

31st IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS (B4)
Small Earth Observation Missions (4)

Author: Dr. Adrian Dumitrescu
Romania

Mr. Sebastian Severin
Politehnica University of Bucharest, Romania

Mr. Daniel Betco
Politehnica University of Bucharest, Romania

Ms. Ilona-Daniela Oprea
Elecnor Deimos, Romania

ROSPIN-SAT-1: ROMANIA'S FIRST OPEN SOURCE EARTH OBSERVATION CUBESAT MISSION

Abstract

Although Romania has been a full member of ESA since 2011, the country does not have an active CubeSat platform in orbit. Moreover, Romania is facing challenges in maintaining the health of its forests, due to severe droughts, pests, and occasional fires, all aggravated by climate change.

With the goal to raise awareness regarding these issues while developing Romania's first open-source Earth Observation Cubesat, the ROSPIN-SAT-1 mission was born. ROSPIN-SAT-1 is a student-led project started and managed by the Romanian Space Initiative (ROSPIN), an NGO established in 2019 that promotes space education activities. Since January 2023, the ROSPIN-SAT-1 platform is under development as part of the ESA FYS Design Booster Program.

The primary objectives of ROSPIN-SAT-1 encompass the collection of high-resolution images of Romanian territory and forests, providing an open-source in-orbit platform for stakeholders to test software applications. ROSPIN-SAT-1 is fostering the development of the local space sector by engaging Romanian students and young professionals in the CubeSat mission lifecycle. While ESA already has the OPS-SAT mission in orbit, a similar open-source satellite is a timely addition given the long waiting time to test software on OPS-SAT.

ROSPIN-SAT-1 is a 3U CubeSat primarily composed of COTS components. It features a payload consisting of an RGB camera with a resolution of 36 m/px and a Payload Experimentation Platform (PEP), designed to run onboard experiments. The PEP includes an FPGA and a carrier board that will manage the interface with the rest of the CubeSat. The satellite will be launched into a Sun-Synchronous orbit at an altitude of 465 km for a 2-year mission time. ROSPIN-SAT-1 is close to its CDR and Flat Sat activities are commencing.

ROSPIN-SAT-1 will continuously supply foresters and farmers with pertinent agroforestry inventory information while offering a platform for experimentation in space technology. Consequently, ROSPIN-SAT-1 will provide consumer-aligned data products, including high-resolution images and metadata for targeted areas, to aid reforestation efforts, and source-aligned data products, consisting of experiment results, to empower students and companies. The digital products will be accessible through a dedicated portal, facilitating collaboration and innovation. Data processing and packaging will be conducted internally, with infrastructure supporting data transfer from the Ground Station to the Operation Centre.

This paper presents a high-level analysis of the concept of operations and of the CubeSat platform, with a focus on the payload data products and the data management of the open-source aspect of the mission.