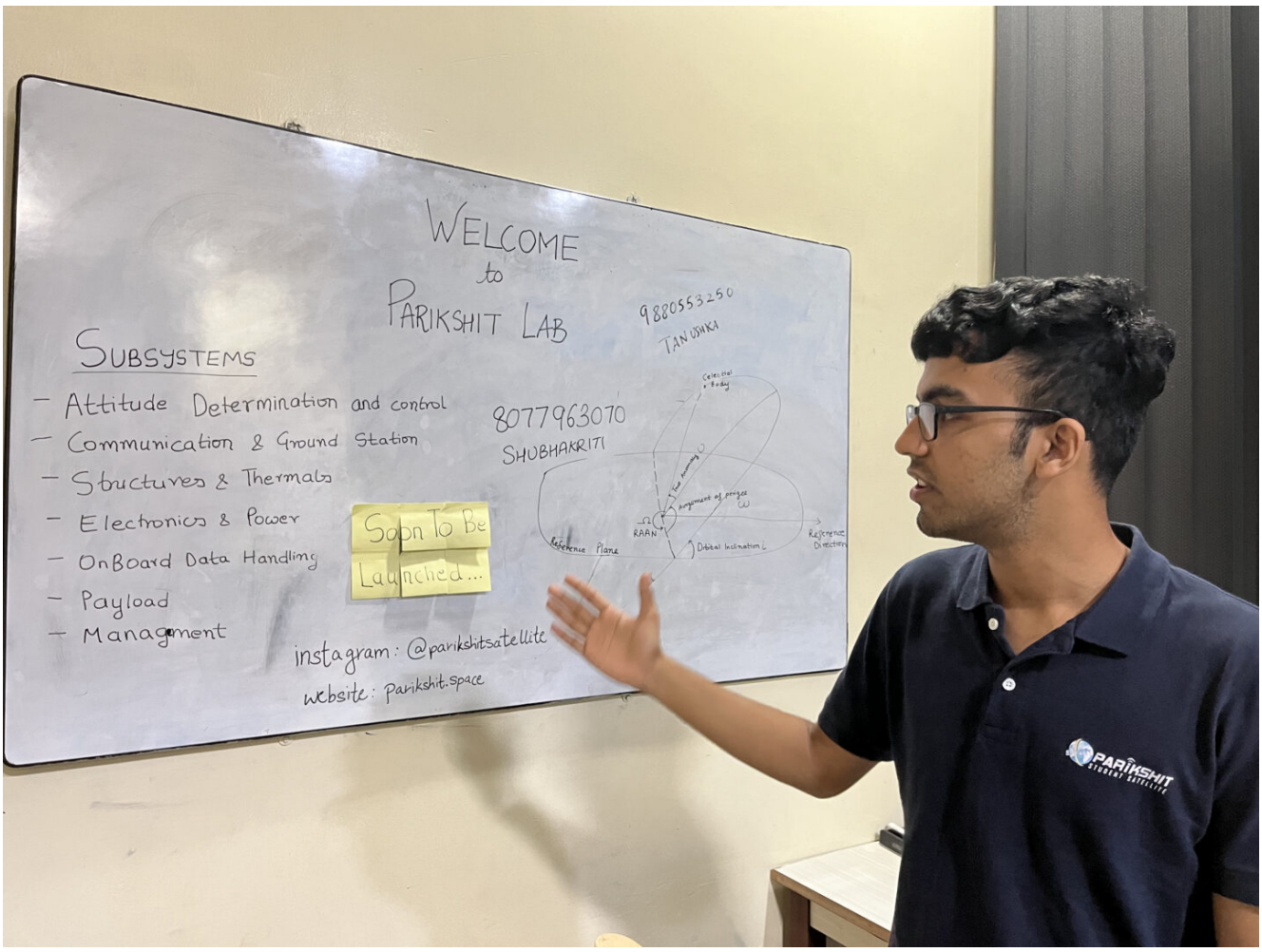
To Infinity and Beyond—SATCON 2022

On 4th November 2022, the team behind Parikshit Student Satellite organized SATCON 2022 to discuss satellite technology and give a tour of their workshop. Parikshit Student Satellite is a group of passionate undergraduates designing and building a low-cost 2U class nanosatellite. They aim at using their satellite for thermal imaging of the Indian Subcontinent, being launched by ISRO in 2023. They discussed the subsystems that go into making the satellite and briefed about the work they do. The tour was presided by Tanushka Choudhary, Akash Kumar Singh, Ojas Ashwini Ravindra, and Chinmay Marathey.

Member from Parikshit conducting the talk [Credits: Pranav K]

The seven subsystems discussed by the team were:

- Attitude Determination and Control Subsystem: Once the satellite is out of the PSLV, it launches into orbit tumbling at high angular velocities, the job of ADCS is to bring the satellite to stability and maintain its orbit and orientation to fulfil payload requirements.
- Communication and Ground Station Subsystem: COMMS is responsible for providing a robust link between the satellite and the ground station. The Parikshit Ground Station (PAGOS) is built to receive the beacon and payload data from the satellite.
- Electrical Power Subsystem: They are responsible for harnessing, conditioning, storing, and distributing power onboard the satellite. They also deal with the design of PCBs for the testing of the modules of the satellite.
- On-board Data Handling Subsystem: The On-board Data Handling Subsystem (ODHS) is the brain of the satellite. ODHS is responsible for developing drivers, integrating modules, and scheduling processes using a Real-Time Operating System (RTOS). It ensures proper links between the PCBs and controls the system’s data flow.
- Payload: The payload subsystem deals with the final objective of the satellite mission. Images captured by the thermal camera are processed and analysed. Research is underway regarding a novel passive deorbiting technique.
- Structures, Thermal, and Mechanisms Subsystem: They are responsible for the final assembly of the satellite. They also ensure that the satellite can persist launch loads, survive radiation, deal with extreme temperature conditions, etc.
- Management: Management deals with all the back-end operations of the team. They also deal with the development of the website and social media platforms while handling administrative and PR relations.



The Parikshit team explaining their subsystems [Credits: Pranav K]

The tour of the workshop began with a basic introduction to the program and then moved on to the first stop—the Parikshit Ground Station. The next stop in this tour was the actual working area, the place where the magic happens. A place where the whole architecture of the satellite takes place. From ideas to mathematical calculations. The complete plan for its execution took place in this room.

Parikshit's primary goal is simple, to make a satellite that will dramatically bring down the total cost of construction. With an expected launch date towards the end of 2023, this satellite is being made to orbit the earth for 8 to 12 months. To ensure that the purpose of this satellite is completed, the satellite will be installed with two payloads. The primary payload will be the Thermal Energy Camera and the secondary

payload is the Electro Dynamic Tether. The Electro Dynamic Tether is wrapped by a conducting wire. This wire will ensure that the satellite will lose its orbit once its lifespan is up so that the space waste will be reduced. The tour also included the Signal Generator and Oscilloscope, used to test the components and generate the signals.

Finally, they discussed the role of emerging technologies in the space industry and the percentage of companies and associations making use of these technologies.

- Miniaturized satellites: used by 24% of the associations
- Advanced space manufacturing: used by 22% of the companies
- Advanced communications: used by 10%
- Space traffic and transportation management: used by 9%
- Smart propulsion: used by 7%
- Space-based activity management: used by 7%
- Space mission: used by 7%
- Space mining: used by 6%
- LEO satellites: used by 4%
- Space data: used by 4%

A few of the major applications of these new technologies discussed during this presentation were tracking climate change, disaster monitoring, military, and defense. According to the presenters, the event might not have turned out the way they expected, but, in the end, it was all worth it.

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