

Mauritius's Big Step to becoming a Spacefaring Nation:

The story of MIR-SAT 1

Interview conducted on 11 August 2021

Institution:



Interviewee: Vickram Bissonauth, Faraaz Shamutally and Ziyaad Soreefan (Mauritius Research Innovation Council)

Background:

The [United Nations Office for Outer Space Affairs \(UNOOSA\)](#), in partnership with [Japan Aerospace Exploration Agency \(JAXA\)](#) offers the UN/Japan Cooperation Programme on CubeSat Deployment from the International Space Station (ISS) Japanese Experiment Module (Kibo) "[KiboCUBE](#)". The programme aims to provide educational or research institutions from developing countries with the opportunity to deploy CubeSats from the International Space Station Japanese Experiment Module "Kibo". The collaboration between UNOOSA and JAXA initiated in 2015 and has been the cornerstone of the UNOOSA [Access to Space for All Initiative](#). Thanks to KiboCUBE, three countries Kenya, Guatemala and Mauritius have deployed their satellites into space.

[Mauritius Research and Innovation Council \(MRIC\)](#) was selected as the 3rd round awardee of KiboCUBE in 2018. The first satellite of the Republic of Mauritius, [MIR-SAT 1](#) was successfully deployed into space on 22 June 2021 and is now orbiting the Earth.



Team MRIC (from left; Mr. Faraaz Shamutally, Mr. Ziyaad Soreefan, Dr. Vickram Bissonauth, Mr. Koushul Narrain and Mr. Kiran Tatoree) ©MRIC

Interview:

What is the main objective of MIR-SAT 1?

In the initial design, the Mauritius Imagery and Radiocommunications Satellite 1 “MIR-SAT 1” was originally a CubeSat that carried an infrared thermal camera to detect sea temperature change and UHF/VHF modules and S-band to acquire experience in satellite communication technologies. During the development, due to technical difficulties and with some of the components planned for use being phased out of the market, many changes had to be made. As a result, the current MIR-SAT 1 is equipped with a commercial-off-the-shelf camera, which will serve to test the transmission of imagery and on-board communication systems. We have also included an experimental module which will allow us test ‘island to island’ communication between the Indian Ocean islands.

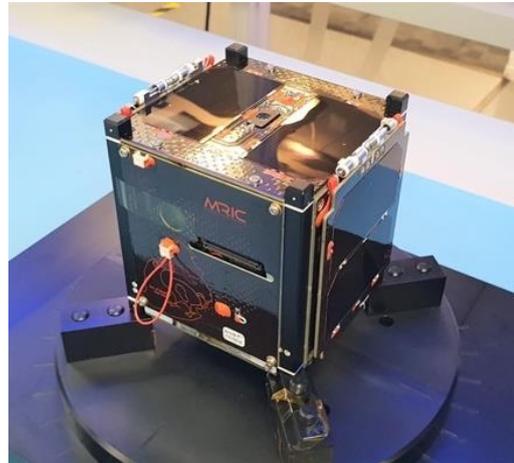


Photo of MIR-SAT 1 ©MRIC

What is the current status of MIR-SAT 1?

The satellite is currently in orbit and is in the process of a 8 week commissioning phase, where we are checking the health of all the subsystems of the satellite. The commissioning phase also helps us in getting a good grip on the ground segment and solving issues as they appear. For example, we set our antenna on the 10th floor of the MRIC building, but had to unmount it when the wind was too strong and threatened its integrity. Commissioning a satellite is a lot about learning and adjusting, however, we are at the final steps of this phase and hopefully MIR-SAT 1 will soon be able to proceed to its mission mode and start taking images of Mauritius.

Thanks to the radio amateurs around the world who were on the outlook for signals from MIR-SAT 1 from the launch, we were notified that the first signal from the CubeSat was received just 45 minutes after the deployment. Thanks to the hard work (Pro-Bono) of our expert collaborators Mr Daniel Estevez and Mr Chris Thompson, we developed a decoder to share with all radio amateurs, so that they can connect and download telemetry data from MIR-SAT 1, which proved successful and helped us grasp the status of our satellite.

As part of the requirements of the KiboCube Programme, we are also carrying out capacity-building activities targeting secondary school students with the support of the [Mauritius Amateur Radio Society \(MARS\)](#). The support of the radio amateur community has been outstanding and members of MARS, led by Mr Jean Marc Momphe have helped with technical workshops from to secondary schools and universities within Mauritius. The aim of these workshops is for students to get acquainted with the antennas and communication technology. We have helped 100 students from over 12 schools and 5 universities to build simple antennas to communicate with MIR-SAT 1. In the first instance, the trained institutions have used their antennas to capture images from the NOAA satellites – some of the pictures downloaded can be viewed on the [MIR-SAT1 website](#). We are thrilled to see that some schools were able to download telemetry data from MIR-SAT 1 within a month after the launch. Our target is to reach out to all schools in Mauritius, including the small island of Rodrigues. We want to make the students realize that they are closer to space than they think and that everything is possible!



Photo of technical workshops conducted at Raffa State Secondary School for Boys (left) and Forest Side State Secondary School for Girls (right) ©Mauritius Radio Amateur Society

How did the MIR-SAT 1 team start off?

It all started, back in 2017, with a solicitation from the Ministry of Foreign Affairs and the Ministry of Education, Tertiary Education, Science and Technology to all universities in the country and institutions such as MRIC to consider participation in the KiboCUBE Programme offering the possibility for Mauritius to design, build and deploy a CubeSat in space. MRIC as part of its mandate to pioneer new and emerging research, took up the challenge. We solicited help from a number of international experts, amongst which only [AAC Clyde Space](#), a UK based company, responded positively to our solicitation. In close consultation with AAC-Clyde Space, we started to work on a proposal. In short time we were able to put an application together and submit it just in time. That proposal did not make it through at our first attempt in 2017, but we received advice on improvements from an engineer from JAXA, which encouraged us to try even harder for the following round. We then sought advice and expertise from the amateur radio community at MARS and together with AAC-Clyde Space, we submitted a second proposal to the 3rd Round of the KiboCube Programme, where our proposal was finally selected among all the submissions. With the help of AAC Clyde Space, we worked through the whole process of satellite design, building and testing. AAC Clyde Space also trained our personnel for designing, building, testing and operating the satellite and its ground station. Slowly but surely, our team is getting a good grip of all the technicalities that need to be understood. We are all enjoying this learning process together.

How did the development of MIR-SAT 1 go?

The COVID-19 pandemic delayed the development for roughly more than 1 year. We managed to work with Clyde Space online, with countless meetings, exchanging documents and information electronically. Honestly, if we were able to complete the scheduled visits to the UK where our team members would have had the chance to actually be present in the facilities, we feel we would have gained a lot more. Especially, after travel restrictions kicked in, the testing phase and assembly phase were all conducted online.

Safety assessments and reviews with JAXA were also all conducted online. This was a new way of working for JAXA as well, and we all discovered new things, learned, adapted, and grew from each other through this experience.

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Photo of Fit-check Case Test conducted online between MRIC, JAXA, Clyde Space and UNOOSA ©UNOOSA



We would not say that everything went smooth during the development phase, but our team valued the “People’s Approach”, instead of just sending emails and waiting, we were very proactive and found opportunities to talk and engage more with the related people.

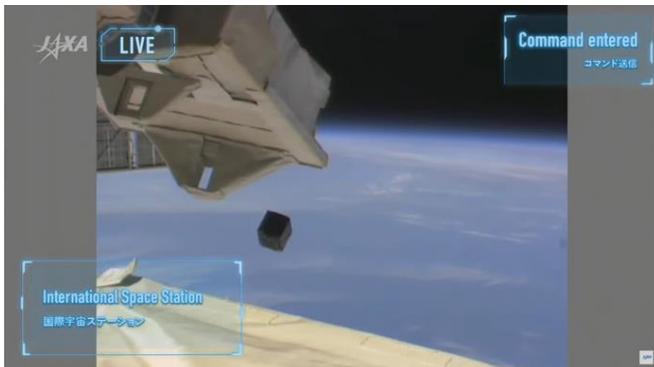
Were there any difficult or challenging moments in the process?

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There were frustrating moments where we had to push for things, but we were able to navigate through them and made very effective use of online productivity tools that helped adjusting with everyone’s different work styles. KiboCUBE has also been a great learning experience on working with other cultures and on international cooperation. With this we are now better equipped to overcome other challenges. One of the most difficult experiences through the project was the radio frequency registration but luckily we were working together with the amateur radio community and the local authority for telecommunication – the Information and Communication Technologies Authority of Mauritius (ICTA).

One of the team members, Jean-Marc Momple who is a radio amateur, was instrumental in this process. We believe despite of UNOOSA and the [International Telecommunication Union \(ITU\)](#) have worked together to provide [information](#), more awareness raising on that topic would be beneficial and KiboCUBE as a programme can do more in that respect.

How has the deployment of MIR-SAT 1 impacted your country?



This very first satellite has opened new opportunities for us

The government and the people of Mauritius are very proud that, only after 50 years of independence, Mauritius has become spacefaring, with our own satellite in space.



This very first satellite has opened new opportunities for us and there have been many messages congratulating the country and expressing interest to learn from our experience or for international collaboration.

(Top) Photo of MIR-SAT 1 deployment from ISS ©JAXA/NASA

(Below) Prime Minister of Mauritius witnessing the deployment © Government of Mauritius



What future vision do you have now?

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We are in discussion for the development of a space programme. The 4 aspects of the programme would be,

1. Pursuing capacity building, awareness raising and development of space satellite technology
2. Leveraging international collaboration opportunities to push the country's mandate further
3. Initiating the creation of space related start-ups in the country to create business
4. Creating a national network for space science, technology and applications incorporating the universities in Mauritius and making sense of the already existing space data to advise policy

With the government having interest in encouraging the creation of new and innovative business within the country, this is an opportunity to bring international firms conducting space related business to

Mauritius, to create a knowledge portal and future revenues. As a Small Island Developing State (SIDS), Mauritius is constantly at risk of the negative effects of climate change. Mitigation of these effects is a big priority of the country. We strongly believe that space technology can contribute to mitigating, adapting and also innovating new solutions to address climate change.

We hope that UNOOSA and the international community can help us gain the understanding of the government by continuously supporting the MIR-SAT 1 project, sharing lessons-learned of developing space activities, especially SIDS, and giving us a voice.

Would you recommend KiboCUBE to others and why?

KiboCUBE has been a very exciting journey for us. At each step, you discover something new and you are able to grow. The Access to Space for All Initiative and KiboCUBE allow countries to get on the wave and take part in the space activities of the new era. It boosts innovation and confidence within the country and brought us recognition from other countries.

We strongly recommend countries to take part in KiboCUBE and the other Access to Space for All opportunities. It is not an easy journey, but it is worth it, every step of the way.

For more information on MIR-SAT 1, please check out SpaceMauritius.com



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Photo of MIR-SAT as seen from the ISS after deployment ©JAXA/NASA