

IAF EARTH OBSERVATION SYMPOSIUM (B1)  
Earth Observation Applications, Societal Challenges and Economic Benefits (5)

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AN EARTH IMAGING CUBESAT AS A DISASTER RELIEF TOOL FOR AMATEUR RADIO  
OPERATORS

**Abstract**

Real-time Earth imaging has been shown to make a tangible difference in the efficacy of emergency relief operations. During a disaster, the environment itself is rapidly changing and being able to understand the current landscape is essential for any relief efforts. Data from current Earth observation satellites can only be retrieved through conventional communication infrastructure such as ground stations, radio towers and data lines which may fail during an emergency. Traditionally disaster relief efforts have relied on Amateur Radio Operators (AROs) to continue the flow of information in these situations. However, they can only transmit data that is available to them which has historically not included satellite imagery data. To address this shortcoming, we designed ALEASAT, a 1U Earth-imaging CubeSat, that will provide on-demand satellite imagery directly to AROs. An ARO will be able to send a request with a set of coordinates to the ALEASAT team, who will approve the request and provide the ARO with an authentication key to allow direct communication with ALEASAT. During the next available pass, ALEASAT will capture the image and the ARO can retrieve it directly from the satellite.

ALEASAT will be launched into a low sun-synchronous orbit in late 2021 and operate for a nominal mission lifetime of 6 months, with a possible extended mission continuing until its eventual reentry. As the first of its kind, ALEASAT will serve as a low-cost demonstration mission to test the technology and operations, and train AROs for disaster relief. This mission will pave the way forward for a potential constellation of CubeSats to deliver on-demand and up-to-date imagery to all AROs. Due to the limited available bandwidth and downlink pass times, image compression will be necessary to transmit images to AROs in a single pass. To achieve this and increase the efficacy of a future constellation, the team will test a variety of compression algorithms that can be developed and improved by researchers on the ground, and later uploaded for testing during regular in-orbit operations.

As climate change worsens, the severity and frequency of natural disasters is expected to increase dramatically and remote communities are the most exposed and vulnerable to these disasters. This is where amateur radio services play a significant role in emergency response. Our goal for ALEASAT is to serve and help these communities face the increasing environmental challenges they may encounter in the future.