

## NEW HORIZONS

Relevant for: Science & Technology | Topic: Space Technology & related matters

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Last week, Indian Space Research Organisation (ISRO) head K Sivan spoke about India building its own space station by the end of the next decade. The announcement came as a surprise, but ISRO seems to have been working on this project for some time. The first indication came in 2017 when Rs 10 crore was budgeted for an orbital rendezvous and docking experiment between two satellites. Docking expertise is essential when two separate free-flying units in space are required to physically link with each other. This technique is important to link the space shuttle with the space station. The second indication was when the human space flight mission (2021/22) was announced in August 2018. This suggested that India was preparing to undertake microgravity experimentation.

India's space station is expected to be very small with limited utility. It would be placed in an orbit, 400 km above earth. ISRO has mentioned it would start planning for the station only after the successful completion of a manned space flight, slated for 2022. ISRO has now called for proposals for experiments, including docking, to be carried out on the orbiting platform (PS4-OP). For the last few years, ISRO has been experimenting with its PSLV rocket in different ways. Now, a single PSLV rocket can put satellites in different orbits. PSLV launch vehicle is a four-stage rocket. On two occasions (PSLV-C44 and PSLV-C45 missions) in 2019, ISRO successfully converted the fourth stage (PS4) of the rocket into an orbital laboratory. Such laboratories are normally hosted on space stations.

Since the project is in the inception stage, some questions about the proposed space station should be asked.

First, is India trying to reinvent the wheel? Should India not have participated in the International Space Station (ISS) experiment? The ISS is now in the last leg of its existence and is expected to become redundant during 2024-28. India could not have been a part of the ISS in its heyday since it was excluded from such projects because of Delhi's nuclear policy; ISRO and DRDO were taken out of the export control list only in 2011.

Second, what are the scientific benefits of microgravity experimentation? It offers the scientific community a range of subjects to conduct research in, from astronomy and meteorology to biology and medicine. Also, materials is one arena where India should make major investments. Breakthroughs in this field would have major commercial and strategic benefits.

Third, why is India planning for a very small space station? ISS, which is a joint project of 16 countries (the US, Russia, Europe, Japan, etc), is a 400-tonne station, while the proposed Chinese space station (Tiangong programme) is likely to be a 80-tonne station. India is proposing a 20-tonne station to serve as a facility where astronauts can stay for 15 to 20 days. Would it not be wise to have a project with much bigger dimensions where scientists can stay longer? There is a need for ISRO to learn from the past experiences of missions to the Moon and Mars. These missions offered limited scope for scientific experimentation since India's heavy satellite launch vehicle, GSLV, was not ready in time, and ISRO could not send heavier

scientific payloads. But with India making a breakthrough with cryogenic technology, ISRO is expected to have better options by the end of next decade to carry a heavier payload to the low earth orbit.

Fourth, is the project economically viable? Cost consideration could emerge as a major issue. So, India must involve the private sector in such projects. Recently, NASA has declared that the ISS would be open for commercial business and people could “purchase” a ticket to visit ISS. India could think of developing such projects under a public-private partnership model.

Major projects like the space station are national projects. They may not offer any immediate scientific/technological benefits, but investments must be sustained. Private industrial houses within India should be encouraged to participate in such projects.

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