DOMESTIC SATELLITES

Six slots for COMSAT?

Space is limited. At least the space for synchronous communications satellites to serve the continental United States, Alaska, Hawaii and Puerto Rico is limited to positions between 94 and 124 degrees west longitude. With 5-degree intervals between satellites, there is room for six slots.

The Communications Satellite Corp., established by Congress as a publicly owned, quasigovernmental utility in 1962, this week placed two proposals before the Federal Communications Commission which, if approved, would use all six slots. Competition for the domestic satellite slots has been opened to all comers (SN: 8/29/70, p. 160), and the COMSAT proposal is expected to draw more controversy than the 1962 Communications Satellite Act, which established COMSAT and gave it controlling power in INTELSAT—the international communications consortium in operation since 1965.

One of the proposals was made jointly with the American Telephone & Telegraph Co. It is an updated version of an earlier joint COMSAT-AT&T proposal. In the proposal's latest form, COMSAT would procure and launch three satellites for exclusive use of AT&T. Each would have a capacity of 10,800 circuits. Their total cost would be $96.5 million.

The other proposal, new this week, would allow COMSAT to establish a system of three satellites to serve multipurpose users. Two of the satellites would be operational; the third would be a backup.

The proposal for three COMSAT satellites details a nationwide network of 132 ground stations that would ultimately cost about $248 million. According to COMSAT president Joseph V. Charyk, the system would be capable of handling all types of high quality communications including telephone, data services and television programming. Each satellite, when using a 97-foot antenna, could carry 14,400 telephone circuits, or more than a billion bits per second of high speed digital information, or 24 television channels—or combinations of these. The two operational satellites would each operate with 24 transponders in microwave frequencies between 4 and 6 gigahertz.

Dr. Charyk notes that large potential users (providing they don't get their own systems) would have a total requirement equivalent to 24 full-time transponders. These would include carriers such as General Telephone System Companies, Western Union Telegraph Co. and Datran. An additional 18 to 20 transponders would serve other users: news media, data processing, industrial and wholesale distributors, television networks (8 equivalent full-time transponders) and the public broadcasting and cable television industry.

"We are not proposing a monopoly," says Dr. Charyk. "But we are saying that the major users can satisfy their requirements through pooling in a single system of satellites." He adds that the single system would be the only way for small users to benefit.

Dr. Charyk may not call acceptance of the two proposals a monopoly, but other companies, including Western Union, Hughes Aircraft Co., Fairchild-Hiller and Western Tele-Communications have made, or plan to make, similar proposals to the FCC, for use of some of the six slots. The long-standing debate over participation in a domestic satellite system for the United States has undoubtedly entered another protracted phase. □

SHUTTLE ENGINE TESTS

Mississippi site chosen

The fierce competition among the National Aeronautics and Space Administration's 10 field centers surfaces every time a new program begins. The fewer the programs, the more intense it seems to be. The competition for the space shuttle is no exception. Although a decision has not yet been announced for the sites for flight testing and eventual shuttle ports, NASA announced site selections this week for shuttle engine testing.

For sea-level testing, NASA is reactivating its Mississippi Test Facility in Hancock County, Miss. It had been phasing down as Apollo Saturn testing ended. Testing under simulated altitude conditions will be done at the Air Force's Arnold Engineering Develop-

Fletcher to head NASA

Among the 150 guests at the White House dinner honoring the Apollo 14 astronauts this week was the heir-apparent to the National Aeronautics and Space Administration's top post—Dr. James C. Fletcher. Three days earlier, President Nixon had announced Dr. Fletcher as his choice to succeed Dr. Thomas O. Paine (SN: 8/1/70, p. 93), who resigned as Administrator last Sept. 15.

When approved by the Senate, Dr. Fletcher will bring a strong set of credentials to the NASA position —educator, businessman, physicist, adviser, arbitrator and, sometimes, soft-spoken philosopher. For the past six years he has been president of the University of Utah. Before that he had been president of two space corporations—the Space General Corp., which he organized and later sold to Aerojet-General, and the Space Electronics Corp., a subsidiary of Aerojet. He began his involvement with space activities as associate director of the Guided Missile Laboratory at Ramo-Woolridge Corp. (now TRW, Inc.), which designed the Atlas intercontinental ballistic missile. In Washington Government circles he has been a consultant to the Office of the Secretary of Defense, to the Arms Control and Disarmament Agency and the President's Science Advisory Committee. He holds a Ph.D. in physics and mathematics from the California Institute of Technology. He thus would be the first NASA head with a doctorate in basic science. Coupled with his obvious industry and administrative skill, is a gentle, soft-spoken manner.

What Dr. Fletcher will do with the 12-year-old space legacy he has inherited is yet to be seen. But this week, Rep. Olin E. Teague (D–Tex.), chairman of the House Science and Astronautics Committee's subcommittee on manned space flight, and Rep. James G. Fulton (R–Pa.), ranking Republican on that committee, criticized the new nominee for coming to NASA, "a very positive agency, with negative statements." The negative statements attributed to Dr. Fletcher in a newspaper quoted him as saying that "interest is waning in the space program and it is going to be up to us to have more exciting things to rekindle the interest." In rebuttal Teague cited his experiences with the "American public" on a recent 21-state tour with Apollo 13 Astronaut John L. Swigert in which he found "both an understanding and an enthusiasm for a continued strong national space effort."

"His background in space science and physics," says one Government scientist of Dr. Fletcher, "may make him lean more heavily to the unmanned space program." But it is generally considered that Dr. Fletcher will seek to work out in his own way what President Nixon outlined for the 1970's—"a bold and balanced mix of both manned and unmanned space science programs."

ment Center in Tullahoma, Tenn. The sea-level testing will include 12,000 developmental and acceptance tests between 1973 and 1979. The Air Force work will be done between 1974 and 1976.

Three companies—Pratt & Whitney, Rocketdyne and Aerojet-General—are competing for the engine development contract. □

ACCELERATORS

A crucial year

This appears to be a critical time for the technology of accelerators. Conventional techniques of constructing particle accelerators have been pushed as far as they can be pushed, says Dr. Allen Schwettman of Stanford University. For future development particle physicists will have to look to superconducting techniques (SN: 8/10/68, p. 139) or electron ring accelerators (SN: 7/12/69, p. 35). He believes that a superconducting accelerator will be successfully demonstrated this year.

Dr. R. B. Neal of the Stanford Linear Accelerator agrees that this is a crucial year for superconducting accelerators. The major questions, he says, are likely to be answered this year, but the answers could be yes, no or maybe.

Both men spoke at a symposium on superconducting linear accelerators this week at the 1971 Particle Accelerator Conference in Chicago. The panel included representatives of the other major laboratories involved in experimentation on superconducting accelerator techniques: Drs. Harald Hahn of Brookhaven National Laboratory and the University of Karlsruhe in Germany, Henry Halama of Brookhaven, Michael Kuntze of the University of Karlsruhe, Viet Nguyen of the Saclay Laboratory in France and Perry M. Wilson of SLAC.

It appears that the major worries involve whether superconducting techniques, which have been successfully demonstrated in small experimental models, can be successfully scaled up to working accelerators. Optimists, like Dr. Schwettman, say yes. Others, more dubious, see serious difficulties.

Superconductivity is the ability of certain metals at temperatures near absolute zero to pass electric currents without resistance. Superconductors could be used either in the magnets used to bend and focus the beams of particles being accelerated or in the waveguides that hold the high-frequency radio waves that do the actual accelerating. Superconductors could make accelerators more economical, smaller and ultimately more energetic since they would operate without heating and with virtually no power loss.

That superconducting radio frequency waveguides will work has been demonstrated experimentally in small sections (SN: 6/22/68, p. 601). To make an accelerator a number of small sections have to be put together. The small cavities of the experiments, says Dr. Kuntze, are equivalent to single crystals of niobium, the metal most often used. What happens, he asks, at grain boundaries when two are put together?

Another problem is that the testing was done at frequencies much higher than those needed for actual accelerators. The reason, as Dr. Schwettman explains it, is that the only furnaces available for fabricating the waveguides were made for high-frequency work. Since such a furnace costs about a quarter million dollars it was impractical to request a new one just for a few experiments.

Several persons on the panel worry that when waveguides are made for lower frequencies they will not accelerate particles as well as the high-frequency ones. Dr. Schwettman says there is no reason in principle why performance should suffer at low frequencies, but the skeptics respond that practice doesn't always follow principle. The waveguide question is primarily of importance to linear accelerators.

Yet another important question is the effects of impurities in the metal and of bumps, pits and whiskers in the cavity surfaces. The cumulative effect of these, when several cavities are put together, could be much greater than their effect in the small test units.

It is apparent that these and other questions will be answered soon. Two actual superconducting accelerators are nearing completion, one at Stanford and one at the University of Illinois.

The Stanford machine will be a linear accelerator with an ultimate energy of 2 billion electron-volts. It has been under construction since 1967. At present, says Dr. John Turneaure of Stanford, construction is complete except for fabrication and placing of the waveguides. Within a year, he says, they hope to have enough sections in place to accelerate particles to 200 million electron-volts.

At the University of Illinois a test beam has already been delivered by their smaller superconducting accelerator. Dr. A. O. Hanson calls it a "wee beam of one million electron-volts" but says they are delighted with it. The machine is designed to accelerate in stages. The actual accelerating unit gives particles 30 million electron-volts at a pass. The particles can be recycled enough times to come out ultimately with 600 million electron-volts. As tests continue it may begin to answer the questions about the feasibility of niobium waveguides. □

GROWING CONFLICT

Utilities and the environment

Conservationists have grown increasingly critical of the electric power industry because of the thermal pollution and sulfur oxide emissions of power plants (SN: 8/29/70, p. 187) and indications the utilities are doing little about their problems. They point out the utilities may even be exacerbating the problems with promotional campaigns that cause demand to exceed supply. A prime question has been whether President Nixon, in his new environmental fervor, would be willing to battle the utilities, a traditional supporter of conservative Republicanism.

The question is beginning to be answered in the affirmative. In his 1971 environmental message, the President proposed a power plant siting law which he must have known the utilities would oppose. Then last week, at a science writers' energy seminar at the National Academy of Sciences, an Administration representative and a utility official spoke—and disagreed on almost every point raised.

The two contenders were S. David Freeman, energy policy staff chief in the President's Office of Science and Technology, and W. Donham Crawford, president of the Edison Electric Institute, a utility trade organization.

The two men differed remarkably in their views of the current energy crisis —if it is a crisis. The electric power industry, Freeman said, has been characterized by rapid growth, abundant supplies and little attention to the environment and to diminishing reserves of fuel. As a result, he said, the country has faced growing utility-caused environmental problems, plus periodic power shortages. There is little doubt, he claimed, that there will be serious brownouts on the East Coast this summer.

Crawford replied flatly that there is no national power crisis. "On an overall basis, reserve generating capacity is on the upswing." Where there are problems, they are small and local, he added.

Freeman blamed the problems—as he sees them—not so much on environmentalist opposition to power plant construction, a prime whipping boy of the utilities, as on a number of other factors, especially promotional policies. "Utility sales departments are doing better than production departments," he said. Other problems, include, he said, poor quality control by electrical equipment manufacturers and consequent decreased efficiency of power plants; a plateau or even a regression in steam plant efficiency as the plants are built larger and larger; substitution of ener-