

IAF SPACE OPERATIONS SYMPOSIUM (B6)
Mission Operations, Validation, Simulation and Training (3)

Author: Mr. Muhammad Ziyaad Soreefan
Mauritius Research and Innovation Council (MRIC), Mauritius

Dr. Vickram Bissonauth
Mauritius Research and Innovation Council (MRIC), Mauritius
Mr. Muhammad Faraaz Shamutally
Mauritius Research and Innovation Council (MRIC), Mauritius

THE CHALLENGERS OF OPERATING A SATELLITE FOR THE FIRST TIME

Abstract

On the 22nd of June 2021, MIR-SAT1(Mauritius Imagery Radiocommunication Satellite 1) was deployed from the ISS. From the six orbit elements provided by JAXA, an estimated TLE was generated for the spacecraft using STK. 45 minutes after deployment, the satellite switched on and first transmission signals were identified over the east coast of Australia. First beacons were decoded over the east coast of USA. The MIR-SAT1 separation sequences occurred as planned on the first attempt where the antenna and solar panels were deployed from the data captured by the Radio Amateur community. The newly setup Ground Station (GS) in Mauritius managed to capture the transmission signal of the spacecraft over Mauritius however it took 2 days to troubleshoot and adjust the GS. Once the link between the satellite and the GS was established, the Engineers proceeded towards the commissioning phases of MIR-SAT1. Before the commission phases has even started the engineers noticed that the CubeSat had a high spinning rate. Commands were uploaded to the satellite to switch on its magnetorquers to lower the spin rate. Once the satellite was stabilised, the commission campaign started where every subsystem onboard was tested thus ensuring the satellite is operating as expected. The commissioning campaign went for 2 months. The engineers had to test commands on the FlatSat, simulate the satellite passes using STK, maintain the GS and work around the clock to ensure maximum passes were conducted. In July 2021, the first images were captured by MIR-SAT1. First thumbnails were downloaded to check the image content. During the downloading process, it was found that the CFDP protocol inefficient. Hence, LDT is being used to download all the satellite telemetries and payload data. Downloading images turned out be longer and more complex than anticipated. The next challenge was to orientate MIR-SAT1 so that its camera faces earth which required an understanding of the satellite attitude. MIR-SAT1 has three missions' objectives:(1) (a) Establish contact with MIR-SAT1 on orbit. (b) Receive telemetry from and send telecommands to MIR-SAT1. (2) (a) Capture an image with the Primary Payload and downlink the image to the MRC Ground Station. (b) Perform imaging operation in the Mauritian EEZ. (3) (a) Experimental communication with other islands in the region via the satellite (for scientific and/or emergency purposes). (b) PACSAT. As the mission progress, more technical challengers arose which turned out to be beneficial for this capacity building mission.