Satellites in low orbit

The financial catastrophe of Iridium has forced some hard thinking about the economics of the revolutionary low earth orbiting satellite systems. Morris Jones reports.

In the closing years of the twentieth century, the skies above us have been filled with two major constellations of Low Earth Orbit (LEO) satellites. These have been among the most ambitious projects in the history of telecommunications.

Communications satellites have been mature technologies since the 1960s, but the overwhelming majority of them are parked in the geostationary orbit belt, roughly 36,000 kilometres above the equator. At this altitude, a satellite orbits the Earth in 24 hours, and thus appears to remain stationary to a ground-based observer. Point a dish antenna at a satellite in geostationary orbit, and you will never need to move it. A geostationary satellite can also "see" roughly half the Earth from its high vantage point, and can easily cover large areas in the footprints of its antennas.

Yet there are problems with such a system. Try to talk back to a satellite in geostationary orbit, and you will need a lot of power in your transmitter. These satellites are roughly a tenth of the distance to the moon away. The distance also produces time delays in getting a signal back and forth from them. It's noticeable for voice communications, and it can produce annoying delays for high-bandwidth interactive applications.

Enter the LEO constellations. A vast network of satellites is placed in low orbit, usually only a few hundred kilometres above the Earth. Signal delays and power requirements are lowered immediately. The satellites can only see a small portion of the Earth at one time, but a network of them can span the globe. If one satellite fails, there are plenty of others to take its place.

With this in mind, plans for literally dozens of LEO constellations have been drawn by companies around the world. Two major constellations, Iridium and Globalstar, have actually made it into orbit. The larger of the two, Iridium, uses 66 satellites in its network (hence the name, which borrows from the 66th element in the Periodic Table). The systems are primarily designed to service mobile telephony markets. Handsets that are only slightly larger than a conventional mobile phone transmit directly to the satellites overhead, with no need for a local ground station.

Getting Iridium and Globalstar off the ground (not a metaphor!) has been an impressive achievement for the engineering community. Never before have so many satellites in the same system been launched in such a short space of time. Launches have been quietly taking place for years from spaceports around the globe. Most LEO launches carry several of these relatively small satellites at once. Sometimes this strategy pays off. Sometimes it doesn't. Globalstar set a new record for losing multiple payloads when a faulty Russian rocket destroyed twelve of their satellites in a single accident! The manufacturers of the satellites have also pioneered new methods of mass production, enabling them to rapidly produce large numbers of near-identical satellites. So far, their on-orbit performance has been very good, with only a few serious failures.

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Now that the sky above us is filled with these tiny satellites, what will happen? In the short term, it seems that there will simply not be enough business to make either one of these ventures an outstanding success. Investors were enticed with sparkling predictions of high subscription rates in a very short period, and suggestions that this would amortise the huge overheads generated in creating these systems. Advertising has gone out in upmarket media outlets across the world. But the demand for these services has fallen far short of expectations. In some cases, potential clients have been unable to receive service due to poor sales management and a lack of user handsets.

Despite the efforts placed on building and launching these systems, it seems that no LEO developer has paid enough attention to the actual market for these services. Handsets for these constellations are expensive, and the subscription fees compare poorly with conventional mobile networks. Sure, you could stand at the north pole and call home successfully, but how many people really want to do this? Plans for Iridium were drawn at a time when conventional terrestrial mobile networks were not as

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commonplace as they are today. By the time the Iridium constellation was actually being deployed, the ground beneath it harboured far more terrestrial networks than before.

In August 1999, Iridium filed for Chapter 11 bankruptcy protection in the US, less than a year after it began providing services. In mid-March 2000, the company announced that it would be terminating service at 11.59pm EST on March 17. Motorola, one of the major investors in the company, said it would maintain the system for a limited period to allow customers in remote locations to obtain alternative communications.

On 20 March, a group of investors headed by hotJump!, a "privately held content network", announced plans to acquire Iridium. In mid-April, a representative of one of Iridium's twelve "gateway" companies told Reuters that a rescue package was still being discussed. Motorola, meanwhile, has continued working to facilitate the transfer of customers to alternative providers (the Iridium handsets will not work with other satellite systems).

LEO constellations are, on paper, an excellent idea. They will certainly be a part of our communications infrastructure in the future. At the moment, they would seem to be an idea that is still just slightly ahead of their time. With so many other avenues of instant communications available to consumers, LEO constellations will need to offer something very unique in terms of price, convenience or service before they will seriously compete with other infrastructures.

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From The Archives

The Future of the SBS

Seven months after announcing, as part of its National Agenda for a Multicultural Australia, that it would introduce legislation to establish the Special Broadcasting Service as an independent corporation with its own charter, the government released in February a discussion paper on the issues arising from this proposal.

The paper summarises the views which have been expressed in the past on the key issues, notably by the Connor Committee of Review of the SBS (1983) and the 1988 and 1989 discussion papers of the Review of National Broadcasting Policy, and while it raises questions, provides no conclusions of its own.

The paper was intended to form the basis of Department of Transport and Communications consultations with the SBS, the ABC and "other interested groups", including the Federation of Ethnic Communities Councils and other community interest groups. Consultations have taken place with ethnic and consumer groups and a preliminary discussion with ABC staff but not, so far, with the SBS. Nothing now seems likely to occur for some time, at least until a new government has settled in.

The direction which might be taken after the election on the SBS question in the event of a change of government is unclear. The Coalition Communications policy published in the December issue of Update contains no specific policies on matters like corporatising SBS, or on the central issue of the extent to which it might be obliged to rely on sponsorship or advertising as sources of funds. Opposition spokesman, Senator Richard Alston, has indicated support for these sources in discussions with SBS, and the Coalition is in favour of "limited" advertising on the ABC.

Although SBS has had the power to take limited sponsorship (for sport only) for some time, the broadcaster's first major initiative is Cathay Pacific sponsorship of the 1990 World Cup, involving 30-second mentions during the coverage as well as message "crawls" along the bottom of the screen.

The amount involved is around $300,000 including contra deals – a drop in the ocean compared to SBS's overall needs and only a fraction of the total cost of mounting the Cup, which SBS sources suggest is around $2m.

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