Professor Sir Martin Sweeting, Chief Executive, Surrey Satellite Technology Ltd. (SSTL).

Professor Sir Martin Sweeting is the Director of the Surrey Space Centre and Chief Executive of Surrey Space Technology Ltd. (SSTL). He has pioneered the concept of constructing advanced nano-, micro- and mini-satellites using readily available components to provide affordable access to space. After first constructing two micro-satellites for research purposes at the University of Surrey in the early 1980s, he formed the SSTL company as a University spin-off company in 1985. So far, it has designed, built, launched and operated 24 small satellites that have been used for space science, telecommunications and Earth observation purposes. Besides which, the company has a number of small satellites under construction that will be launched over the next two years - the majority for remote sensing purposes.
Sir Martin has received many awards from national and international scientific societies and engineering institutions for his pioneering work. In 1995, he was awarded the OBE and, in 2002, he was knighted by the Queen for his outstanding contributions to the creation of the small satellite industry. Besides these personal awards, the SSTL company has been the recipient of a number of awards for its innovations and achievements. These include most recently (in April 2005) the Queen's Award for Enterprise for its development of micro-propulsion systems on board its recent spacecraft using steam as the propulsive agent instead of highly toxic chemicals.

What is the current structure and ownership of SSTL? Originally the company was 100% owned by the University of Surrey. However now one hears of a small proportion of shares being set aside for company employees and of an investment in SSTL by the SpaceX company based in California that is developing its range of low-cost Falcon launchers. What is the present position?

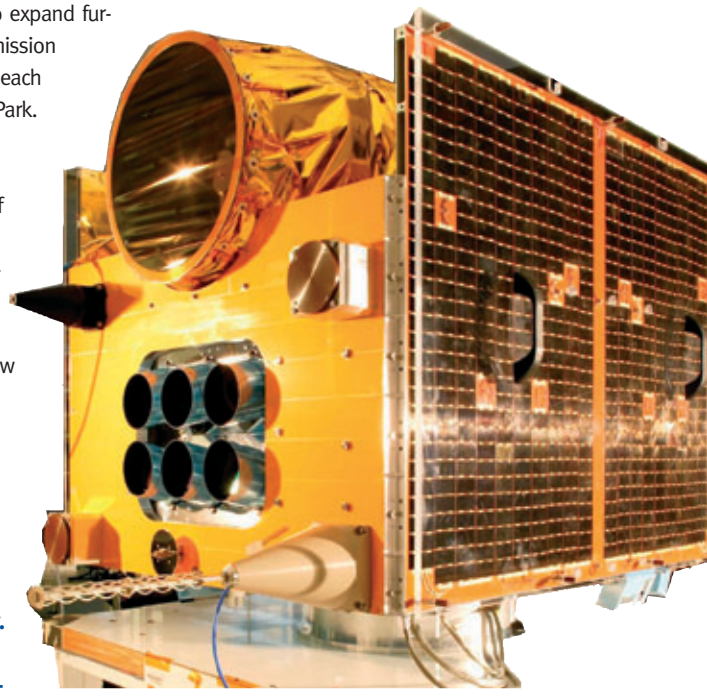
Until 2003, SSTL was 95% owned by the University of Surrey – with 5% held by myself as the founder of the Company. Over the last few years, a further 5% has been bought by the employees and, at the beginning of this year, 10% was sold to Space-X in order to cement a strategic relationship regarding low cost launchers and satellites addressing the US market.

In April 2005, your University announced that SSTL would be moving to a new larger building on the Surrey Research Park. In what way will this move benefit the company? Will it now be able to carry out those test operations in-house that previously had been outsourced to other facilities and laboratories?

This will, in fact, be our third 'move' - we built our current building on the University campus in 1992 and then built an extension in 1998 as our business and academic activities expanded. In 2004, we leased a second (commercial) building on the perimeter of the University to house further expansion as we reached 260 commercial and 50 academic staff and researchers. We wish to bring the team together under one roof again and, as there is no room on the current campus to expand further, we have decided to commission two new buildings adjacent to each other on the nearby Research Park. The first building will house design offices and laboratories accommodating some 300 staff and be ready for occupation in mid-2006. A second more complex technical building housing larger clean rooms and a new satellite control centre will follow about 2 years later.

Another European builder of small satellites that originated from a University development is the OHB company based in Bremen, Germany. Do SSTL and OHB compete in the supply of small satellites for remote sensing applications or are the two companies supplying rather different markets?

SSTL and OHB generally team together on market opportunities of mutual interest – and very occasionally compete. SSTL operates across a very wide international market place whereas OHB concentrates on the German and ESA markets.



The China DMC+4 micro-satellite that is being constructed by SSTL for the Beijing Landview Mapping Information Technology (BLMIT) company. It features a new 4m GSD panchromatic pushbroom imager (built by SIRA Electro-Optics), besides the standard multi-spectral imager with 32m GSD that is being used in the current DMC micro-satellites - AlSAT-1 (Algeria); NigeriaSat-1 and UK-DMC.

Quite a number of SSTL's satellites have been constructed on the basis of transferring the technology and know-how to developing countries wishing to enter the field of space science and remote sensing. Do you expect this activity to be maintained or even increased?

Yes, we do expect this activity to continue – although to be pedantic, we transfer know-how rather than technology, as our satellites are based on commercial-off-the-shelf (COTS) technologies which are widely available. We provide the know-how to use COTS parts in space to achieve reliable, low cost yet capable small satellites.

What is the purpose of setting up the DMC International Imaging (DMCII) company recently as a spin-off from SSTL? Do the non-UK partners in the Disaster Monitoring Constellation (DMC) have a financial interest in the DMCII company? Do these partners receive payment for the images acquired by their satellites and, if so, on what basis?

The DMCII Ltd (a subsidiary company of SSTL) was established in 2004 specifically to exploit commercially the image data returned from the 4 (soon to be 5) satellites in the DMC. Currently, DMCII is wholly-owned by SSTL but the DMC partners have been offered an opportunity to invest in the company if they wish. Presently, DMCII co-ordinates all the commercial imaging across the satellites in the constellation for all the partners, markets and sells the resulting data, and then returns royalty payments from the sales to the individual partners in proportion to the assets used.

Recently SSTL has been involved in a controversy concerning the supply of its micro-satellites to China. What is the basis of this controversy and how has the matter been resolved?

The US is very sensitive about our supply of satellites to PR China. However both of our satellite contracts with China have been rigorously examined and fully approved by the UK Government Export Control procedures (as indeed are all of our satellites exported to any country). The recent publicity has been based on some rather fanciful and factually-incorrect statements from a US-based article. These stirred up some concerns which we have allayed with a clear statement of the facts.

Back in January 2000, SSTL announced an agreement with the German RapidEye company to act as prime contractor and spacecraft platform supplier for its constellation of five mini-satellites targeted at the agricultural industry and mapping information service companies. In return, SSTL was to have made an equity investment in the RapidEye company. However the final contract for the supply of the satellites to RapidEye was only made last year (in June 2004) - with MacDonald Dettwiler Associates (MDA) of Canada now acting as prime contractor and making the award of the contract to SSTL for the supply of the spacecraft platforms, the arrangements for the launch of the satellites and the supply of the mission control centre.

(a) What caused the long delay in finalizing the contract?

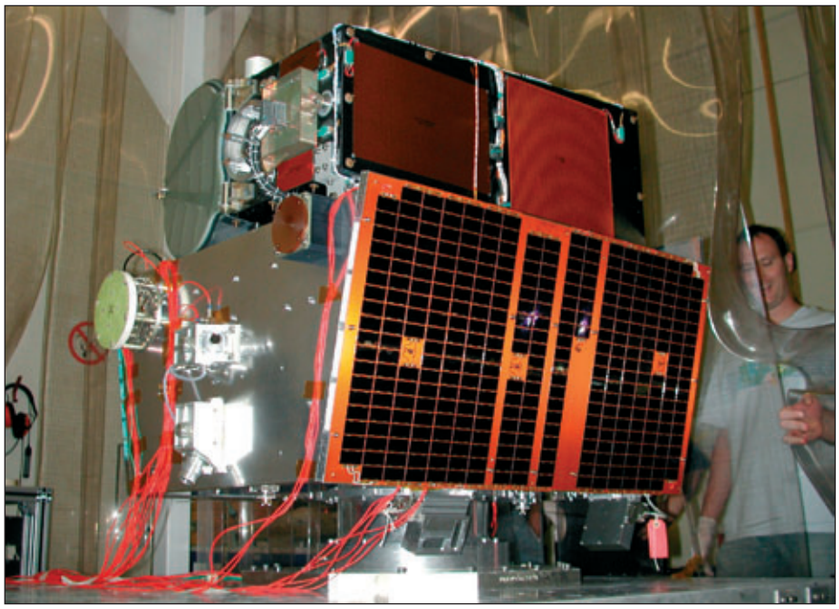
(b) Has the design of the satellites and their imagers been changed during this period?

(c) Does SSTL still have an equity interest in the project as originally announced?

(a) The financial guarantees required by the funding banks made it impracticable for SSTL to continue as prime contractor for the whole RapidEye project and hence MDA took over that role supported by Canadian government guarantees.

(b) Not significantly

(c) Yes



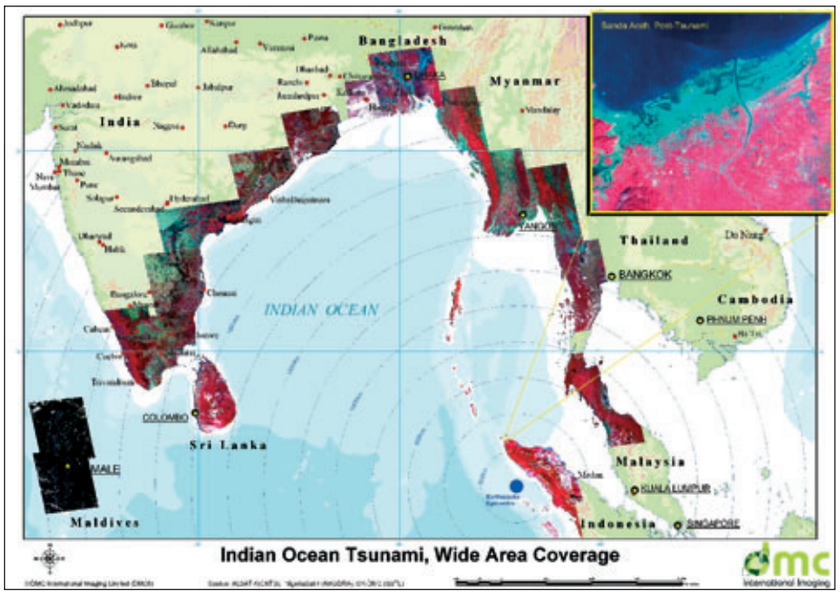
The TopSat micro-satellite that is being constructed for the UK government, is being funded jointly by the British National Space Centre (BNSC) and the UK Ministry of Defence (UK-MOD). SSTL is constructing the micro-satellite platform; while the Rutherford Appleton Laboratory (RAL) is providing the pushbroom scanner imager which will generate panchromatic imagery with a 2.5m GSD.

For the many readers of GeoInformatics who work within the mapping and GI industry, the advent of fairly high-resolution optical imagery from micro- and mini-satellites such as the RapidEye (6.5m GSD), China DMC+4 (4m) and TopSat (2.5m) is of special interest. What are the special challenges faced by SSTL in accommodating the high-resolution imagers equipped with long focal length telescopes within a micro- or mini-satellite platform - having regard to the fact that existing high-resolution satellites have a very much greater volume and weight?

The main issues are associated with the increased pointing stability and accuracy required for high resolution imagers – and the higher data rates then needed to downlink large quantities of data. Whilst demanding, these issues have been fairly easily accommodated on both the TopSat & China DMC satellites. We are now looking to increase resolution to 1-metre GSD where the pointing and thermal issues become even more demanding – but we believe this is possible within a ~150kg micro-satellite mission.

In recent years, SSTL has made much use of Russian launchers (Tsyklon, Zenit, Dnepr and Cosmos) - which are fairly readily available and competitively priced. In particular, the company has utilized the Dnepr launch vehicle and the services of the Russian/Ukrainian ISC Kosmotras launch company - with great success.

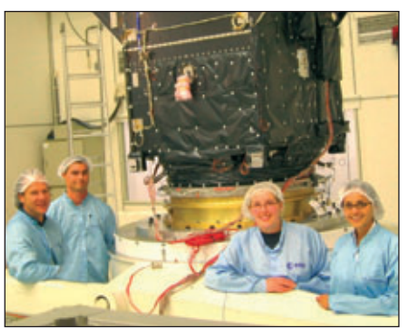
(a) In April 2005, the Russian Space Agency (Roskosmos) issued a statement that "there has lately been a tendency among Russian enterprises to offer satel-



The map shows the coverage that was achieved by the various Disaster Monitoring Constellation (DMC) micro-satellites whose images were provided to various relief organisations that used them to monitor the areas affected by the Indian Ocean tsunami of 28th December 2004.

lite launch services to foreign customers at prices that are substantially lower than those prevailing on the world market". A spokesman for the Agency then followed up this statement by mentioning specifically the Dnepr launcher and the Kosmotras company and the need for it to consult with Roskosmos before setting prices. Is this statement likely to impact on the future launches of satellites constructed by SSTL? (b) A second statement, made a few days later, announced that Russia and Kazakhstan have agreed on the development of a new very low-cost civil satellite launching system. This comprises a Mig-31 fighter plane and the Ishim missile which is equipped with a solid fuel engine. The system is designed to launch satellites of up to 200kg into a low Earth orbit. Is this system likely to be of interest to SSTL for the launch of the micro-satellites that it will be constructing in the future?

(a) I have recently discussed this matter with the DG of the Russian FSA (Roskosmos). The comparison of Russian launch prices with those for conventional US (or European) launchers is only partially justified. The imminent appearance of the US Space-X Falcon-1, which is comparable to the Cosmos launcher, at a price matching the current prices for Cosmos and Dnepr will, I believe, stabilize this discussion and we will see the Russian prices held at about the same level they are today.
(b) I have had discussions with the Kazakh agencies responsible for the Ishim air-launched system earlier this year. It is certainly of interest to SSTL, but it is still in the early stages of development – and, of course, our interest will depend on the final price tag and the satellite-carrying capacity of the system.



The first Galileo test satellite (GSTB-v2A) built by SSTL is undergoing thermal, mechanical and electro-magnetic testing at ESA's European Space Technology Centre (ESTEC) located at Noordwijk in the Netherlands. The satellite is scheduled to be launched by a Soyuz rocket from the Baikonur Cosmodrome in Kazakstan in December 2005.

SSTL has manufactured a series of Space GPS Receivers (SGR) that have been used for the in-orbit determination of the position and attitude of the satellites that it has built for a number of customers. Besides which, it has also supplied these sets to ESA, NASA, the ISS and the USAF for use on various satellites that have not been built by SSTL. Why did SSTL decide to develop and build its own GPS receivers? Is this an area where there will be considerable market opportunities in the future?

For the last 15 years, SSTL has had a strategy to develop a comprehensive in-house capability covering virtually all the sub-systems incorporated in our small satellite missions. This was adopted both in order for SSTL to be able to control cost and schedule risks more responsively and as a central requirement to be able to offer in-depth know-how transfer and training programmes. Whilst SSTL specialises primarily in satellite missions, the company also offers its sub-systems individually to customers. For example, it has supplied on-board data handling, attitude control, RF and power subsystems to international customers - as well as GPS receivers.

Up till now, SSTL has built numerous micro- and mini-satellites that have been launched into low Earth orbits (LEO), e.g. for remote sensing purposes. Now the company has moved into the construction of a much larger and heavier (600kg) satellite in the form of one of the Galileo Satellite Test Bed (GSTB) navigation satellites that will be launched into a medium Earth orbit (MEO). Why has SSTL decided to enter the field of MEO and GEO (geostationary) satellites that, in the past, has been dominated by the large aerospace companies such as Astrium and Alcatel? What advantages does SSTL offer in building such satellites?

Over the last 10 years, SSTL has developed its small satellite products in both directions up and down since its original '50kg' micro-satellites in order to better meet the demands of its customers for different mission requirements. SSTL developed and launched the 320kg UoSAT-12 mini-satellite in 1998 - funded internally to demonstrate advanced small satellite capabilities in orbit & attitude control and Earth Observation (EO). Likewise, in 2000, SSTL developed and launched a 6.5kg advanced nano-satellite. Since then, SSTL has developed 100-150kg EO micro-satellites and the 600kg Galileo test mini-satellite (GSTB-v2A) which will provide the first orbital demonstration of the company's 'GEMINI' platform for MEO and GEO carrying communications payloads. SSTL believes that there is an evolving market for small geostationary communications satellites (400-1800 kg) for specialised or gap-filler services - operating singly or in clusters - offering a lower mission-level cost threshold and flexibility compared with large satellites.

Web sites: SSTL – www.sstl.co.uk/
DMCII – www.dmcii.com/