Development of Israeli Nanosatellite, Possible Benefits, Discussed

Report by Gil'ad Shenhav: "Amos, Jr"
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Will the News Come from Israel?

It all began about three years ago. Dr Raz Tamir, chief engineer of the Amos-4 project, attended an international conference that dealt with small satellites, and became excited with the idea. Over the next two years, he recruited no fewer than 15 engineers from Israel Aerospace Industries [IAI], RAFAEL -- Armament Development Authority, the military and from the Technion -- Israel Institute of Technology, and formed them into a group with the goal of turning Israel into a pioneer in the young field.

The Israeli Nano-Satellite Association was established in 2006, defining a clear goal for itself: to develop Israel's first nanosatellite and fly it into space by next year. Tamir was named head of the association, and the ambitious space race began in earnest. Since the association is a nonprofit and has no funding whatsoever, all of its members work on the project in a completely voluntary capacity on their free time. Tamir explains the rationale behind a group of veteran engineers who have made developing complex technology a hobby: "Moshe Sinay was once asked what he likes besides soccer, and he replied English soccer. It's the same with us -- besides satellites, we like nanosatellites."

A year has passed, and the prototype for the association's first satellite is currently in the final development phases. It is unlike any satellite you may have imagined: It weighs just 4.5 kg, less than a small weight at the gym or the bags we lug from the supermarket, and it contains components some of which are state of the art.

The first launch is planned for late 2008, and it is supposed to be based completely on Israeli technology. The venture has attracted the interest of, among others, Rokar, which builds small GPS cards for satellites, AccuBeat, which developed a miniature atomic clock, and Ramon Chips, a subsidiary of the Technion, which develops purpose-built computers. All of the companies have donated their products for free. IAI contributed the rest of the hardware components and the testing labs.

Association officials explain that the goal is currently not an economic one. "Before we start dealing with money, we want to prove to the world that the business is possible and that it works. Afterwards, we'll talk about the tremendous business potential," says Meydad Pariente, one of the association's members and an engineer on the Amos-3 satellite.

"The revolution that we are talking about is a satellite for every worker. Our dream is to recreate what Ford did for the automobile, when he broke the car market and reduced prices -- but in space," Tamir explains. "If the technology reaches maturity, it will enable us to say goodbye to our cellular company and Internet service provider, and to receive all the communications we need, from anywhere, directly from the satellite. Nanosatellites can have a significant impact on public bodies as well. A small city will be able to buy its own private satellite, and with it operate the entire traffic system in the city -- with a minimum of malfunctions. The mini-satellites may also be good news for the third world, in that they would enable millions of people to have access to a telephone and to the Internet, at minimal costs on any scale."

If nanosatellites prove themselves and move to commercial production, their cost will fall to $30,000 per satellite, Pariente estimates. "I am not sure that in the first phase private individuals will buy them, but small companies and organizations will be able to so on a mass scale. The best parallel to what is liable to happen is P2P technology, which is used in software like e-mail and Kazaa. One miniature satellite cannot do anything, but a network of hundreds of satellites around the world transcends borders. If they can talk to each other, there will no longer be a need for large corporations that control expensive infrastructure. It will be possible to talk by phone or to send a huge amount of information from anywhere to anywhere else: Your satellite will simply talk with my satellite."

In order to promote this vision, the association promises to maintain complete transparency. "We want to invent the open code of the satellite world. When transferring information between satellites is free, many more companies will enter the market, prices will plummet, and the entire issue will become as popular as broadband. If sounds utopian, but less than a decade ago fast Internet in every home sounded impossible."

A Feather Light Testing Lab

Another advantage that the small satellites have is quantity. "In the Second Lebanon War there was a malfunction in a foreign satellite, and that shut down the activity of all pagers," Pariente says. "Following that, we were asked to examine whether it is possible to create a network of nanosatellites that would prevent similar situations. Our examination showed that it is possible. Deploying a network of satellites costs the same as one medium-size satellite, but it displays much higher survivability. If three or four of them shut down, customer service would not be harmed."

But how do you make such a complex thing as a satellite smaller? It turns out that on the large satellites currently being launched into space one can find 486-type computer systems, like those that we used more than a decade ago. The satellite's internal communications is also not carried over a wireless network, as is done in many homes in Israel, but rather over a hodgepodge of wires.

The reason for that is the huge concern by companies about malfunctions. They sell the outmoded technology and the communications cables. The Pentium and wireless Internet are still perceived to be a gamble.

"Space is a very hostile environment. It has strong radiation, a complete vacuum, and dramatic changes in temperature," Pariente explains. "Therefore, when you want to build an electronic component in space, you have to pass it through seven rings of hell of tests, and even then it is hard to guess what will happen to it when it reaches space."

According to him, the main reason why the field adopts new technologies so slowly is the insurance companies. "They simply refuse to insure satellites that use technologies that have not been tested in space. That has created an absurd situation in which satellites have occasionally lagged behind home computer technology. Think about it, there are plants in China that produce obsolete 486 processors just for the space industry."

This situation, Pariente argues, is about to change. "We are breaking through this very glass ceiling. New and experimental technologies will become a matter of routine when the price of malfunctions is reasonable. When a miniature satellite costs the same as a car rather than a skyscraper, and it is possible to experiment everything on it in real-life conditions, the entire field will be able to leap forward."

Besides testing advanced technologies, the association is planning additional projects as well. One of them is to create a nanosatellite that would be a sort of "repairman" in space. It would be attacked to the large satellite and would be able to provide a solution in the event of a malfunction.

Another project is developing miniature equipment for cleaning up space from the remains of rocket launchers and debris that endanger shuttles and other satellites. About a week and a half ago, association members held their first conference, with help from the Fisher Institute. All of the members faced their Israeli space industry colleagues wearing uniform shirts emblazoned with the association's logo, just like in a youth movement. At the event, they assessed that the initiative, which began as a hobby on a volunteer basis, would quickly become a real economic entity. The association is expected to become a company, and in that way the startup begun on people's spare time could turn into a going concern. Wit a bit of luck, they may even make history.