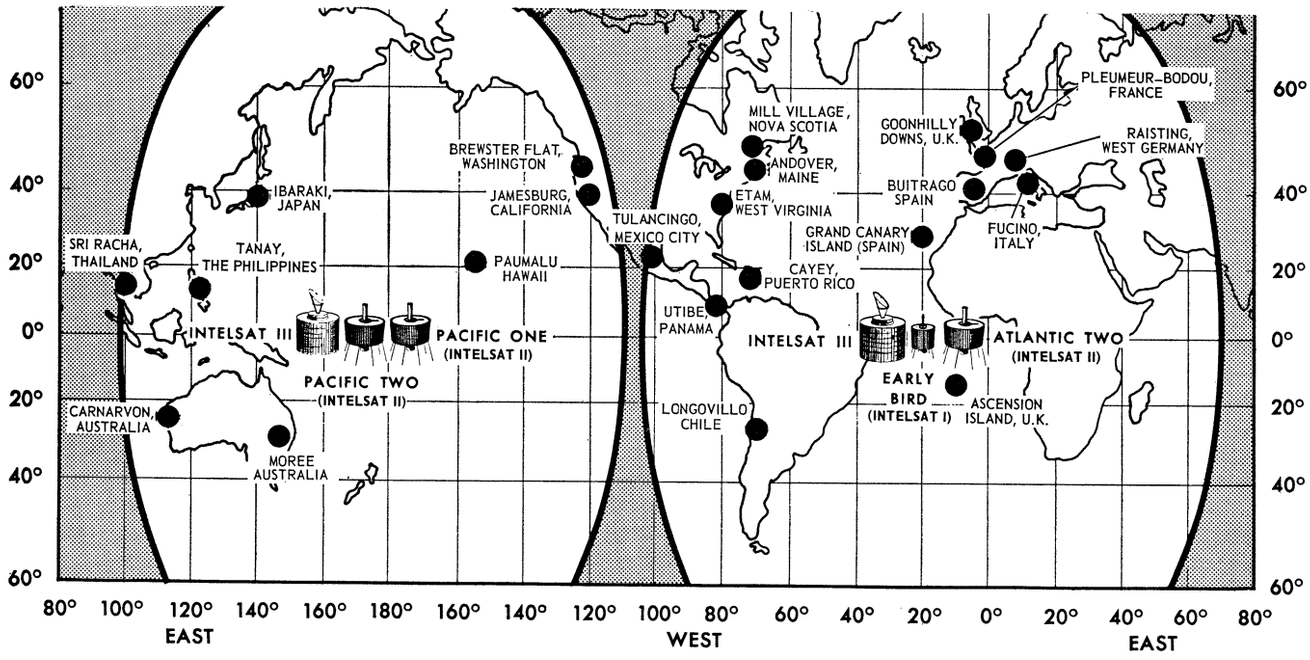


Comsat

Satellite communications ground stations around the world await Intelsat III's fivefold boost in talk capacity.

Accommodating the talk explosion

Satellites and transoceanic cables are ready to handle the next big jump in the conversation escalation

When a radio link made possible the first overseas telephone conversations in 1927, some 11,750 calls were placed during the first 12 months. Since then the volume has increased more than a thousandfold. Last year some 12.3 million overseas calls connected with the United States, and the number shows every sign of continuing to accelerate upward toward some incalculable babble-point.

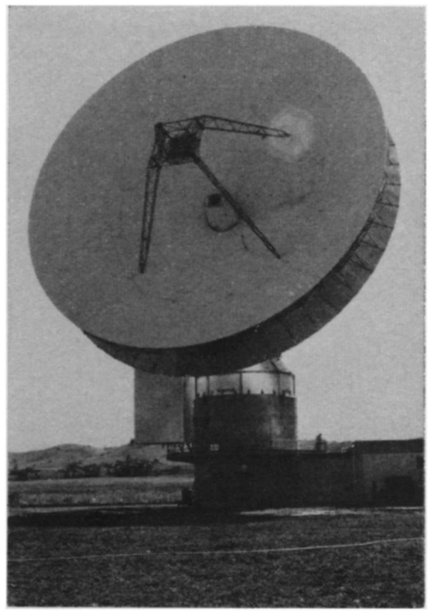
More than two dozen undersea cables and four satellites now strive to carry the load, but they would all soon drown in a sea of words if reinforcements were not on the way.

On Sept. 18, the Communications Satellite Corp. (Comsat) plans to launch the first of four Intelsat III satellites, each of which will be able to handle about 1,200 conversations at a time. Late next year, American Telephone and Telegraph Corp. will lay a 720-circuit cable, five times bigger than its predecessors, from the U.S. to Spain, and by the early 1970's, Comsat hopes for a four-satellite Intelsat IV system capable of carrying as many as 44,000 conversations simultaneously.

At present the Pacific and Atlantic Oceans each have two commercial communications satellites hovering overhead, with a total of 480 channels, or potential simultaneous conversations, per ocean. When a television program is sent by satellite, however, it consumes virtually the entire capacity of one satellite; telephone talkers must simply shut up and wait their turn. So far, this has not posed much of a problem, largely because a satellite's full attention is an expensive commodity, even for a TV network, so their use for television has been minimal.

As the volume of transoceanic communication increases, however, the rates will go down, and then the crowding could become severe. The first New York-to-London calls, for example, cost $75 for three minutes, compared to less than $6 for the same call today.

One of the major issues is whether all that profitable new traffic will be carried by satellite or cable. Comsat maintains that satellites offer much greater capacity per dollar than do cables, while AT&T would rather use the two methods equally. "With such a balance," says AT&T Vice President Richard R. Hough, "in the event of a catastrophic failure of one type of facility, not more than half of the services would be lost to us."



Comsat

Big ear listens in Cayey, Puerto Rico.

If next year's big trans-Atlantic cable were not installed, Hough points out, by 1972 satellites would be carrying about 75 percent of the communications volume, making the system overly dependent on their continuous operation. With the cable, however, but prior to the Intelsat IV series, cable traffic will account for about 46 percent of the total, with satellites having the slight edge (two percent is still accounted for by radio).

The new 720-channel cable is a major step for the engineers at Bell Telephone Laboratories, where it was designed. Transistorized amplifiers every 10 miles

keep the signals up to strength, compared to vacuum tube amplifiers spaced at 20-mile intervals in the last, 138-channel version. A special research program led to improved insulation that prevents the signals' energy from leaking away.

The first of the new cables, which went into operation last month, is a short hop from Jacksonville, Fla., to St. Thomas in the Virgin Islands. The next is now being laid from Puerto Rico to the Dominican Republic. The trans-Atlantic version will be placed next year for operation beginning in 1970.

Building bigger communications satellites, however, has not been a technological strain on the state of the art. Ground stations are already big enough to handle the upcoming Intelsat IIIs, and the satellites themselves will simply be given more power to handle a wider communications band.

In years to come, business developments are likely to be every bit as important to the growth of overseas communications as technological ones. Engineers are working with lasers (which pack thousands of channels into a single beam of energy), waveguides (already used to direct microwave beams but which could offer greater efficiency for other wavelengths), new switching systems (which can often double the capacity of an existing system with few other changes) and other techniques.

A major obstacle is the incredible tangle of interests vying for control of what they know will be an increasingly booming market. Comsat, AT&T, the Federal Communications Commission, RCA, Western Union International and the International Telecommunications Union are a few of the protagonists.

The ITU, in fact, already anticipates enough growth that it has adopted a plan for worldwide direct distance dialing. Under the system, to call a friend overseas, a caller would first dial an access code for the international network, then the country code, an area code, the exchange and the number itself, perhaps carrying a headful of numbers such as 900-686-807-542-0855.

LEPROSY

Step toward a vaccine

The culturing of *Mycobacterium leprae,* the bacillus of Hansen's disease, a major advance toward a vaccine for the disease, has been announced by Dr. Toyoho Murohashi, head of the tuberculosis department of the Japanese National Institute of Health.

Dr. Murohashi reported his success to a recent meeting of the panel on tuberculosis and leprosy of the Japan-U.S. Cooperative Medical Science Committee in Tokyo.

ONLY FIVE YEARS

Transplanted hearts will be shortlived

The first beat of one man's heart in another man's body was so revolutionary that the recipient's survival for a matter of days was a matter for wonder and thanks.

In the few months since this event, however, the science and technique of heart and other organ transplantation has come a long way. Strides made in countering the recipient's immune reaction to and rejection of the foreign organ have brought this demon under some control, and no one is much surprised any more to hear of patients making routine recoveries from transplants.

Now that heart recipients can realistically look forward to leaving the hospital and taking up a semblance of normal life, the question arises, what kind of semblance, and for how long? South Africa's Dr. Christiaan Barnard, performer of the first heart transplant, has a sobering view.

Barnard: a sobering view.

These operations, he told the recent meeting of the Australian Medical Congress in Sydney, can only be considered palliative, not curative. A transplanted heart can not be expected to survive for more than a few years at best, regardless of the skill used in immunosuppression.

A palliative measure basically is one which postpones the consequences of a disease, for a greater or a lesser period of time. To be curative a procedure must result in the patient's being free of the disease itself.

"A transplanted heart will last only five years—if we're lucky," Dr. Barnard told the congress. However, he added, "a thing is a success when it does what it was planned to do. The operation was planned to palliate heart disease. Dr. Philip Blaiberg would not have lived six days without a heart transplant." He said Dr. Blaiberg, who received his new heart seven months ago, now is able to lead a "practically normal life."

So the transplanted heart, because of the operation itself and the inevitable degree of physiological mismatch with the new body, must still be considered an abnormal heart. Thus the patient still suffers from heart disease, though less troublesome than before.

In line with this is a further point: In most cases heart disease is basically a symptom of a general upset of the body's biochemistry, for instance hardening of the arteries. This leads to clogging of the coronary artery which supplies the heart muscle itself with blood; the heart starves for oxygen and may eventually die from the lack (the familiar coronary attack).

Or heart disease may be the symptom or result of a mechanical failure elsewhere in the body, such as congested lungs. This puts a greater pumping load on the heart, which may then lose its elasticity, and become enlarged until it can no longer pump.

In either event replacing one heart made useless by its environment with another will only expose the new heart to the same damaging environment. Sooner or later it too will become a victim—sooner in the case of most transplants of this generation of surgery, which have to be a compromise between suitability and availability of donors.

Actually Dr. Barnard's statement should strike most organ transplant surgeons as something they already know or might expect, for the same thing holds true for nearly all tissue transplants.

Kidney transplants, for instance, though major surgery, are by now almost routine. Yet even these have a poor record of long-term survival. There appears to be a gradual deterioration which cannot be explained simply as a rejection process.

Dr. Donald E. Kayhoe, chief of the transplantation immunology branch of the National Institute of Allergy and Infectious Diseases, Bethesda, Md., says several factors may come to bear on the transplanted organ. Rejection, the tendency of the body to destroy foreign tissue, may be the most obvious factor at first. But of equal importance are the state of the patient's health generally and the specific nature of the original disease.

The relationship between the rela-