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NigeriaSat

Outlook

- With no new satellites projected to be delivered to Nigeria, this report will be archived
- Nigeria announced plans in September 2014 to build an indigenous SAR satellite to launch in 2018, but no progress has been announced since that date
- NigeriaSat-2 and NigeriaSat-X launched in August 2011, a two-year delay from the original date

Orientation

Description. NigeriaSat spacecraft are small satellites built as part of the Nigerian satellite program.

Sponsor. The government of Nigeria is the sponsor of the program. Surrey Satellite Technology Ltd (SSTL) partially sponsors the NigeriaSat-1 spacecraft.

Status. The NigeriaSat-1 was launched in September 2003 and is operational. Negotiations for the NigeriaSat-2 came to a successful conclusion in November 2006. The NigeriaSat-2 launched in August 2011.

Although Nigeria announced intentions in 2014 to build its own satellites by 2018, no progress toward that goal has been announced since then.

Total Produced. Three.

Application. The NigeriaSat-1/DMC is one of five satellites in the Disaster Monitoring Constellation that provides global Earth observation and disaster support. (See "Disaster Monitoring Constellation" report in this service.)

The NigeriaSat-2 is the follow-on to the NigeriaSat-1 and is more capable than its predecessor is.

Price Range. The NigeriaSat-1 cost approximately \$2 million to build. The NigeriaSat-2 cost an estimated \$20 million to build, launch, and operate.



NigeriaSat**Contractors****Prime**

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Technical Data

Design Features. The platform of the NigeriaSat-1 is based on Surrey Satellite Technology's SSTL-100 Enhanced Microsatellite design. The SSTL-100 is compatible for batch launch on the Cosmos, Dnepr, Eurockot, Athena, and Taurus.

The NigeriaSat-1 carries both communications and optical payloads. The satellite has a pushbroom multispectral imager that provides a 36-meter ground sampling over a 600-kilometer swath.

Payload data are transferred to five ground stations via an 8 Mbit/s S-band downlink.

The three-axis attitude control has three reaction wheels that provide agility. The model is based on the attitude control system of SSTL's UoSAT-12 mini-satellite.

The GPS receiver (SGR-10) was built by SSTL. It is an orbit/attitude determination subsystem that includes 12 channels and two receive antennas.

The power system is composed of four body-mounted gallium arsenide (GaAs) cell panels and a 10-cell, 7 Ah nickel cadmium (NiCd) battery. Power for the payload is provided by numerous switched and hardwired supplies from an unregulated 28 V bus.

The satellites in the Disaster Monitoring Constellation are equally spaced around a 686-kilometer, sun-synchronous orbit.

	<u>Metric</u>	<u>U.S.</u>
Dimensions (NigeriaSat-1)		
Based on SSTL's Modular Microsatellite		
Platform (stowed)	0.69 x 0.36 x 0.36 m	2.3 x 1.2 x 1.2 ft
Deployed antennas	0.84 x 0.58 x 0.58 m	2.8 x 1.9 x 1.9 ft
Performance		
Image resolution, nadir	36 m	118 ft
Swath width	600 km	373 mi
Orbit	Sun-synchronous	
Design life	5 yr	
Power	50 W	

Variants/Upgrades

NigeriaSat-1. This is a remote sensing satellite designed for low-Earth orbit. Launched in 2003, it is part of SSTL's Disaster Monitoring Constellation.

NigeriaSat-2. The NigeriaSat-2, built by SSTL, carries two high-resolution payloads: a 2.5-meter panchromatic imager and a 5-meter multispectral imager. It also carries a medium-resolution payload: a 32-meter multispectral imager. The medium-resolution payload serves as a replacement of the payload on the NigeriaSat-1 to ensure data continuity. It has a pointing

accuracy of about 35 meters, as opposed to the 350 meters obtainable from the NigeriaSat-1. The spacecraft is also capable of imaging in several modes. The NigeriaSat-2 can deliver 400 images per day.

The satellite, originally expected to launch in the middle of 2009, launched in August 2011.

NigeriaSat-X. Nigerian scientists and engineers built the NigeriaSat-X in 2009 with the help of SSTL under a Know-How Transfer and Training (KHTT) agreement signed as part of the NigeriaSat contract.

Program Review

Background. Nigeria's National Space Research and Development Agency (NASRDA) was established in 1999. The organization is managed by a governing panel presided over by Nigeria's president and the ministers of defense, research, information, and environment.

That same year, Nigeria considered developing a communications satellite system and remote sensing system. Originally, Nigeria had planned to launch two satellites before 2005 in a \$700 million coproduction program with the U.K.'s Surrey Satellite Technology. Although the Nigerian government approved the proposal, President Olusegun Obasanjo deemed it a low priority and too costly, and ordered it terminated in July 2000.

With the launch of the DMC demo satellite, Tsinghua, SSTL was able to re-establish negotiations with Nigeria. The Tsinghua was built under a KHTT program established between China and SSTL. The advances gained the attention and later the support of Obasanjo. Nigeria agreed to participate in the Disaster Monitoring Constellation with Algeria and the United Kingdom. Upon the Tsinghua's in-orbit success, SSTL was able to offer Nigeria a package that included participation in a global remote sensing system, a KHTT program, and a feasibility study for a communications satellite based on the SSTL-100 platform (formerly called Microsat-100). SSTL and Nigeria signed the \$13 million contract in 2000.

NigeriaSat-1 Launched

In December 2001, 15 engineers from the Federal Ministry of Science and Technology in Nigeria arrived at SSTL to begin work on the NigeriaSat-1 program. The NigeriaSat-1 entered the manufacturing phase in December 2002 and quickly took shape for its planned 2003 launch. Nigerian engineers finished their

classroom training and moved into the clean room, where their training continued throughout the manufacturing process.

The NigeriaSat-1 was launched alongside Turkey's BilSat DMC spacecraft and the U.K.'s DMC spacecraft in September 2003 on a Kosmos 3M from the Plesetsk Cosmodrome in Russia.

The DMC is the world's first constellation of multinational, low-cost Earth observation microsatellites specifically designed and dedicated to monitoring natural and man-made disasters. Each member nation built an advanced yet low-cost Earth observation microsatellite through Surrey's KHTT program. All members have agreed to exchange their DMC satellite resources and data to achieve a daily Earth observation imaging capability for monitoring disasters and other dynamic phenomena.

The original partners were Algeria, the People's Republic of China, Nigeria, Turkey, and the United Kingdom. In May 2002, SSTL sought and found additional sponsors – Thailand and Vietnam – that brought the total constellation to seven satellites.

NigeriaSat-2 Contract Signed

Nigeria's National Space Technology Development Program signed a contract with SSTL for the construction of its second Earth observation satellite, known as NigeriaSat-2, in late 2006. As part of the contract, SSTL was to install a new mission control center in Nigeria to operate the satellite. The company also provided on-the-job training in Guildford, U.K., for 25 Nigerian engineers, who built their own advanced flight-standard training model satellite under the supervision of the SSTL team.

The launch of the NigeriaSat-2 satellite was expected in the middle of 2009, but was delayed. Neither SSTL nor



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the NASRDA gave a reason for the delay. The NigeriaSat-2 and NigeriaSat-X launched together on August 17, 2011, on board a Russian Dnepr rocket.

SAR Satellite. In September 2014, Nigerian Minister of Science and Technology Dr. Abdu Bulama

announced that Nigeria would design, fabricate, test, and launch an indigenous synthetic aperture radar (SAR) satellite by 2018. The satellite was intended to be indigenously developed under a project headed by the Obasanjo Space Centre of the NASRDA.

Funding

Funding for the production of the NigeriaSat-1 was provided by Nigeria. The country signed a contract with SSTL for approximately \$13 million.

Timetable

Month	Year	Major Development
Nov	2000	Contract signed for NigeriaSat-1
Dec	2001	Nigerian engineers arrive for commencement of KHTT program
Nov	2002	Planned launch of first DMC satellite, Algerian AISat-1
Sep	2003	Launch of NigeriaSat-1 on Kosmos with BilSat and U.K. DMC
Nov	2006	NigeriaSat-2 contract signed
Aug	2011	NigeriaSat-2 and NigeriaSat-X launch on board Dnepr

Forecast Rationale

Nigeria has gradually developed space technologies under the NigeriaSat program. Initially, Surrey Satellite Technology Ltd built satellites as part of the Disaster Monitoring Constellation (DMC). SSTL also trained 25 Nigerian engineers to build satellites as part of the contract to build the NigeriaSat-2. Those engineers built the NigeriaSat-X, which launched alongside the NigeriaSat-2 in 2011.

Following the launch of NigeriaSat-2 and NigeriaSat-X, Abuja planned to build its own remote sensing satellite. The National Space Research and Development Agency planned to head development of a satellite, which would include a synthetic aperture radar payload. The agency aimed to complete the satellite by 2018.

Space research activities formed an important part of national industrial and technological development

strategies. Former Nigerian President Goodluck Jonathan reaffirmed the nation's desire to move forward with space technology development. The NigeriaSat program was a major part of this plan.

However, due to the expense and difficulty of developing a satellite, no progress has been announced on the program since it was initially revealed in 2011. With no progress, the NigeriaSat program will not take delivery of additional satellites. Instead, Nigeria will likely acquire satellite services from one of the many SmallSat operators. These companies offer rapidly updated imagery from global fleets of small satellites.

With no new satellites projected to be delivered to Nigeria, this report will be archived.

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