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MDASAT – A NANOSATELLITE CONSTELLATION TO IMPROVE THE SOUTH AFRICAN
MARITIME DOMAIN AWARENESS CAPABILITY

Abstract

MDASat is a proposed nanosatellite constellation that will provide maritime domain awareness services to the African continent. The mission will be developed by Amaya Space, a spin-out company of the nanosatellite programme at the Cape Peninsula University of Technology (CPUT). The programme is funded by the South African government's Department of Science and Technology in support of Operation Phakisa, an initiative with the goal of unlocking the economic potential of South Africa's maritime domain, which, by estimation, could contribute up to R177 billion to the GDP and 1 million jobs by 2033.

The ZACube series of satellites is being developed within the nanosatellite programme at CPUT, which has produced two satellites to date: ZACube-1, also known as TshepisoSat, launched on 21 November 2013, and ZACube-2, launched on 27 December 2018. These satellites are used as technology demonstrators that will feed technology into the MDASat programme. The MDASat constellation will support the Automatic Identification System (AIS), a terrestrial radio system used for collision avoidance among ocean vessels, as well as the VHF Data Exchange System (VDES), which is being designed as an extension to AIS, greatly expanding its capabilities, adding additional services and including support for satellite links. AIS was designed to use terrestrial coastal AIS stations to communicate with ships and its coverage is typically limited to several tens of nautical miles from the coast. The use of an AIS receiver on a satellite can potentially provide global AIS coverage, removing the aforementioned terrestrial coverage limitation. ZACube-2, developed as a precursor satellite for the MDASat mission, is a three-unit CubeSat that carries an advanced software defined radio (SDR) payload that implements an AIS receiver. The SDR payload is reconfigurable in-flight in anticipation of the implementation of the full VDES standard, as well as other communications applications.

An overview of the MDASat mission objectives, technology and value proposition, as well as preliminary ZACube-2 mission results, will be presented.