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ABSTRACT

Overview of Satellite Communications

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Commercial Satellite Communications began thirty four years ago, in 1965, with the launch of the first commercial geostationary satellite, Early Bird, later to become Intelsat I. The expansion of communications services by satellite has been rapid, and worldwide the business is estimated to be worth about $30 billion in 1999. In 1998, video distribution and direct broadcast satellite TV earned revenues of $17 B.

Over the 34 year period, there has been a steady move away from telephone traffic on satellites to video distribution and DBS-TV, and now to data links. Fiber optic cables have captured the market for telephone traffic in the US, and are slowly extending across the globe and under the oceans. However, the fiber circuits have yet to reach every home in the US, or even some countries, creating an opportunity for satellites to provide high speed data links. The new challenge for GEO satellites is to provide high speed two way access to the Internet from fixed and mobile terminals.

Low earth orbit satellite systems are just beginning to enter commercial service, and offer voice and data links worldwide at somewhat higher cost than cellular phone. LEO satellites have to be used in constellations of 50 or more satellites to provide continuous coverage, and are therefore expensive to build. Their future looks uncertain at the present time, as customer acceptance of the new systems has been slower than anticipated and revenues have not built as expected.

Satellite systems have also evolved to be the primary means of navigation. GPS and GLONASS provide high accuracy position location services anywhere in the world, and seem set to invade every automobile and cellular phone in the near future.

New satellite communication systems need new frequency bands in an already congested RF spectrum. LEO systems with omni-directional antennas need L-band and S-band frequencies, as they cannot exploit the higher frequencies. The development of self-steering phased array antennas for mobiles would help greatly in expanding these services. A new generation of GEO satellites is planned for the Ka, Q and V Bands. Slant path propagation research is still needed in the Q and V bands, and to determine the effects of foliage and buildings on satellite signals at all frequencies.

The greatest challenge facing the developers of new satellite systems is the rapid growth of the Internet. Fiber optic links to the home or office will eventually provide high speed access to fixed locations, but mobile users will still need satellite service. Linking a mobile user into the Internet via a satellite at megabit per second rates is indeed a challenge.