



As budget cuts loom, Boeing chief calls for vision
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Android reaches new heights

Satellite with core made up of smartphone technology may point the way to future low-cost commercial applications

The challenge of getting a mobile signal in remote locations will be raised to new heights with the 2012 launch of a satellite with an electronic core consisting of an Android smartphone. Surrey Satellite Technology (SSTL) and the University of Surrey hope their experiment with common smartphone technology will work well enough to point the way to low-cost, high-performance commercial applications in a very small satellite built from commercial off-the-shelf components.

SSTL engineer Shaun Kenyon, who is working on the Surrey Training, Research and Nanosatellite Demonstrator (STRaND-1), says a mobile phone “is 90% of a satellite”, with processor, radio, camera, motion sensor already built in; add solar panels and orientation control and you get to 100% – based on a core component that costs less than \$500.

Kenyon is not exaggerating. The Google Nexus One phone being used for STRaND-1 includes a 5MP camera, 3-axis accelerometers, a magnetometer and compass, an FM radio receiver, microphone, light sensor and battery temperature sensor. And its 1GHz processor with 512MB RAM is far

STRAND-1 EXPERIMENTAL COMPACT SATELLITE

Inside STRaND-1



- 1 Electrical power system and power board
 - 2 Digi-Wi9C high performance computer
 - 3 On-board computer
 - 4 GPS receiver
 - 5 Google Nexus One smartphone payload
 - 6 Reaction wheels*
 - 7 Sun and Nadir sensors
 - 8 Pulsed plasma thrusters*
 - 9 Standard three-unit CubeSat 34cm by 10cm structure
- *Experimental

SOURCE: Surrey Space Centre & Surrey Satellite Technology

meatier than that found on most spacecraft. SSTL and the Surrey Space Centre – the university’s space engineering department – ran a Facebook competition for ideas for phone apps that could be used to demonstrate in-orbit function. Four were chosen, including one that will let people

record screams on a website to be played and recorded in orbit to test the theory expounded by 1979 film *Alien* that in space, “no one can hear you scream”.

More scientific are two apps to use the phone’s camera to take pictures and, via Google Earth, build a map of the planet. A fourth will measure magnetic field using magnetometers.

The objective is to see if, in principle, such a simple spacecraft could measure oscillations in the upper atmosphere. Another plan is to take advantage of the touchscreen’s sensitivity to charged particles.

The phone, says Kenyon, is effectively a geiger counter and may be able to measure levels of space radiation.

NEW TECHNOLOGIES

STRaND-1 will also test new technologies developed by the Surrey Space Centre, including electric pulsed plasma thrusters, a first on a very small satellite.

University of Surrey lecturer Chris Bridges, one of Kenyon’s STRaND partners, says the opportunity to fly the thrusters – the product of six years’ work by a PhD student – illustrates the value of the partnership with SSTL, which started out as a spin-off from the university 30 years ago.

The spacecraft will also test a Surrey-developed radio transceiver built around a radio chip that hasn’t been used in space before, and an attitude determination system devised by the University of Stellenbosch in South Africa consisting of two wide angle cameras to look for the Sun and the Earth’s horizon.

STRaND-1 will also carry a GPS unit, a small “normal” thruster, magnetorquers – small coil electromagnets used to help point the satellite by reacting against the Earth’s magnetic field – and reaction wheels, which are small metal flywheels, used to help point the satellite.

The basic satellite is a three-unit CubeSat, a design standard set out by California Polytechnic State University based on 10cm by 10cm by 10cm units weighing no more than 1.33kg (see box).

The standard is important to developers as associated launch dispensers make it feasible to piggyback several units on a more standard payload. STRaND-1 is likely to piggyback on a mission early in 2012.

If it works, and Kenyon readily admits it is a big “if”, the team already has commercial applications in mind.

Kenyon, Bridges and eight colleagues are working in their own time to keep costs down. SSTL and the University have each put up £35,000 (\$55,000) to fund STRaND. ■

‘Cubesats are here to stay’

University of Surrey engineering lecturer Chris Bridges says of the 200 to 250 active Cubesat projects, STRaND-1 is the most sophisticated, but SSTL and the Surrey Space Centre are not the only big names to work with this small format – Boeing and the US Defence Advanced Research Projects Agency (DARPA) have used the 10cm boxes.

The beauty of Cubesats is their very low cost ability to test or demonstrate technologies that could find their way into

larger spacecraft. As Bridges puts it: “All the ground testing in the world will not be the same as being up there.”

SSTL’s STRaND-1 leader Shaun Kenyon underscores the cost-effectiveness of Cubesats when he notes that, for all its relative sophistication, the spacecraft will end up costing “less than a family 4x4”, adding: “Cubesats are here to stay.” Kenyon does not rule out eventual commercial applications for Cubesats.

For the quirky side of out-of-this-world technology, see flightglobal.com/hyperbola