U.S. space station controversy grows

On April 24, NASA finally gave its much-delayed go-ahead for U.S. aerospace companies to bid on contracts to start building an earth-orbiting space station. The project has been staunchly advocated by the administration since President Reagan announced it in 1984 as a national goal. Opposition to the costly venture has become increasingly vocal, however, and last week members of Congress and representatives of the private sector were maintaining that, for all the station's possible worth, NASA was making a poor case for what advocates have called the agency's "centerpiece."

"The perception is growing that there is something fundamentally wrong in the way the space station program has been developed," said Sen. Donald W. Riegle Jr. (D-Mich.), chairman of a key Senate space subcommittee, at a hearing. Other members of the subcommittee described the program itself as "incoherent and incomplete."

Such views echo the opinions of a number of space scientists, some of whom have been expressing them since before the project was ever initiated. A major concern in the station's opposition has been that the cost of the facility will drain funds away from space science in general, including that done on the station itself. NASA has not launched an interplanetary mission, for example, since 1978, and the cost of the station has grown by NASA's own estimates from $8 billion when it was first proposed to $14.6 billion about a month ago.

Typical of the scientific opposition is a statement issued last week by Carl Sagan of Cornell University, Caltech professor Bruce Murray (former director of Jet Propulsion Laboratory in Pasadena, Calif., principal center for NASA's interplanetary missions) and Louis Friedman, former JPL manager of advanced studies. The three are the chief officials of the 100,000-member Planetary Society, a space-interest group whose expressed views have become more strident with NASA's declining planetary research budgets.

"The rationale behind the now $20 billion space station," according to the statement, "rests largely on the vague notion that space holds great potential for manufacturing — of pharmaceuticals, alloys, ball-bearings and the like. Yet outside the aerospace industry itself, and beyond verbiage, no large commercial concern advocates the space station strongly enough to share the costs of its development. No one has offered compelling arguments that space industrialization would be economically competitive with manufacturing on earth when a comparable capital investment is made. Nevertheless, the key and often-unstated assumption that products manufactured in space can be commercially profitable continues to permeate U.S. space station planning."

Similar criticisms have been voiced before. A year ago, for example, a group of university heads and corporate chief executives called the Business-Higher Education Forum noted that "the government must be careful not to stimulate an industry before it is economically feasible to do so. Caution must be exercised against over-stating the potential and over-promising the benefits of commercial space development [SN: 4/19/86, p.250]." But the current space station program's opponents have become more vociferous of late as the project is scheduled to move from mere studies into actual — and more costly — construction.

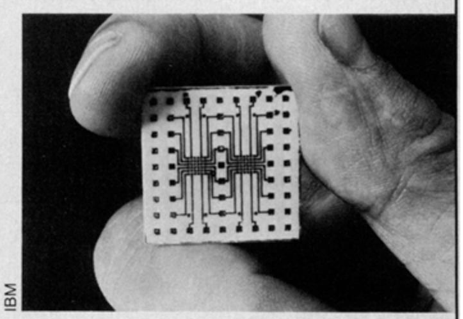
Another factor often cited by the Reagan administration in recent months, however, has been American "competitiveness" in the world marketplace. Here, says the Planetary Society statement, it is sometimes argued "that international agreements based on anticipated commercial benefits have already been negotiated and therefore must be followed through. Does this mean that there is a set of foreign industries poised to profit from the station? No. The only identified interests, foreign or domestic, with a serious commitment to the station are the organizations that stand to profit from building it."

The purpose of the statement's authors before congressional committees last week, however, was not one of general station-bashing. They were advocating the human exploration of Mars, an oft-discussed 21st-century goal that they maintained would give NASA a sorely needed sense of purpose. Besides science and national prestige, they say, it would offer "a realistic and possibly unique opportunity for the United States and the Soviet Union to work together."

The Planetary Society team says a space station would be necessary for such an endeavor, but argues that the proposed emphasis on materials-science experiments would require the facility to be held too steady for construction projects and launchings, two of its likeliest roles. Also, they aver, budgetary trade-offs like limitations on a station module with spin-produced artificial gravity have restricted the initial station configuration's utility for studying the effects on humans of long-duration space flight. "NASA's space station," says the group, "as now envisioned, is not a practical stepping stone to Mars." — *J. Eberhart*

Painting with superconductors

The new high-temperature superconducting materials are brittle and ceramic and only recently have been found to have technological potential, but already people have drawn wires and films from them and made rings out of them. The latest news from IBM, in whose laboratories the first of them was discovered, is that scientists at its Thomas J. Watson Research Center in Yorktown Heights, N.Y., have managed to make superconducting circuits called SQUIDs (superconducting quantum interference devices) out of the new materials and have developed a technique for spray painting them onto surfaces. This photograph shows such a pattern of superconducting lines.



IBM

Because SQUIDs can sense quantum-by-quantum changes in magnetic fields, they are frequently employed as high-sensitivity magnetometers. The Josephson junctions that are the basic elements in SQUIDs have many actual and potential uses in microcircuitry, particularly as switches in computer circuitry. However, previous Josephson junctions needed refrigeration by liquid helium to a temperature of 4 kelvins to operate, and that limited their prospects. These new IBM SQUIDs are fully superconducting at 68 kelvins and so can operate with refrigeration by liquid nitrogen. Liquid nitrogen temperature is normally 77 kelvins, but adjusting the pressure can reduce it to 68 K, IBM says.

The new superconducting substances, which are compounds of copper oxide with yttrium and barium, are amenable to the technique known as plasma spraying, IBM scientists have found. In plasma spraying the substance is heated until it is ionized and then quickly deposited on a suitable surface and cooled. After annealing, the painted substance is completely superconducting, again at 68 K. IBM researchers have managed to coat preformed shapes such as wires, contoured and flat surfaces, and even tubes. They can paint lines with the superconductors on substrates commonly used in making conventional printed circuitry. Such superconducting lines could someday form connections in computer circuitry, thus eliminating some serious hindrances to computer speed and data-processing volume.