IAF SYMPOSIUM ON INTEGRATED APPLICATIONS (B5)
Satellite Commercial Applications (3)

Author: Mr. Kannas Wiid
Dragonfly Aerospace Pty (Ltd), South Africa, kannas@dragonflyaerospace.com

Mr. Bryan Dean
Dragonfly Aerospace Pty (Ltd), South Africa, bryan@dragonflyaerospace.com
Mr. Rikus Cronje
South Africa, rikus@dragonflyaerospace.com

AFFORDABLE COMMERCIAL ACCESS TO SPY SATELLITE QUALITY IMAGERY

Abstract

A very-high-resolution reconnaissance satellite (sometimes referred to as a "spy" satellite) is well known for being a) large and expensive, b) government controlled or with limited commercial sales and c) unsuitable for large scale commercial operations. The question is: what would it take to offer high quality, affordable, daily-refreshed, very-high-resolution imagery from a truly commercial space system?

With the price of launches coming down there is now a trend for small 'affordable' microsatellites to be launched in constellations providing very-high-resolution images with daily revisit. These current constellations are able to achieve the 1m or in cases sub-meter resolution image threshold but still cannot quite match the resolution and lack the image quality of the larger systems.

There is after all a reason that these large "spy" satellites are needed to achieve the high performance imaging. There is a physical limit to what can be achieved from a given altitude and with a specific imager aperture. These satellites are also designed to fly in relatively high altitude orbits to decrease image revisit time, increase accessible area in a pass and increase ground station access times. From these altitudes a large aperture imager is required and thus the resulting satellite is large.

A next step has to be taken to fully achieve the potential of these 100kg class systems and with large constellations reach the ultimate goal of daily high quality very-high-resolution imaging of the entire planet. This goal will only be possible with compact high performance microsatellites that utilize the latest advances in materials, electronics and on-board processing to deliver images to match or beat the resolution and image quality of their multi-ton "spy" satellite cousins. There are innovations taking place in the Newspace arena right now and every trick in the book needs to be thrown at this problem to achieve the goal. Low altitude missions with aerodynamically profiled satellites and long duration low-thrust propulsion. Non-diffraction limited imagers with advanced materials for mirrors and structures using the latest high quantum efficiency detectors with small pixel-pitch, super-resolution and oversampling. These and other innovations make the goal achievable and worth pursuing.

This paper will discuss and analyse the major challenges that would need to be considered to achieve such a microsatellite and describe practical solutions that can easily be applied to an existing microsatellite bus.