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Author: Ms. BLESSING ZINOM
National Space Research and Development Agency (NASRDA), Abuja Nigeria, Nigeria

DESIGN CONSIDERATION FOR CONSTELLATION OF SMALL SATELLITES TO TACKLE
INSECURITY CHALLENGES IN NIGERIA

Abstract

Nigeria has been faced with several insecurity challenges in the past and has drastically increased in the last eight (8) years, which has become a great challenge in the southern part of the country and greater threat in the north eastern part of the country. Space technology is an area of consideration when it comes to issues of insecurity. This paper analysis and highlights some important design consideration using small satellite constellation with different payloads to address the issues of insecurity. Basically, a low mass and low volume of any artificial satellite can be referred to as a small satellite. Small satellite constellation is considered a brilliant and promising direction towards satellite design. This design consideration proposes the use of small satellites orbiting in the low earth orbit (LEO) of sizes between 1k – 10 kg (Pico - Nano) depending on the size and the mission objective of the payload and the spacecraft design. Small satellites facilitate quicker, cost effective and reliable access to space which is of great importance to the spacecraft engineer. This paper highlights some reviews that have been carried and ongoing to improve constellation of small satellites. It also presents a design of small satellites in constellation that will achieve real time coverage with several satellite payloads for surveillance/ monitoring of affected areas. Satellite Tool Kit (STK) software package will be utilized to simulate different scenarios to check the capability of the constellation as regards intersatellite link and the functionality of the satellite bus. The design consideration in this paper is based on the use of commercial off the shelf (COTS) components. Formation design for small satellites with different payloads for a particular mission objective is indeed a great area to look into more and more for developing countries, the academic world or even small teams of space enthusiasts to develop their own space mission based on small satellites constellation to tackle insecurity.

Keywords: Constellation, Small Satellite, Satellite Tool Kit, Insecurity, Design Consideration, Low Earth Orbit