



Prez Murmu, during a Human Rights Day event, says climate change is knocking on the doors and people in poorer nations are going to pay a heavier price for the degradation of environment, P 26

US soccer journalist Grant Wahl, who was earlier briefly detained for trying to enter a WC stadium in Qatar in a rainbow T-shirt in support of LGBTQs, dies after suffering 'acute distress' while covering a match, P 23

Veteran musician Elton John is the latest celebrity to leave Twitter following Elon Musk's takeover of the platform. "Their recent change in policy will allow misinformation," he says

Former track and field star P T Usha has been elected the first woman president of Indian Olympic Association, ushering in a more inclusive era for sports administration in the country, P 25



These Hyderabad startups want to be your ticket to space

After Successfully Launching A Rocket And Satellites, Respectively, In November, Skyroot And Dhruva Space Have Their Sights Set On Human Spaceflight In The Next 10 Years

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November 2022 was a watershed for India's private space sector, and powering this thrust were two Hyderabad-based space-tech startups - Skyroot Aerospace and Dhruva Space. On November 18, Skyroot sent India's first privately built rocket, Vikram-S, into space in its maiden attempt, something even biggies like Elon Musk could not do.

Buoyed by the success of their 'Mission Prarambh', Skyroot founders Pawan Kumar Chandana and Naga Bharath Deka are now dreaming of making space travel as affordable as air travel.

"The common man should be able to access space - be it visiting as a space tourist or even living in space. Today, space travel is very expensive, but as rocket technology matures and feasibility improves, it can come down to a few hundred dollars. The ultimate aspiration and goal is to make it as affordable as air travel," says Chandana.

Elon Musk's SpaceX, Richard Branson's Virgin Galactic and Jeff Bezos' Blue Origin demonstrated civilian space travel in 2021. "If an 82-year-old can travel to space, anyone can," adds Chandana, referring to female aviator Wally Funk, who travelled with Bezos on board Blue Origin's New Shepard in July 2021.

Fresh off the success of their sub-orbital test flight, Hyderabad's own rocket boys, who have 'Opening Space for All' as their mission statement, have already hit the drawing board to kickstart the development of reusable rockets and space capsules that could ferry humans.

Chandana says while the market for human space travel in the US is burgeoning, India has the potential to emerge as



NEW FRONTIERS: (Top) Skyroot founders Naga Bharath Deka and Pawan Kumar Chandana recently launched their first sub-orbital test flight (right). (Above) Dhruva Space's Chaitanya Dora and Abhay Egoor launched two nanosats as part of an Isro mission

the second largest player ahead of Europe or even China. "We are on the cusp and see the tipping point in human space travel from India in the next 10 years. In the next 20 years, I expect everybody to start travelling to space."

But he adds satellite launches will be the first step in developing reusable rockets, and only then will they graduate to capsules for human flight as that requires life-support systems and the ability to come back safely to Earth.

"It is our target to develop reusable rockets in the next 5-8 years, followed by capsules to ferry humans. Reusable rockets will be humongous - taller than 30-storey buildings and weighing several hundreds of tonnes. A lot of investment has to come together and tech dem-

onstration has to take place to enable human travel on our rockets," explains Chandana.

Meanwhile, Dhruva Space, which successfully launched two nanosats into orbit on board Isro's PSLV C54 on November 26, is busy working on two multiple payload platforms - a 30kg satellite called P-30 and a 90kg one called P-90, besides working on launching constellations of 100-500 satellites, even as it nurtures ambitions of participating in human flight programmes with Isro and other agencies.

"Human spaceflight is the next big thing that is going to happen from India in the next 5-10 years. We have already submitted some proposals to Isro for the human spaceflight programme that came out last year or so. We are excited

about contributing to the programme in the future," says Dhruva Space founder and CEO Sanjay Nekkanti.

Both Skyroot and Dhruva claim their successful maiden missions are garnering a lot of investor and customer interest from India and abroad, and they are counting on collaborations with Isro, which mentored them, to realise their human spaceflight dreams.

Skyroot's Chandana says their reusable launch vehicles will be built using technology similar to their Vikram series, but since it's a humongous project they are eyeing a good public-private partnership (PPP). "What we are looking for is a good PPP, like the one that Isro is taking up with Gaganyaan. We hope to help out in a joint programme." He

adds that Isro's experience with Gaganyaan will help private players like them.

Nekkanti says Dhruva could build some of the critical elements related to the human spaceflight programme, such as large solar arrays for satellites that can also be utilised in human spaceflights around crew capsules or space stations. It can also contribute towards the communication requirements of these missions as it has developed ground stations, he adds.

Abhay Egoor, co-founder and CTO, Dhruva Space, says sensors that go into spacecraft, inflatables as well as astrobiology are other areas where Dhruva Space is partnering with some educational institutions and companies to come up with combined proposals.

Needless to say, both startups are gearing up for their next space odyssey. Skyroot's scheduled to launch its first commercial rocket, Vikram-1, in October 2023, followed by Vikram-2 in mid-2024 and Vikram-3 by 2024-end. It is already in parleys with the Telangana government for acquiring or leasing a huge parcel of land to set up its integrated rocket development, manufacturing and testing facilities.

Over the next two years or so Skyroot, which started out with a 15-member team from a nondescript facility in Hyderabad's Kondapur area, is looking to raise \$150-200 million to fuel the next phase of its expansion and aspirations, Chandana says.

Dhruva, which has raised \$8 million so far, is also in talks with the Telangana government as it looks to scale up operations. "We are at an inflexion point. In the next 12-18 months we want to set up a large integrated facility, which will require more funds. We are looking at raising \$20-25 million, a part of which will be utilised towards the new facility," says Nekkanti while refusing to divulge the timeline of the fundraise or other details.

UAE: India laying out new space infra, opening up sector to benefit us too

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Abu Dhabi: Calling space cooperation between two countries as 'historic', UAE space agency director general Salem Butti Salem Al Qubaisi on Tuesday lauded India for "laying out a new structure in the space sector by setting up new companies to promote businesses with private players and foreign entities", and said the new setup will benefit his country too.

In an interview with TOI, Al Qubaisi said, "India opening new public sector entities (Isro's commercial PSU NSIL and space regulator IN-SPACE) to encourage the private

sector to have more access to its space infrastructure is a great opportunity. It wants to open new partnerships with foreign players. This is an opportunity for the UAE too. Just like India, our mandate is to focus on developing our private sector."

"I consider the launch of Nayif-1 (a UAE nano-satellite launched in 2017) by India as a transactional cooperation as it was a one-off. Thereafter Covid affected launches for over two years. There is always the question of the competitiveness and pricing issues (for satellite launch) but there are intangible benefits too. There are many opportunities for space cooperation between the two sides as both countries have strategic partner-

ship," he said, adding he had agreed with Israel president Issac Herzog who at the Abu Dhabi Space Debate, wanted a close partnership between India, Israel and the UAE.

On whether the UAE will emulate India by using its space technology for improving ease of living just like smart city, farm and water management projects, Al Qubaisi said, "We are already working on this field as people are our priority. Our top priority is food and water security."

Unfazed by western influence, Al Qubaisi said the UAE is ready to tie up with any country, including China, for space collaboration in "national interest". "For us, it's a 'leo-political' equation rather than a geopolitical situation in space cooperation," he said.

