Space Flight Laboratory and Kepler Communications take a new approach to satellite development and production

Photo courtesy of Kepler Communications

As the newly revitalized space sector marches on, new collaborations between microspace and NewSpace organizations will become increasingly commonplace. One such partnership is that of Space Flight Laboratory and Kepler Communications, which have entered into a sizable agreement for Kepler's upcoming satellite constellation, as outlined by Kevin P. Corbley, Business Consultant.

Space Flight Laboratory (SFL) and Kepler Communications have entered into a satellite development and manufacturing agreement that could serve as a blueprint for future collaboration between microspace and newspace organizations.

Under the deal announced in late January, SFL – a developer of successful microspace missions for over 21 years – will build the first fully operational nanosatellite in Kepler's planned constellation of commercial communications satellites. As development of the nanosatellite is underway, SFL personnel will also be assisting with the startup of production at a Kepler-owned and operated manufacturing facility where duplicate satellites will be mass produced.

"For the past few years, an open question has been whether the emergence of newspace was challenging the market share of microspace manufacturers," said SFL Director Dr Robert E. Zee. "I have always been very optimistic about the future because the business models of microspace and newspace are quite different – yet complementary."

"The key to success for a microspace company has always relied on continuous innovation in an environment that does nothing but constantly design satellites for new applications," explained Zee. "SFL has been developing micro- and nanosatellites for 21 years, and each mission has built on the technological advancements of the previous. No two were the same. The microspace companies that have thrived in the past decade of disruption are the ones that have developed smaller and more advanced satellites in a rapid succession," he said.

For newspace companies, on the other hand, the business model is bottom-line oriented, driven by the need to offer satellite-derived services at ever-competitive prices. Earth observation and data communications are among the most common. These newspace organizations are not in the satellite manufacturing business per se, but they bring mass production in house as a cost-control measure.

"The vulnerability of this business model is the newspace firms leave themselves open to competition from a new company entering the market with even better technology," said Zee. "A company with a smoothly running satellite assembly line but with a core competency in providing imaging or communications services is typically not well positioned to innovate efficiently in the area of satellite development."

Kepler understands these challenges and partnered with SFL on a plan to collaborate, building on each other's strengths to form a business relationship that is not yet common in the space industry, Zee added.

"Our partnership with SFL has enabled us on many fronts…ensuring we can reach our required cost and performance targets to provide affordable global connectivity," said Kepler CEO and Co-Founder Mina Mitry.

Providing global data connectivity

Kepler is based in Toronto near the University of Toronto Institute for Aerospace Studies (UTIAS) which has been home to SFL since its founding in 1998. Toronto is also the site of Kepler's new manufacturing facility where the nanosatellites will be mass produced to complete its proposed commercial constellation of 140 satellites.

The Kepler business plan calls for providing two primary communications services through its constellation of satellites. The first is a global data transfer service that will securely relay gigabytes of data in a high-bandwidth store-and-forward solution via a Ku-band high-data-rate communications system aboard each satellite. The second service will provide cellular-quality, standardized Internet of Things (IoT) connections linking sensors and devices anywhere on Earth with their service provider.

"A critical part of our business model is to bring data

"The key to success for a microspace company has always relied on continuous innovation in an environment that does nothing but constantly design satellites for new applications,"

connectivity to remote and underserved areas – including the polar regions," said Mitry, citing energy exploration, agricultural monitoring, fleet management and maritime transport as example end user markets.

The global coverage will be accomplished by placing the nanosatellites in seven sun-synchronous orbital (SSO) planes with two mid-inclined planes as gap fillers. There will be 20 satellites in each SSO plane at 500-600km altitudes.

Kepler launched two demonstration satellites in 2018 with a third planned for 2020. The company already has paying customers retaining its services. The planned fully operational satellites which Kepler is calling Gen1, however, will incorporate significant upgrades from the demonstration spacecraft to deliver higher data transfer rates and last longer in orbit.

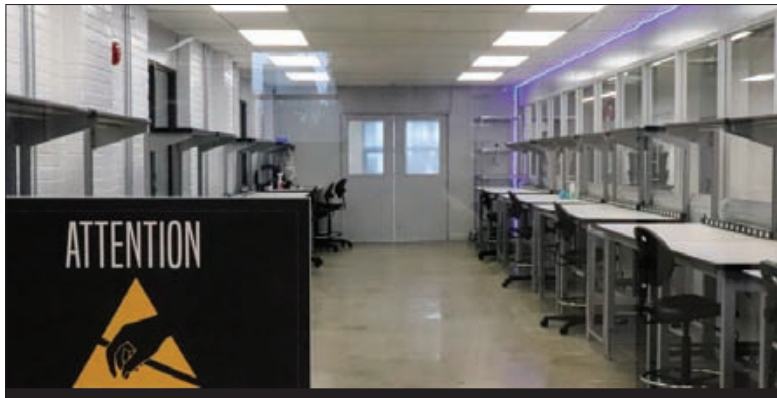
"The Gen1 satellites will be a big technical step up in performance compared to what's on the market," said Mitry. "By designing and building them in a different way, we are able to get this performance very economically."

Future-proofed technology

For the Kepler program, SFL is designing a new 6U XL nanosatellite platform 'SPARTAN' that leverages its flight-tested 3.5kg THUNDER and 7kg GRYPHON buses. SFL is tailoring existing power, propulsion, and attitude control technologies – all developed in-house during earlier missions - for the first satellite in the Gen1 cluster of fully operational commercial spacecraft.

"We are specifically designing this new nanosatellite with mass production in mind," said SFL's Zee.

While the first Gen1 nanosatellite is under construction



CleanRoom. Photo courtesy of Kepler Communications

in SFL's cleanroom, engineers from the microspace firm are working with Kepler at its 5,000-square-foot plant to train personnel and set up the testing, integration and assembly processes for the subsequent spacecraft. A crucial element in both the satellite design and production workflows is that both are being built in anticipation of disruption.

"They are designed to allow for upgrades and changes to the system as the constellation advances," said Kepler's Mitry.

SFL's Dr Zee says Kepler is ready for any future competitor that promises to deliver faster, bigger or better data connectivity services with advanced satellite technology. At that point, Kepler may collaborate again with SFL to rapidly build another microspace solution that is even more innovative. And just as importantly, according to Kepler, its manufacturing facility will be prepared to overhaul internal workflows and begin mass producing the newest generation of spacecraft.

"From innovation to launch, we are creating an agile satellite production process," said Zee. "We expect our approach will define microspace-newspace collaboration for decades to come."

Kepler test model is prepared for vibration testing at Space Flight Laboratory in Toronto. Photo courtesy of SFL