

Tiny satellites play big role in Israel's space ambitions

Three nanosatellites due to be launched in next 18 months will break new ground

Ora Coren

In 18 months' time, a new frontier in space is due to be explored, with the joint launch from the Kourou Islands in French Guiana of three nanosatellites.

The nanosatellites are the flagship project of the Israel Space Agency, developed by research at the Technion – Israel Institute of Technology, Haifa, in cooperation with the defense-systems maker Rafael and Israel Aerospace Industries. Details of the project – known as Samson, for Space Autonomous Mission for Swarming and Geolocation with Nanosatellites – were released ahead of next week's Israel Space Week.

Developed by a 40-person team headed by Prof. Pini Gurfil, the satellites each weigh a mere eight kilograms, requiring the expertise in miniaturization that

Rafael has. Each satellite is built out of six cubes, each 10 cubic centimeters. They will be thrust into space together with the Israeli-French Venus microsatellite, another innovative project whose goal is to provide precision agricultural imaging and environmental monitoring.

"The breakthrough was the decision to go ahead with such a grandiose project in world terms, and one of the most complex in the academic world," said Gurfil on the nanosatellites.

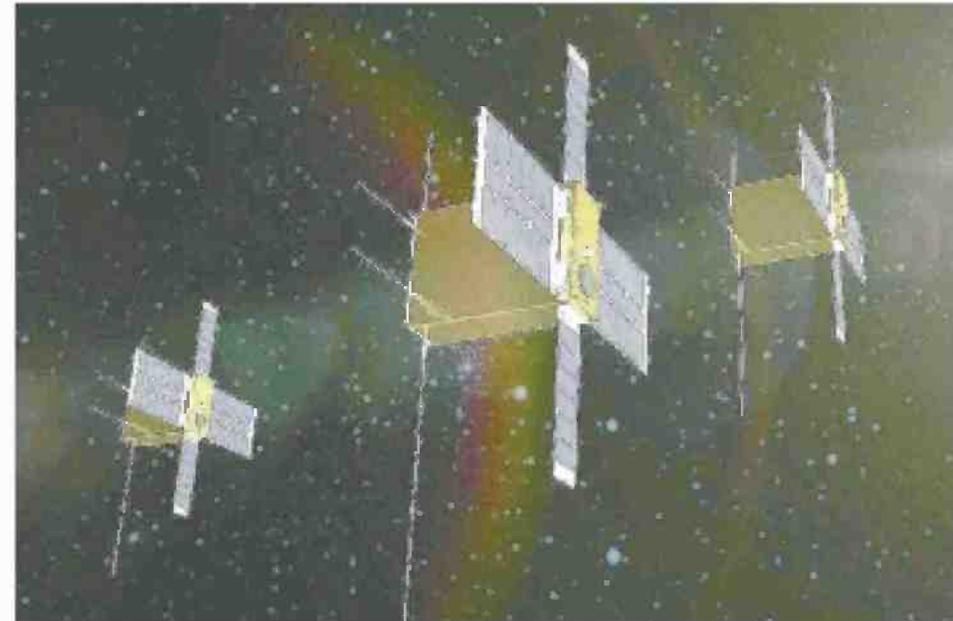
"Along the way, we made a lot of progress in improving the algorithms for coordinated flight and assembling the satellite themselves. From a technological viewpoint, compressing all that information into a space the size of a shoebox itself is a breakthrough," he added.

The three satellites will work as a team, with a "lead-

er" and two "followers," orbiting in fixed formation no more than 250 kilometers apart from each other – a kind of coordination never achieved before by satellites in orbit 600 kilometers above Earth's surface. The programs and algorithms that manage the flight were developed by Technion Space Research.

Apart from proving that it is possible to hold satellites in formation for a year or more, their purpose is to find signals of people on Earth who are missing or in distress. But the team has other ideas for their satellite technology, among them as a platform for speedier communications and very-high-resolution photography.

"We know there are planets similar to Earth beyond our solar system. We don't know if they have life on them, because we can't pho-



Artist's conception of the three Samson nanosatellites in orbit.

tograph them," said Gurfil. "If we had a network of satellites with better photographic capabilities, we would take a picture of a planet like this. That's the Holy Grail."

The nanosatellites are part of an ambitious goal of the Israel Space Agency for the country to capture a 5% share of the \$150 billion global civilian space industry. To achieve that, Israel's public and private sectors need to invest 300 million shekels (\$77 million) annually over the next five years.

Of that, 90 million shekels was budgeted to the agency itself for 2013-2014, said Israel Space Agency director Me-

nachem Kidron, who said the Finance Ministry had promised him a similar amount for 2015-16 when the news government introduces a budget after March's election. About 45% of that will be spent on international projects, like Venus, and another 30-35% on local industry – mainly startup companies.

A major international project in which the ISA is a part is the EU's JUPITER ICY moons Explorer (JUICE) initiative to launch a probe to explore Jupiter in 2022. Scientists from the Weizmann Institute are playing a leading role in the scientific aspects of the project, and the

Israeli company Accubeat is providing highly accurate time- and frequency-control products.

Meanwhile, the Venus satellite is being constructed at Israel Aerospace Industries and the ISA is part of the EU's MEPS project for microsatellites, in which Rafael is playing a major role.

One of the startups ISA is supporting is Ramon Chips, named after Israeli astronaut Ilan Ramon, who died in the 2003 U.S. Columbia space shuttle disaster. A fab-less semiconductor company, Ramon is developing unique chips designed to resist radiation in space.