Council on Foreign Relations*, 24 February 2022. <https://www.cfr.org/blog/nigerias-all-too-familiar-corruption-ranking-begs-broader-questions-around-normative-collapse>

Pearlman, Robert Z. "White House Directs NASA to Extend International Space Station Operations Through 2030." Space.com, 31 Dec. 2021, www.space.com/white-house-international-space-station-2030-extension.

Pike, John. "NigComSat-1." GlobalSecurity.org, 2011, www.globalsecurity.org/space/world/nigeria/nigcomsat-1.html

Rao, Rahul. "India's Human Spaceflight Plans Coming Together Despite Delays." *Space.com*, 17 June 2021, www.space.com/india-human-spaceflight-plans-gaganyaan.

"Replacing Nigerian Satellite Gone Past Design Life; The Journey So Far." *Space in Africa*, 9 Apr. 2021, africanews.space/replacing-nigerian-satellite-gone-past-design-life-the-journey-so-far/

Serpell, Namwali. "The Zambian "Afronaut" Who Wanted to Join the Space Race." *The New Yorker*, 11 Mar. 2017, www.newyorker.com/culture/culture-desk/the-zambian-afonaut-who-wanted-to-join-the-space-race.

"Spacelab-1: Twenty Years on." European Space Agency, 28 Nov. 2003, www.esa.int/Science_Exploration/Human_and_Robotic_Exploration/Research/Spacelab-1_Twenty_years_on.

"SSTL's Space Portfolio - NigeriaSat-1 | SSTL." Small Satellite Supplier | Surrey Satellite Technology Ltd | SSTL | SSTL, www.sstl.co.uk/space-portfolio/launched-missions/2000-2009/nigeriasat-1-launched-2003.

"State of the Nigerian Space Program - Interview with Dr Halilu Ahmad Shaba , NASRDA New Director General - Space in Africa." *Space in Africa*, 26 May 2021, africanews.space/state-of-the-nigerian-space-program-interview-with-dr-halilu-ahmad-shaba-nasrda-new-director-general/.

Statute on the African Space Agency. 2018, au.int/sites/default/files/treaties/36198-treaty-statute_african_space_agency_e.pdf. Accessed 11 Nov. 2021.

Stimac, Valerie. "3 Predictions for Space Tourism in 2022." *Forbes*, 6 Jan. 2022, www.forbes.com/sites/valeriestimac/2022/01/06/3-predictions-for-space-tourism-in-2022/?sh=1374663b471c

"THE ARTEMIS ACCORDS: PRINCIPLES FOR COOPERATION IN THE CIVIL EXPLORATION AND USE OF THE MOON, MARS, COMETS, AND ASTEROIDS FOR PEACEFUL PURPOSES." *NASA*, 13 Oct. 2020, www.nasa.gov/specials/artemis-accords/img/Artemis-Accords-signed-13Oct2020.pdf.

United Nations Office on Outer Space Affairs. *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies*. U.S. Department of State, 1967, 2009-2017. state.gov/t/isn/5181.htm#treaty. Accessed 11 Nov. 2021.

"Your Guide to NASA's Budget." The Planetary Society, Apr. 2021, www.planetary.org/space-policy/nasa-budget.

