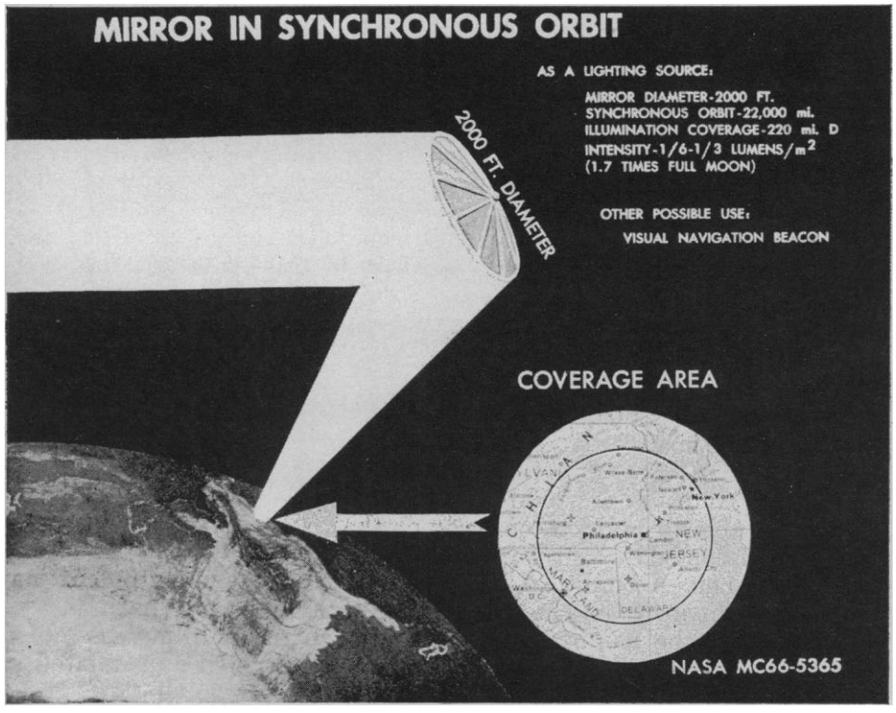
Reflecting Satellite: NASA Study Causes Concern among Astronomers

The bright "star" that astronomers fear may be rising in the East is not a vision from a post-holiday hangover. Rather, it stems from the realization that NASA and the Department of Defense have commissioned feasibility studies on a satellite which would reflect extensive light onto portions of the dark side of the earth.

In testimony before the House Committee on Science and Astronautics in the last Congressional session, George E. Mueller, NASA's Associate Administrator for Manned Space Flight, exhibited a drawing of a space mirror 2000 feet across, which would orbit at a height of 22,000 miles and cover an area of 220 miles in diameter with a light intensity 1.7 times as bright as the full moon. Mueller said that aluminized mylar films could be assembled into a flat mirror which would be constructed and inflated in space.

In his House testimony, Mueller said that such a mirror "could provide some level of light in Vietnam if that were a desirable thing to do so as to limit the operations at night." In addition to facilitating nighttime military activities, civilian uses which have been contemplated include aid to search and rescue activities, recovery operations, the lighting of blacked-out cities, and increased lighting in polar latitudes. Mueller suggested that such a structure could be modified to serve "as a very large radio antenna for radio astronomy use."

Some astronomers say that such reflection would hamper astronomy in adjacent areas, and they predict that the orbiting of several "space mirrors" could seriously impair astronomical observation over much of the earth's surface. Other scientists have suggested that the rhythms of plant and animal life would be disturbed.



This drawing of a contemplated space mirror was exhibited by George E. Mueller, NASA Associate Administrator for Manned Space Flight, during 1966 hearings before the House of Representatives Committee on Science and Astronautics. It depicts a mirror reflecting light onto an area of the eastern United States which extends from Washington to a point slightly northeast of New York City. In the hearing, Mueller said that such a reflecting satellite could be used to provide light to limit hostile operations in Vietnam at night. Mueller explained that the synchronous earth orbit program, of which the space mirror proposal is a part, "is designed to produce an operational capacity by the middle of 1970."

NASA officials have attempted to pacify concerned astronomers with two arguments: first, they have insisted that a reflecting satellite of the type contemplated would not interfere with astronomy; second, they say that there has been no decision to orbit such a solar mirror and no judgment yet even as to whether it would be a worthwhile project. In the studies done for NASA, it has been determined that the orbiting of such a reflecting satellite would be technically feasible. The five companies conducting feasibility studies are Boeing, Westinghouse Electric, Grumman Aircraft, Goodyear Aerospace, and the G. T. Schjeldahl Company. The five contracts total $490,000.

The scientist who is primarily responsible for developing public questioning about the NASA study is Edgar Everhart, a physics professor at the University of Connecticut and an amateur astronomer. Fearing that this project was being undertaken without adequate attention to the effects on astronomy, Everhart alerted astronomers and wrote a warning letter which served as the basis of an editorial "But who needs sun at night?' which appeared in the October issue of *Sky and Telescope.*

In view of the increasing concern about the project among astronomers, the Committee on Potential Contamination and Interference from Satellites—part of the National Academy of Science's Space Science Board—recently began a study of the satellite. From a number of telephone interviews, it is apparent that scientists and government officials are depending on this committee, which is chaired by John W. Findlay* of the National Radio Astronomy Observatory at Charlottesville, Virginia, to study the matter thoroughly and ascertain any harmful effects on science. For instance, Charles Townes of M.I.T. who serves as chairman of the NASA scientific advisory committee for the manned space project, said that his committee would probably defer its own study of the space reflector until

* Other members of the committee are Sidney A. Bowhill, University of Illinois; Thomas M. Donahue, University of Pittsburgh; William Liller, Harvard College Observatory; Carl E. McIlwain, University of California, San Diego; Wolfe Vishniac, University of Rochester; and Fred L. Whipple, Smithsonian Astrophysical Observatory.

after the Findlay committee had made its report. Townes termed the Findlay group "a good committee" and said he expected to rely on its recommendations.

As of this writing, the Findlay committee has not yet met to discuss the reflecting satellite. "Maybe we should work faster on this," Findlay said, "but it's not really an active project. They're a long way from being committed." He reported that he had sent out his initial findings to his committee about the first of December and had received only one or two comments in reply. Findlay said his committee was likely to finish its study within a month, and added that, because of the press and public interest, "maybe we'll have to be a little more formal." The group is scheduled to hold its first meeting to discuss the space mirror in Washington on 6 February. Findlay said his committee would not judge the worth of a reflecting satellite or ask NASA for "all the facts" about such a project but, rather, would attempt to judge its effects on astronomy and other scientific concerns. NASA has cooperated fully in providing all the relevant facts for such a determination, he said.

The Findlay committee was created several years ago to study Project West Ford, in which several hundred million copper needles were orbited as an experiment to establish a jam-free communications network. At the time, astronomers expressed fears, which proved unjustified, that West Ford would interfere with their observations.

Since the initial concern over the space mirror, NASA has apparently been successful in reassuring many astronomers and other scientists. Although recognizing the validity of astronomers' concern about a reflecting satellite, Townes maintains that "NASA is considerate of the needs of astronomers; the national government is not likely to do anything to seriously damage astronomy. Even if it were put up, the 'dish' wouldn't be a serious problem."

Other scientists are more skeptical. William Liller of the Harvard College Observatory said he was worried about the possibility of orbiting space reflectors. Although one satellite might not be especially detrimental to astronomy, he said, the launching of that satellite might have a "foot-in-the-door effect" and increase the possibility that other space reflectors would be orbited.

Edgar Everhart said he was now more concerned about a "proliferation" of satellites than about the orbiting of one particular satellite. He argues that the orbiting of even one satellite would be "using space for warfare purposes," thus violating the intention of the recent space treaty (*Science*, 16 December). Everhart said he is worried that such satellites cannot be serviced in space or brought down and that they thus pose the danger of running out of control and randomly reflecting light onto areas of the world where it is not desired.

"This satellite is such an awful thing for astronomers, it's like thinking about nuclear bombs," Everhart said, "There is a tendency for astronomers to put their heads under blankets, go about their jobs, and not think about it."

One of the astronomers who has communicated his concern to NASA, G. C. McVittie of the University of Illinois, said that one reason he asked for an explanation is his expectation that American astronomers will be beseiged with critical questions about the reflecting satellite from foreign colleagues. Such a confrontation could take place when the International Astronomical Union meets at Prague in August. McVittie said that several astronomers were assured in late December by Henry Smith, deputy director for NASA's physics and astronomy programs, that their observations would not be adversely affected by the orbiting of a space mirror.

NASA maintains that there has been no decision to begin any kind of final study on a reflecting satellite project. But such assurance does not guarantee that a space mirror will not be eventually orbited by the United States. Townes said that a reflecting satellite should not be ruled out and that it might be launched "fairly rapidly" once the decision was made.

A space mirror might be tempting at any time, but the Vietnam war could provide special impetus to the project. Astronomers and other scientists will be paying special attention to NASA and the Department of Defense to determine whether they detect the first glimmerings of a new kind of earth-circling object.—BRYCE NELSON

Oceanography: Will LBJ's New Study Panel Make Its Mark?

Six months ago Congress, trying to gain initiative in influencing government policy in oceanography, passed the Marine Resources and Engineering Development Act of 1966 (*Science*, 10 June 1966). President Johnson, despite some sentiment among his advisers that he should veto the measure, signed it. However, it was not until last week that the President appointed the study commission for which the act provides. The commission will be a companion body to the marine council, made up of cabinet members or their representatives, established by the act as a temporary group to advise the President on oceanographic policy. The commission's performance may provide an interesting, if inconclusive, test of the usefulness of such study panels.

The commission's responsibility is to recommend an "adequate national marine science program" and an appropriate government organizational structure to carry it out. In fact, the commission is expected to recommend the establishment of a new agency to give greater focus and impetus to nonmilitary marine science activities.

The new 15-member body is chaired by Julius A. Stratton, chairman of the Ford Foundation and former president of the Massachusetts Institute of Technology. Stratton had no voice in the selection of the other members. Just a few days before the commission's membership was announced he was persuaded by Vice President Humphrey, chairman of the Marine Council, to take the chairmanship. On the commission, in addition to Stratton and a few other university scientists, are two lawyers (including a professor of international law), a professor of economics, three federal officials, a director of state fisheries, and four businessmen.