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## Communications Satellites

When man's capacities for constructive achievement are implemented, the result can be admirable and impressive. This is well illustrated in the continuing development of long-distance communication by means of geostationary satellites. The state of the art has come a long way since the launching in 1965 of the Early Bird satellite, and indications are that even more striking developments will occur.

Today most of the nations outside the Soviet Bloc are linked together by an effective and highly reliable communications network based on satellites located about 22,300 miles above the equator over the Atlantic, Pacific, and Indian oceans. Three such locations are sufficient to give global coverage.

The satellites are owned by the International Telecommunications Satellite Consortium (INTELSAT), a partnership that includes about 76 nations. Because the United States has been the major user of international communications, it owns about 53 percent of the consortium and has a corresponding share of the voting rights. The interests of the United States are represented by a publicly owned company, the Communications Satellite Corporation (COMSAT). In turn, COMSAT is the operating company for INTELSAT.

In its day, Early Bird (INTELSAT 1) was hailed as quite an achievement. It had a capacity of 240 circuits with annual cost per circuit of \$20,000.\* Present-day INTELSAT 3 satellites have capacities of 1,200 circuits with an annual cost of \$2,000. Under construction for use in 1971 is a new model with a capacity of about 6,000 circuits and an annual cost of \$700 per circuit. COMSAT scientists and engineers are working on components and design questions which they feel will permit improvement by at least another factor of 10 both in numbers of circuits and in costs per circuit near the end of this decade.

At present the satellites are principally used for telephonic communication. When the new satellites begin to function, costs of international conversations will drop, gradually approaching those of domestic calls. Prospects are fairly substantial that COMSAT will launch a geostationary satellite for use in communication internal to the United States. Pending is a proposal involving COMSAT and the American Telephone and Telegraph Company.

The communications satellites have a variety of applications, including telephone, telegraph, television, and data and facsimile transmission. One application that will probably be implemented fairly soon is aeronautical and ship communication. Radio works well on line of sight but is undependable at distances greater than 300 miles. Many ships have been lost while radio operators were trying in vain to communicate their peril. Midocean aeronautical navigation represents another growing need which could also be filled.

Satellite enthusiasts point to other potential uses. One of these is Picturephone, which now requires about 100 telephone circuits for a single two-way conversation. High-capacity, low-cost satellite circuits would help to make feasible large-scale use of this device. Perhaps more distant but of great consequence would be exploitation of future inexpensive communications for use in educational television.

Constructive applications of satellites are now a reality, and extension of technological potentials will have profound and global consequences.—PHILIP H. ABELSON

\* Additional expenses are incurred in ground stations. See *Report to the President and the Congress, Communications Satellite Corp.*, Washington, D.C., 20 April 1970, for additional details.

# Science

## Communications Satellites

Philip H. Abelson

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