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FROM 1KUNS-PF TO WILDTRACKCUBE-SIMBA: STRENGTHENING THE COOPERATION  
BETWEEN ITALY AND KENYA IN NANO-SATELLITE MANUFACTURING AND OPERATIONS

**Abstract**

The development and operations of 1KUNS-PF, a 1U CubeSat manufactured by University of Nairobi in collaboration with Sapienza University of Rome, has marked the first nanosatellite launch from Kenya. The CubeSat started its development in 2017, was delivered to JAXA in January 2018 and was launched on May 11th, 2018, as first beneficiary of the UNOOSA/JAXA KiboCUBE Programme, from the Kibo module of the International Space Station. The satellite has been successfully completing its mission of testing the on-board bus components and acquiring panchromatic images of the Earth's surface in the almost two years of operations, providing an invaluable development platform. For the continuation of the joint manufacturing and operations of nanosatellites, Sapienza University of Rome, University of Nairobi and Machakos University have conceived WildTrackCube-SIMBA (Wildlife Tracking CubeSat – System for Improved Monitoring of Animals), a 1U CubeSat mission for capacity building and improved wildlife monitoring from a nano-satellite platform. The satellite project has won a free launch opportunity offered by IAF (International Astronautical Federation) and GK Launch Services at the 69th IAC (International Astronautical Congress) in 2019. The CubeSat equips several spread-spectrum receivers for low-SNR reception of positioning and health data from large mammals throughout Kenya national parks. The mission ground segment is composed of RF tags able to collect health and positioning data of animals over a large surface area and to uplink them to the satellite in real-time using spread-spectrum techniques in order to cover the distance using low-power transmitters. The acquired data is then downlinked in

bulk to ground stations via a typical RF link. WildTrackCube-SIMBA will aim at demonstrating this space technology for solving the progressively more frequent animal-human conflicts that occur at the boundaries of Kenya National Parks. This paper will describe the novel design of WildTrackCube-SIMBA by highlighting the major common points and differences with 1KUNS-PF, with which it shares most of the bus components. The lessons learned from 1KUNS-PF in satellite manufacturing and development, involvement of Italian and Kenyan students, performed capacity building activities and tasks will be reported together with the planned activities for the WildTrackCube-SIMBA operations. An overview of the performed tests on WildTrackCube-SIMBA both to assess the performances of the commercial spread-spectrum receivers and the CubeSat itself, and a preliminary report of the operations will be provided.